HEALTH AND SAFETY PLAN
SAN JACINTO RIVER WASTE PITS SUPERFUND SITE

Prepared for

McGinnes Industrial Maintenance Corporation

International Paper Company

U.S. Environmental Protection Agency, Region 6

Prepared by

Anchor QEA, LLC

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Ocean Springs, MS 39564

December 2009

9341127

CERTIFICATION PAGE

David Keith, Ph.D., R.G., C.HG.	Jason Kase
Project Manager	Field Lead
Anchor QEA, LLC	Anchor QEA, LLC
Date: _____	Date: _____

The information in this Health and Safety Plan has been designed for the Scope of Work presently contemplated by Anchor QEA, LLC (Anchor QEA) for this Site; however, that scope of work is not yet fully understood. Therefore, this document may not be appropriate if the work is not performed by or using the methods presently contemplated by Anchor QEA. In addition, as the work is performed, conditions different from those anticipated may be encountered and this document may require modification. Therefore, Anchor QEA only intends this plan to address currently anticipated activities and conditions and makes no representations or warranties as to the adequacy of the Health and Safety Plan for all conditions encountered.

HEALTH AND SAFETY PLAN ACKNOWLEDGEMENT FORM

Project Number: 090557-01 Project Name: San Jacinto River Waste Pits

My signature below certifies that I have read and understand the policies and procedures specified in this Health and Safety Plan (HASP). For non-Anchor QEA employees, this HASP may include company-specific appendices to this plan developed by entities other than Anchor QEA.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

SITE EMERGENCY PROCEDURES

Emergency Contact Information

Table A

Site Emergency Form and Emergency Phone Numbers*

Category	Information	
Possible Chemicals of Concern	Dioxins/Furans	
Minimum Level of Protection	Level D	
Site(s) Location Address	(no formal address see Figure A) Channelview, TX 77530	
Emergency Phone Numbers		
Ambulance	911	
Fire	911	
Police	911	
Poison Control	911 and then 1-800-222-1212, if appropriate	
Client Contact - McGinnes Industrial Maintenance Corporation (MIMC)	Andrew Shafer	Office: (713) 647-5460 Cell: (832) 724-3802
Client Contract – International Paper (IP)	Phil Slowiak	Office: (901) 419-3845 Cell: (901) 214-9550
Project Manager (PM)	David Keith	Office: (228) 818-9626 Cell: (228) 224-2983
Field Lead (FL)	Jason Kase	Office: (850) 912-8400 Cell: (251) 259-7196
Corporate Health and Safety Manager (CHSM)**	David Templeton	Office: (206) 287-9130 Cell: (206) 910-4279
National Response Center	1-800-424-8802	
State Emergency Response System	(512) 424-2138	
EPA Environmental Response Team	(201) 321-6600	

* In the event of any emergency contact the PM and FL.

** Integral Consulting Inc. (Integral) will be active on the site during some of the field activities anticipated for this project. The Corporate Health and Safety Manager (CHSM) for Integral is Eron Dodak; his phone numbers are: Office (503) 284-5545 x14; Cell (503) 407-2933. In event of an emergency involving Integral staff, Mr. Dodak must be contacted. Additional Integral contacts will be included in the addendums of this HASP that will be developed as part of task-specific Sampling and Analysis Plans (SAPs). Field personnel should refer to the HASP addenda that accompany the program-specific SAP for detailed emergency contacts.

Figure A

Site Location Map

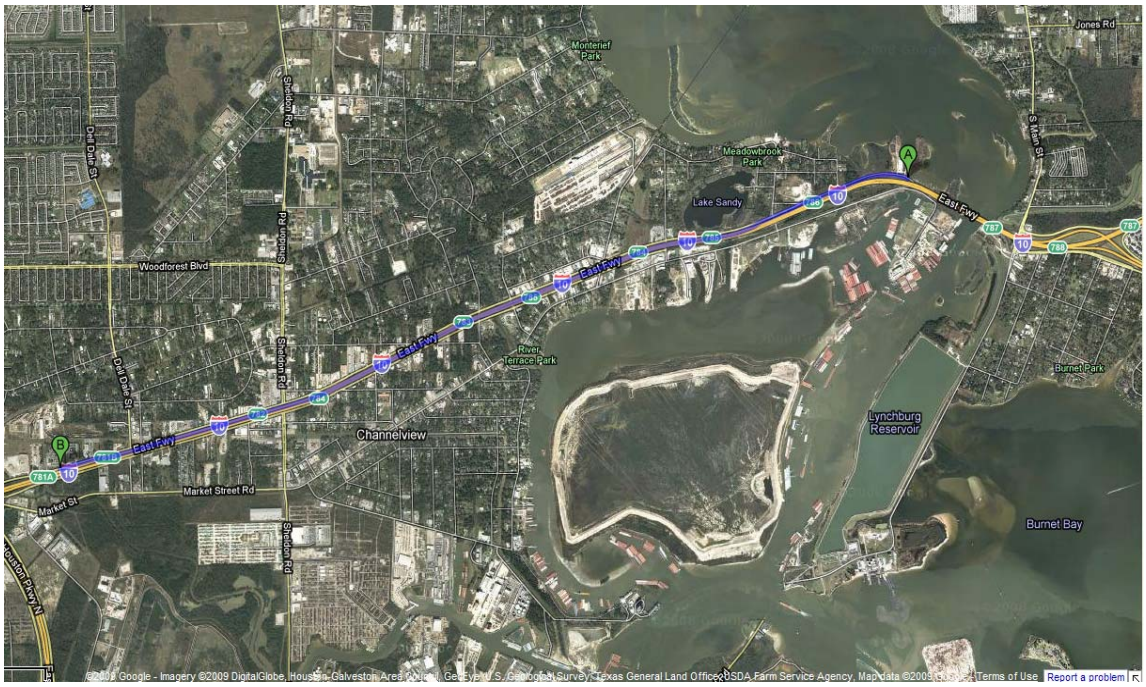
Table B

Hospital Information

Category	Information
Hospital Name	Triumph Hospital – East Houston
Address	15101 East Freeway
City, State	Channelview, TX 77530-41041
Phone	(713) 691-6556
Emergency Phone	(713) 691-6556

Figure B

Hospital Route Map



Hospital Route Map and Driving Directions

1. Head west on East Freeway Service Road toward Monmouth Street (approximately 0.9 miles)
2. Take the ramp on the left to I-10 West
3. Proceed on I-10 West to Exit 781B (approximately 3.7 miles)
4. Exit freeway at Exit 781B onto East Freeway Service Road
5. Continue heading west on East Freeway Service Road (approximately 0.2 miles)
6. Triumph Hospital will be on the right (total distance approximately 5 miles)

Figure C

Access to I-10 West

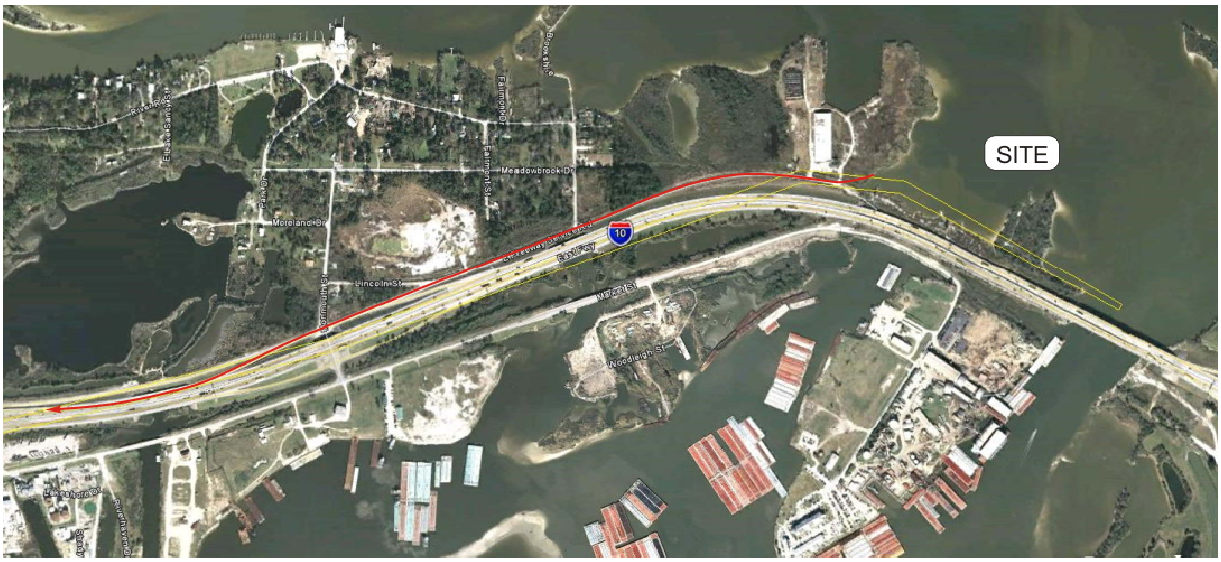


Figure D

Hospital Detail (Egress from I-10 West)

Key Safety Personnel

The following people share responsibility for health and safety at the site. See Section 4 of this HASP for a description of the role and responsibility of each.

Client Contact: Andrew Shafer (MIMC)	Office: (713) 647-5460 Cell: (832) 724-3802
Client Contact: Phil Slowiak (International Paper)	Office: (901) 419-3845 Cell: (901) 214-9550
Project Manager (PM): David Keith	Office: (228) 818-9626 Cell: (228) 224-2983
Field Lead (FL): Jason Kase	Office: (850) 912-8400 Cell: (251) 259-7196
Corporate Health and Safety Manager (CHSM): David Templeton	Office: (206) 287-9130 Cell: (206) 910-4279

Emergency Response Procedures

In the event of an emergency, immediate action must be taken by the first person to recognize the event. Use the following steps as a guideline:

- Survey the situation to ensure that it is safe for you and the victim. Do not endanger your own life. Do not enter an area to rescue someone who has been overcome unless properly equipped and trained. Ensure that all protocols are followed. If applicable, review Material Safety Data Sheets (MSDS) to evaluate response actions for chemical exposures.
- Call the appropriate emergency number (911) or direct someone else to do this immediately (see Table A). Explain the physical injury, chemical exposure, fire, or release and location of the incident.
- Have someone retrieve the nearest first aid kit.
- If necessary, decontaminate the victim without delaying life-saving procedures (see Section 8).
- Administer first aid, and if necessary, cardiopulmonary resuscitation (CPR), if properly trained, until emergency responders arrive.
- Notify the Project Manager (PM) and the Field Lead (FL).

- Complete the appropriate incident investigation reports.

First Aid and CPR Guidelines

Personnel qualified and current in basic first aid and/or CPR procedures may perform those procedures as necessary. Personnel qualified and current in basic first aid and/or CPR are protected under Good Samaritan policies as long as they only perform the basic tasks that they were taught and if they have permission from a conscious victim. Do not perform first aid and/or CPR tasks if you have not been trained in first aid and/or CPR.

Injury Management/Incident Notification

Observe the following injury management/incident notification procedures and practices:

Injury Management

- Once a personal injury incident is discovered, the first action will be to ensure that the injured party receives appropriate medical attention.
- The nearest workers will immediately call 911 or the appropriate emergency number.
- If it is safe to approach the victim, ascertain the condition of the victim to communicate relevant information to the emergency response operator. If it is safe to do so, the nearest workers will immediately render first aid and assist a person who shows signs of medical distress or who is involved in an accident.
- Escort the injured person to the nearest hospital (see Figure B) or arrange for an ambulance.
- Proceed immediately to Notification Requirements, below.

Notification Requirements

- Directly after caring for an injured person, the FL will be summoned. The FL will immediately make contact with the PM or other designated individuals to alert them of the medical emergency. The FL will advise them of the following:
  - Location of the victim at the work site
  - Nature of the emergency
  - Whether the victim is conscious

  - Specific conditions contributing to the injury, if known

- The PM will contact upper line management, including the Corporate Health and Safety Manager (CHSM), and the clients' contact persons.
- The CSHM will facilitate the incident investigation

All client requirements will also be adhered to that are pertinent to personal injury incident reporting.

Incident Other Than Personal Injury

All incidents including, but not limited to, fire, explosion, property damage, or environmental release will be responded to in accordance with the site-specific Health and Safety Plan. In general, this includes securing the site appropriate to the incident, turning control over to the emergency responders, or securing the site and summoning appropriate remedial personnel or equipment. Anchor QEA will immediately notify both of the clients of any major incident, fire, equipment or property damage, or environmental incident with a preliminary report. A full report will be provided to both of the clients within 72 hours.

Near-Miss Reporting

All near-miss incidents (those that could have reasonably lead to an injury, environmental release, or other incident) must also be reported to the FL and/or PM immediately so they can take action to ensure that such conditions that lead to the near-miss incident can be readily corrected to prevent future occurrences.

Spills and Releases of Hazardous Materials

When required, notify the National Response Center and the Texas Department of Public Safety, as appropriate. The following information should be provided to the National Response Center and the Texas Department of Public Safety:

- Name and telephone number
- Name and address of facility
- Time and type of incident
- Name and quantity of materials involved, if known

- Extent of injuries
- Possible hazards to human health or the environment outside of the facility

The emergency telephone number for the National Response Center is 1-800-424-8802. The emergency telephone number for the Texas Department of Public Safety is 512-424-2138.

If hazardous waste has been released or produced during the incident, ensure that:

- Waste is collected and contained
- Containers of waste are removed or isolated from the immediate site of the emergency
- Treatment or storage of the recovered waste, contaminated soil or surface water, or any other material that results from the incident or its control is provided
- No waste that is incompatible with released material is treated or stored in the facility until cleanup procedures are completed
- All emergency equipment used is decontaminated, recharged, and fit for its intended use before operations are resumed.

HASP Modification

This HASP will be modified by amendment, if necessary, to address changing field conditions or additional work tasks not already described in this document. Modifications will be proposed by the FL using the "Modifications to Health and Safety Plan" form included in Appendix A. Modifications will be reviewed and approved by the PM, in consultation with the CHSM.

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Appendix B Material Safety Data Sheets (MSDS)

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LIST OF ACRONYMS AND ABBREVIATIONS

° C	degrees Celsius
° F	degrees Fahrenheit
ACGIH	American Conference of Governmental Industrial Hygienists
Anchor QEA	Anchor QEA, LLC
ANSI	American National Standards Institute
APR	Air-Purifying Respirator
CFR	Code of Federal Regulations
CHSM	Corporate Health and Safety Manager
COC	chemical of concern
CPR	Cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
dB	decibel
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
EZ	Exclusion Zone/Hot Zone
FID	Flame Ionization Detector
FL	Field Lead
GFCI	Ground Fault Circuit Interrupter
HASP	Health and Safety Plan
HAZMAT	Hazardous Materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High Efficiency Particulate Air
HMIS	Hazardous Material Information System
JSA	Job Safety Analysis
kPa	kilopascal
LEL	Lower Explosive Limit
LO/TO	Lockout/Tagout
mg/m^3	Milligrams per cubic meter
MHR	Maximum Heart Rate
MSDS	Material Safety Data Sheets

MIMC	McGinnes Industrial Maintenance Corporation
MUTCD	Manual of Uniform Traffic Control Devices
NEC	National Electrical Code
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NPL	National Priority List
O_2	Oxygen
OEL	Occupational Exposure Limit
OSHA	Occupational Safety and Health Act or Administration
PAHs	Polycyclic Aromatic Hydrocarbon
P.E.	Professional Engineer
PEL	Permissible Exposure Limit
PFD	personal flotation device
PID	Photoionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
ppm	parts per million
REL	Recommended Exposure Limits
RCRA	Resource Conservation and Recovery Act
STEL	Short Term Exposure Limit
SZ	Support Zone/Clean Zone
TLV	Threshold Limit Values
TSD	Treatment, Storage, and Disposal Facility
tsf	ton per square foot
TWA	Time Weighted Average
USCG	U.S. Coast Guard
VOC	Volatile Organic Compound
WBGT	Wet Bulb Globe Temperature

1 INTRODUCTION

This Health and Safety Plan (HASP) has been prepared on behalf of MIMC and International Paper Corporation and presents health and safety requirements and procedures that will be followed by Anchor QEA, LLC (Anchor QEA) personnel and other contractors during work activities at the San Jacinto River Waste Pits Superfund Site (the Site). This HASP has been developed in accordance with Title 29 of the Code of Federal Regulations (CFR), Part 1910.120 (b), and will be used in conjunction with Anchor QEA's Corporate Health and Safety Program. This HASP will be modified by addendum if the scope of these activities is modified in a way that is not addressed by this HASP, or if there is a change to key personnel.

The provisions of this HASP are mandatory for all Anchor QEA personnel assigned to the project. Other contractors that will be working at the Site are also expected to follow the provisions of this HASP unless they have their own HASP that covers their specific activities related to this project. Any other contractor HASPs must include the requirements set forth in this HASP, at a minimum. All visitors to the work site must also abide by the requirements of this HASP and will attend a pre-work briefing where the contents of this HASP will be presented and discussed.

Personnel assigned to work at the Site will be required to read this plan and must sign the Health and Safety Plan Acknowledgement Form to confirm that they understand and agree to abide by the provisions of the HASP.

Other contractors are ultimately responsible for the health and safety of their employees. Other contractors may mandate health and safety protection measures for their employees beyond the minimum requirements specified in this HASP.

The objectives of this HASP are to identify potential physical, chemical, and biological hazards associated with field activities; establish safe working conditions and protective measures to control those hazards; define emergency procedures; and describe the responsibilities, training requirements, and medical monitoring requirements for site project personnel.

This HASP prescribes the procedures that must be followed during specific site activities. Significant operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without the prior approval of the Project Manager (PM) and the Corporate Health and Safety Manager (CHSM).

Issuance of this approved plan documents that the workplace has been evaluated for hazards. A hazard assessment has been performed and the adequacy of the personal protective equipment (PPE) selected was evaluated as required by 29 CFR 1910.132(d) - Personal Protective Equipment, General Requirements (general industry), 1910.134 – Respiratory Protection, 1926.28 – Personal Protective Equipment (construction industry), and 1926.55 – Gases, vapors, fumes, dusts and mist, and is duly noted by the signature(s) and date appearing on the certification page of this document.

2 SITE DESCRIPTION/BACKGROUND INFORMATION

2.1 Site Description

The Site is located on the western bank of the San Jacinto River, immediately north of the Interstate Highway 10 (I-10) bridge. Areas to the west and south of the Site are industrial, while areas east and north of the Site are either undeveloped or residential. Residential development on the eastern bank of the river occurs within 0.5 miles of the Site. The *Screening Site Inspection Report* (SSI) Report prepared by the Texas Commission on Environmental Quality in 2006 states that the former waste pits were comprised of a series of three or more surface impoundments reportedly used to dispose of wastewater treatment sludge from the Champion Paper Mill in Pasadena, Texas; however, correspondence and drawings from the Texas State Department of Health indicate that there were only two impoundments at the Site.

Pulp and paper waste was transported by barge to the Site and unloaded into impoundments formed by levees in 1965/1966. The Site property boundary consisted of more than 20 acres, slightly less than 15 acres of which were utilized.

There were two impoundments at the Site connected with a drain line to allow flow of excess water (including rain water) from Impoundment #1 to Impoundment #2. The waste materials in the ponds were reported to have the following characteristics:

- Primarily fibrous – the dried material was reported to resemble a cheaper grade of cardboard
- Near neutral pH
- Medium stiff to stiff
- Low permeability
- Organic base – grass could be grown on the material.

In a letter dated July 1966, the Texas Water Pollution Control Board stated that it was their understanding that the waste ponds would not be used again for the storage of waste materials.

2.2 Site Background Information

Environmental investigations will be performed to support the design of expedited measures as well as to support the selection and design of a permanent remedy for the site. Previous investigations of sediment quality were reviewed for the preparation of this HASP.

The SSI report reported the results of dioxin/furan and metals analyses of seven sediment samples collected near the site (locations SE-04, SE-05, and SE-07 through SE-11 on Figure 2 in the SSI report). The following table summarizes the maximum concentrations of dioxins/furans and metals reported in the SSI. Semivolatile organic compounds, pesticides, and polychlorinated biphenyls were not detected in the Site sludge materials. Volatile organic compounds were not analyzed for in the SSI.

Table 2-1

Concentration of COCs in Sediment

Constituent	Maximum Concentration
Dioxins/Furans (pg/g)	
2,3,7,8-Tetrachlorodibenzo-p-dioxin	33,900
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	363
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	4.83
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	27.9
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	10.2
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	658
2,3,7,8-Tetrachlorodibenzofuran	51,200
1,2,3,7,8-Pentachlorodibenzofuran	4,970
2,3,4,7,8-Pentachlorodibenzofuran	2,470
1,2,3,4,7,8-Hexachlorodibenzofuran	7,530
1,2,3,6,7,8-Hexachlorodibenzofuran	2,240
2,3,4,6,7,8-Hexachlorodibenzofuran	427
1,2,3,7,8,9-Hexachlorodibenzofuran	795
1,2,3,4,6,7,8-Heptachlorodibenzofuran	2,460
1,2,3,4,7,8,9-Heptachlorodibenzofuran	960
Metals (mg/kg)	
Aluminum	22,100
Barium	244
Chromium	19.7

Iron	14,900
Lead	48.0
Magnesium	4,790
Manganese	790
Mercury	1.7
Nickel	14.0
Vanadium	34.4
Zinc	244

Figure 2-1

Previous Sediment Sampling Locations

3 SCOPE OF WORK

3.1 Project Scope of Work

This plan addresses health and safety issues involved with the following field tasks:

- Sediment, soil, tissue, and surface water sampling to support the RI/FS
- Sampling to support the time-critical and nontime-critical removal action engineering design evaluations
- Oversight of site response construction activities

Tasks may be added to the project scope, and the details of the field tasks will be defined in the work plan documents that will be developed. Task-specific health and safety provisions, if not already covered by this HASP, will be developed and added to this HASP as addenda.

4 AUTHORITY AND RESPONSIBILITIES OF KEY PERSONNEL

This section describes the authority and responsibilities of key Anchor QEA project personnel. The names and contact information for the following key safety personnel are listed in the Emergency Site Procedures section at the beginning of this HASP. Should key site personnel change during the course of the project, a new list will be established and posted immediately at the site. The emergency phone number for the site is **911**, and should be used for all medical, fire, and police emergencies.

4.1 Project Manager

The PM provides overall direction for the project. The PM is responsible for ensuring that the project meets the client's objectives in a safe and timely manner. The PM is responsible for providing qualified staff for the project and adequate resources and budget for the health and safety staff to carry out their responsibilities during the field work. The PM will be in regular contact with the Field Lead (FL) and CHSM to ensure that appropriate health and safety procedures are implemented into each project task.

The PM has authority to direct response operations; the PM assumes total control over project activities but may assign responsibility for aspects of the project to others. In addition, the PM:

- Oversees the preparation and organization of background review of the project, the work plan, and the field team.
- Ensures that the team obtains permission for site access and coordinates activities with appropriate officials.
- Briefs the FL and field personnel on specific assignments.
- Together with the FL, sees that health and safety requirements are met.
- Consults with the CHSM regarding unsafe conditions, incidents, or changes in site conditions or the anticipated Scope of Work.

The PM will have completed the required Occupational Safety and Health Administration (OSHA) 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER)

training and annual updates, the 8-hour Supervisor training, medical monitoring clearance (if necessary per requirements in Section 13).

4.2 Field Lead

The FL reports to the PM, has authority to direct response operations, and assumes control over on-site activities. The FL will direct field activities, coordinate the technical and health and safety components of the field program, and is responsible in general for enforcing this site-specific HASP and Corporate HASP requirements. The FL will be the primary point of contact for all field personnel and visitors and has direct responsibility for implementation and administration of this HASP. The FL and any other member of the field crew have the authority to stop or suspend work in the event of an emergency, if conditions arise that pose an unacceptable health and safety risk to the field crew or environment, or if conditions arise that warrant revision or amendment of this HASP. The following include, but are not necessarily limited to, the functions of the FL related to this HASP:

- Conduct and document daily safety meetings, or designate an alternate FL in his or her absence.
- Execute the work plan and schedule.
- Conduct periodic field health and safety inspections to ensure compliance with this HASP.
- Oversee implementation of safety procedures.
- Implement worker protection levels.
- Enforce site control measures to ensure that only authorized personnel are allowed on site.
- Notify, when necessary, local public emergency officials (all personnel on site may conduct this task as needed).
- Follow-up on incident reports to the PM.
- Periodically inspect protective clothing and equipment for adequacy and safety compliance.
- Ensure that protective clothing and equipment are properly stored and maintained.
- Perform or oversee air monitoring in accordance with this HASP.
- Maintain and oversee operation of monitoring equipment and interpretation of data from the monitoring equipment.

- Monitor workers for signs of stress, including heat stress, cold exposure, and fatigue.
- Require participants to use the "buddy" system.
- Provide (via implementation of this HASP) emergency procedures, evacuation routes, and telephone numbers of the local hospital, poison control center, fire department, and police department.
- Communicate incidents promptly to the PM.
- Maintain communication with the CHSM on site activities.
- If applicable, ensure that decontamination and disposal procedures are followed.
- Maintain the availability of required safety equipment.
- Advise appropriate health services and medical personnel of potential exposures.
- Notify emergency response personnel in the event of an emergency and coordinate emergency medical care.

The FL will record health-and-safety-related details of the project in the field logbook. At a minimum, each day's entries must include the following information:

- Project name or location
- Names of all on-site personnel
- Level of PPE worn and any other specifics regarding PPE
- Weather conditions
- Type of field work being performed.

The FL will have completed the required OSHA 40-hour HAZWOPER training and annual updates, the 8-hour Supervisor training, medical monitoring clearance (if necessary per requirements in Section 13), and current first aid and cardiopulmonary resuscitation (CPR) training. Other certifications or training may be stipulated based on client or site requirements.

4.3 Corporate Health and Safety Manager

Anchor QEA's CHSM will be responsible for managing on-site health and safety activities and will provide support to the PM and FL on health and safety issues. The specific duties of the CHSM are to:

- Provide technical input into the design and implementation of this HASP.

- Advise on the potential for occupational exposure to project hazards, along with appropriate methods and/or controls to eliminate site hazards.
- Ensure that a hazard assessment has been performed and that the adequacy of the PPE selected was evaluated as required by 29 CFR 1910.132(d), 1910.134, 1926.25, and 1926.55, and is duly noted by the signatures and date appearing on the Certification Page of this document.
- Consult with the FL on matters relating to suspending site activities in the event of an emergency.
- Verify that all on-site Anchor QEA personnel and other contractors have read and signed the HASP Acknowledgement Form.
- Verify that corrective actions resulting from deficiencies identified by audit and observations are implemented and effective.

The CHSM will have completed the required OSHA 40-hour HAZWOPER training and annual updates, the 8-hour Supervisor training, and have medical monitoring clearance (if necessary per requirements in Section 13). In addition, the CHSM will have current training in first aid and CPR.

4.4 Project Field Team

All project field team members will attend a project-specific meeting conducted by the FL concerning safety issues and project work task review before beginning work. All field crew, including other contractors, must be familiar with and comply with this HASP. The field crew has the responsibility to immediately report any potentially unsafe or hazardous conditions to the FL, and all members of the field crew have the authority to stop or suspend work if conditions arise that pose an unacceptable health and safety risk to the field crew or environment, or if conditions arise that warrant revision or amendment of this HASP. The field team reports to the FL for on-site activities and is responsible for:

- Reviewing and maintaining a working knowledge of this HASP
- Safe completion of on-site tasks required to fulfill the work plan
- Compliance with the HASP
- Attendance and participation in daily safety meetings
- Notification to the FL of existing or potential safety conditions at the site

- Reporting all incidents to the FL
- Demonstrating safety and health conscious conduct.

5 PROJECT-SPECIFIC REQUIREMENTS

This section provides activity-specific levels of protection and air monitoring requirements to be used on this site based on the anticipated Scope of Work and the chemicals of concern (COCs).

5.1 Activity-Specific Level of Protection Requirements

Refer to Section 10 of this plan for general requirements for PPE. Level D is the minimum acceptable level for most sites. An upgrade to Modified Level D occurs when there is a possibility that contaminated media can come in contact with the skin or work uniform. An upgrade to Level C occurs when there is a potential for exposure to airborne COCs; i.e., if the results of air monitoring reveal that action levels have been exceeded. Hearing protection must be worn when there are high noise levels. Workers must maintain proficiency in the use and care of PPE that is to be worn.

Table 5-1, Project Job Tasks and Required PPE, describes the specific means of protection needed for each identified work activity.

5.2 Project Air Monitoring Requirements

Refer to Section 11 of this plan for general requirements for air monitoring at the project site, including information on air monitoring equipment. Previous investigations of the site indicate that the constituents of interest for worker health and safety during investigation and site response construction are dioxins and furans. There is no evidence of significant concentrations of volatile constituents in sediment or surface water. Therefore, respiratory protection is not expected to be needed and Modified Level D PPE should be appropriate for the entire investigation. Monitoring of the breathing zone will be performed during initial investigation activities, e.g., during collection of the first several sediment grab samples and cores. If air monitoring indicates the presence of unexpected concentrations of volatile organic compounds in the breathing zone, work will be suspended and the provisions of this HASP will be re-evaluated. Based on the results of the initial monitoring, the FL may decide to suspend further air monitoring if conditions warrant. Table 5-2, Project Air Monitoring Requirements, describes the specific air monitoring required for each identified work activity.

Table 5-1

Project Job Tasks and Required PPE

Job Tasks		PPE Requirements
EXAMPLES: • Collecting sediment, soil, tissue and surface water grab samples • Operation of sampling vessel and equipment • Collection of sediment cores and processing sediment cores (visual inspection and subsampling)	☐	Standard work uniform/coveralls
	☐	Work boots with safety toe
	☒	Traffic Safety Vest (when working in areas with vehicle traffic, heavy equipment)
	☒	Chemical-resistant clothing check appropriate garments: ☐ One-piece coverall ☐ Hooded one- or two-piece chemical splash suit ☐ Disposable chemical coveralls ☐ Chemical-resistant hood and apron ☐ Bib-style overalls and jacket with hood **Fabric Type:** Tyvek NOTE: Thick rain pants and coveralls may be substituted for coated Tyvek if sediments are not obviously contaminated with polycyclic aromatic hydrocarbons (PAHs) or related petroleum products. Rain slickers cannot be effectively decontaminated of tar/petroleum contamination.
	☒	Disposable inner gloves (surgical) (required for all activities)
	☒	Disposable chemical-resistant outer gloves **Material Type:** Nitrile (required for equipment decontamination and sediment core collection, not required for core processing)
	☒	Chemical-resistant boots with safety toe and steel shank or disposable boot covers for safety toe/work boots **Material Type:** Rubber or leather with disposable boot covers, if terrain and ground conditions allow use of boot covers without unreasonable danger of slipping hazard)
	☐	Sleeves to be duct-taped over gloves and pants to be duct-taped over boots
	☐	Splash-proof safety goggles
	☒	Safety glasses (face shield may be substituted for safety glasses if splash hazard is too great to be controlled with safety glasses)
	☒	Hard hat (if overhead or falling object hazards are present)
	☐	Hard hat with face shield
	☒	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 decibels [dB] based on an 8-hour time-weighted average [TWA]). **Type:** Ear plugs
	☐	Two-way radio communication (intrinsically safe, if explosive atmosphere is a potential)

Job Tasks		PPE Requirements
	☐	Long cotton underwear
	☒	U.S. Coast Guard (USCG)-approved personal flotation device (PFD)
	☐	USCG-approved float coat and bib-overalls (e.g., full two-piece "Mustang" survival suit or similar) or one-piece survival suit if water temperatures are below 50° F
	☐	Half-face Air-Purifying Respirator (APR) (OSHA/NIOSH-approved)
	☐	Full-face APR (OSHA/NIOSH-approved)
	☐	**Type of Cartridges to be Used:** **☐ OV or ☐ OV/HEPA (if samples are dry)**

Table 5-2

Project Air Monitoring Requirements

Instrument*	Job Tasks / Functions	Measurement	Monitoring Schedule	Actions[1]
FID and/or PID - Measures Total Organic Vapors	Conduct air monitoring for volatile organic compounds (VOCs) initially during activities where VOC contaminated media may be present (during the collection of soil samples, sediment grab samples, and sediment cores). Make sure that a background reading is taken before the start of activities and periodically thereafter. The FL may discontinue air monitoring, in consultation with the PM, after reviewing monitoring results from initial sampling activities.	0 to 5 ppm above background in breathing zone	As soon as practical after collecting the grab sample or while pulling a sediment core sample onto the deck of the sampling vessel. The FL may suspend air monitoring based on data from the first several sampling locations.	Acceptable, continue work.
		> 5 ppm above background in breathing zone		Stop work required[2]. Leave work area and contact Project Manager (PM) and Corporate Health and Safety Manager (CHSM) for guidance.

*Note: Instruments must be calibrated according to manufacturer's recommendations.
1 For VOCs, a sustained reading for greater than 2 minutes in excess of the action level will trigger a protective measure.
2 Contact with the CHSM and PM must be made prior to continuance of work. A hazard review must be conducted before proceeding with work. Corrective actions may include temporary work stoppage to allow vapors to dissipate, and then returning to work if air monitoring data permits.
ppm – parts per million
mg/m^3 – milligrams per cubic meter

6 RISK ANALYSIS AND CONTROL

The following sections discuss the potential worker health and safety hazards associated with the potential field tasks associated with investigation activities that are anticipated for the Site. Controls of these hazards are addressed through the mechanical and physical control measures, use of PPE, monitoring, training, decontamination, emergency response, and safety procedures.

Significant changes in the anticipated Scope of Work covered by this HASP must be communicated to the PM and CHSM, and an amendment to this HASP must be created as needed. Any task conducted beyond those identified in the anticipated Scope of Work and this HASP must be evaluated using the Job Safety Analysis (JSA) process prior to conducting the work.

6.1 Job Safety Analysis

Work tasks will be evaluated for their hazards, and JSA documents will be developed that detail the chemical, physical, and biological hazards associated with these tasks, along with the control measures (e.g., engineering controls, administrative controls, and/or PPE) that will be used to ensure that these tasks are conducted in a safe manner.

The PM and FL are responsible for identifying work tasks and project site conditions that are beyond JSA documents and the HASP for communicating such information to the CHSM. The CHSM will provide support, as needed, to the PM and/or the FL, who will have primary responsibility to develop project-specific JSAs.

The contents of the JSA documents shall be communicated to project personnel during the site orientation meeting and during daily safety meetings when conducting work where the specific JSAs are applicable.

JSA documents applicable to this project will be located in Appendix C of the HASP as it is amended.

6.2 Exposure Routes

Possible routes of exposure to the chemicals potentially encountered on this project include inhalation, dermal contact, and ingestion of dust, mist, gas, vapor, or liquid. Exposure will be minimized by using safe work practices and by wearing the appropriate PPE. A further discussion of PPE requirements is presented in Section 10.

6.2.1 Dermal Contact

Dermal contact with potentially contaminated soil, sediment, biota, surface water, or groundwater during field activities is possible. Direct contact will be minimized through the use of appropriate PPE and decontamination procedures.

6.2.2 Ingestion

Direct ingestion of contaminants can occur by inhaling airborne dust, mist, or vapors, or by swallowing contaminants trapped in the upper respiratory tract. Indirect ingestion can occur by introducing the contaminants into the mouth by way of food, tobacco, fingers, or other carriers. Although ingestion of contaminants can occur, proper hygiene, decontamination, and contamination reduction procedures should reduce the probability of this route of exposure.

6.3 Chemicals of Concern Profile

The following table provides a summary profile for the COCs related to worker safety for this field project. As available, this profile is based on recent site history and site characterization information. For more detailed and specific information, always refer to the Material Safety Data Sheet (MSDS) or equivalent information for the chemical (see Appendix B).

Table 6-1
Chemicals of Concern Profile

Chemical	Physical/Chemical Characteristics (Target Organs/Route of Entry)	OEL (STEL)	Odor Threshold	LEL (%)	IP (eV)
Dioxins/Furans	Dermal contact, eye contact, ingestion, inhalation (dust)	N/A	N/A	N/A	N/A

Notes:
eV – electron volts
IP – Ionization Potential
LEL – Lower Explosive Limit
OEL – Occupational Exposure Limit (identifies the most restrictive exposure limit, e.g., federal or state OSHA permissible exposure limit (PEL), American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values (TLV), and/or National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit (REL) for the chemicals of concern.
STEL – Short-term exposure limit

7 SITE CONTROL AND COMMUNICATIONS

The primary purposes for site controls are to establish the hazardous area perimeter, to reduce migration of contaminants into clean areas, and to prevent unauthorized access or exposure to hazardous materials by site personnel and the public. Site control is especially important in emergency situations.

7.1 General Site Control Safety Procedures

The following are standard safe work practices that apply to all Anchor QEA site personnel and other contractors and shall be discussed in the safety briefing prior to initiating work on the site:

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited on site except in designated areas.
- Hands and faces should be washed upon leaving the work area and before eating, drinking, chewing gum or tobacco, and smoking.
- A buddy system will be used. Radio, cellular telephone, or hand signals will be established to maintain communication.
- During site operations, each worker will consider him/herself as a safety backup to his/her partner.
- Visual contact will be maintained between buddies on-site when performing hazardous duties.
- No personnel will be admitted to the site without the proper safety equipment, training, and medical surveillance certification.
- All personnel must comply with established safety procedures. Any staff member who does not comply with safety policy, as established in this HASP, will be subject to corrective action, potentially including, but not limited to, reprimanded and immediate dismissal.
- Proper decontamination procedures must be followed before leaving a contaminated work area.

7.2 Work Area Access Control

If work is performed in public areas, the following precautions shall be taken to protect both the workers and the public. Access control to the work area will be accomplished by the use of a combination of the following devices and/or methods:

- Fences and/or barricades
- Traffic control devices and/or use of flaggers
- Caution tape
- Other methods to keep the site secure and provide a visual barrier to help keep unauthorized personnel from entering the site and active work areas.

7.3 Hazardous Waste Site Work Control Procedures

To prevent contamination from migrating from personnel and equipment, work areas will be clearly specified as an Exclusion Zone/Hot Zone (EZ), Contaminant Reduction Zone (CRZ), or Support Zone/Clean Zone (SZ) prior to beginning operations. Each work area will be clearly identified using signs or physical barriers. At the end of each workday, the site should be secured and/or guarded to prevent unauthorized entry.

Site work zones will include:

- **Exclusion Zone/Hot Zone (EZ).** The EZ will be the "hot zone" or contaminated area inside the site perimeter (or sample collection area of boat). The EZ is the defined area where potential respiratory and/or health hazards exist. All personnel entering the EZ must use the required PPE, as set forth in this HASP, and meet the appropriate training and medical clearance. Entry to and exit from this zone will be made through a designated point. Appropriate warning signs to identify the EZ should be posted (e.g., DANGER, AUTHORIZED PERSONNEL ONLY, PROTECTIVE EQUIPMENT REQUIRED BEYOND THIS POINT). Personnel and equipment decontamination must be performed upon exiting the EZ.
- **Contaminant Reduction Zone (CRZ).** The CRZ, also known as the "warm zone," is a transitional zone between the EZ and the SZ (also known as the "cold zone" or "clean zone"). The CRZ provides a location for removal and decontamination of PPE and tools leaving the EZ. A separate decontamination area will be established for heavy

equipment. All personnel and equipment must exit via the CRZ. If, at anytime, the CRZ is compromised, a new CRZ will be established.

- **Support Zone/Clean Zone (SZ).** This uncontaminated zone will be the area outside the EZ and CRZ and within the geographic perimeters of the site (including boat and processing areas). The SZ is used for support personnel; staging materials; parking vehicles; office, laboratory, and sanitation facilities; and receiving deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, and others who will not necessarily be permitted in the EZ or CRZ.

A log of all personnel visiting, entering, or working on the Site shall be maintained by the FL. No visitor will be allowed in the EZ without showing proof of training and medical certification, per 29 CFR 1910.120(e), (f). Visitors will attend a site orientation given by the FL and sign the HASP.

7.4 Site-Specific Work Zone Requirements

This section contains guidelines for maintaining safe conditions when sampling, including work performed on a boat.

7.4.1 Sampling Work Zones

Sampling and sample processing will occur within the EZ. The EZ will include, to the extent practical, a corridor between the boat access and the sample-processing area. Samples and contaminated equipment will be kept within the EZ until they are decontaminated and/or contained within coolers (samples) or other protective packaging (used equipment and investigation derived waste). Personnel and equipment leaving the EZ will exit through the CRZ, where contamination will be removed and disposable PPE will be discarded.

The vessel captain and the FL will delineate the boundaries of the work zones aboard the vessel and will inform the field crews of the arrangement. The purpose of the zones is to limit the migration of sample material out of the zones and to restrict access to active work areas.

Because space is limited on a sampling vessel, work zone designations are somewhat abbreviated and may need to be more flexible than when working on land. Two work zones will be observed aboard the vessel. Any area on a vessel where sampling activities are performed will be designated the EZ. Sediment cores and contaminated equipment will be stored in this work zone while they are transported to the upland sample processing area. Only the sampling crew may enter this zone unless assistance is required by other personnel. The second work zone will be for operating the vessel and storing clean equipment. To the extent practical, contaminated equipment and unprocessed samples, such as sediment cores, will be excluded from this relatively clean zone. Coolers of processed samples may be stored in this zone. Anchor QEA personnel will log and process the sediment cores on shore.

7.4.2 Access Control

Security and control of access to the sampling vessel and onshore area will be the responsibility of the captain and FL. Additional security measures may be placed into effect by the client, or as required by national security threat levels determined by the federal government. Access to the vessel and onshore areas will only be granted to necessary project personnel and authorized visitors. Any security or access control problems will be reported to the client or appropriate authorities.

7.4.2.1 Safety Equipment

In addition to PPE that will be worn by shipboard personnel, basic emergency and first aid equipment will also be provided. Equipment will include:

- U.S. Coast Guard (USCG)-approved personal flotation devices (PFDs)
- Emergency throw-ring (or similar)
- First aid kit adequate for the number of personnel
- Emergency eyewash.

Anchor QEA and/or other contractors working on Site will provide this equipment, which must be at the location(s) where field activities are being performed. Equipment will be checked daily to ensure its readiness for use.

7.5 Field Communications

Communications between all Anchor QEA employees and other contractors at the work site can be verbal and/or non-verbal. Verbal communication can be affected by the on-site background noise and various PPE. See Table 7-1 for a list of the types of communication methods and equipment to use, depending on site conditions. Communication equipment must be checked daily to ensure proper operation. All project personnel must be initially briefed on the communication methods prior to starting work; communication methods should be reviewed in daily safety meetings.

Table 7-1
Field Communication Methods

Type of Communication	Communication Device	Signal
Emergency notification	On-site Telephone or Cellular Telephone	Initiate phone call using applicable emergency numbers
Emergency notification among site personnel	Two-way Radio or Cellular Telephone	Initiate communication with Code Red message
Hailing site personnel for non-emergency	Compressed Air Horn	One long blast, one short blast
Hailing site personnel for emergency evacuation	Compressed Air Horn	Three long, continuous blasts
Hailing site personnel for distress, need help	Visual	Arms waved in circle overhead
Hailing site personnel for emergency evacuation	Visual	Arms waved in criss-cross over head
Contaminated air/strong odor	Visual	Hands clutching throat
Break, lunch, end of day	Visual	Two hands together, break apart

8 DECONTAMINATION PROCEDURES AND PRACTICES

8.1 Minimization of Contamination

The following measures will be observed to prevent or minimize exposure to potentially contaminated materials:

Personnel

- Do not walk through spilled materials
- Do not handle, touch, or smell sample media directly
- Make sure PPE has no cuts or tears prior to use
- Protect and cover any skin injuries
- Stay upwind of airborne dusts and vapors
- Do not eat, drink, chew gum or tobacco, or smoke in the work zones.

Sampling Equipment and Vehicles/Vessels

- Use care to avoid getting sampled media on the outside of sample containers
- If necessary, bag sample containers before filling with sampled media
- Place clean equipment on a plastic sheet to avoid direct contact with contaminated media
- Keep contaminated equipment and tools separate from clean equipment and tools
- Fill sample containers over a plastic tub to contain spillage
- Clean up spilled material immediately to avoid tracking around the vehicle/vessel

8.1.1 Decontamination Equipment

All vehicles, vessels, and equipment that have entered potentially contaminated areas will be visually inspected and, if necessary, decontaminated prior to leaving the area. If the level of vehicle contamination is low, decontamination may be limited to rinsing tires and wheel wells with an appropriate detergent and water. If the vehicle is significantly contaminated, steam cleaning or pressure washing may be required. Large tools will be cleaned in the same manner. Small reusable sampling equipment, including bowls, spoons, and knives, will be rinsed, washed in phosphate-free detergent, and rinsed again. Rinsate from all

decontamination activities will be collected for proper disposal. Decontamination of equipment and tools will take place within the CRZ.

The following supplies will be available to perform decontamination activities:

- Wash and rinse buckets
- Tap water and phosphate-free detergent (i.e., Alconox)
- Scrub brushes
- Distilled/deionized water
- Deck pump with pressurized freshwater hose (aboard the vessel)
- Pressure washer/steam cleaner, if appropriate
- Paper towels and plastic garbage bags.

8.1.2 Personnel Decontamination

The FL will ensure that all site personnel are familiar with personnel decontamination procedures as listed below. All personnel wearing PPE in a work area (EZ) must undergo decontamination prior to entering the SZ. Personnel will perform the following decontamination procedures:

- Wash and rinse outer gloves and boots in portable buckets to remove gross contamination. The surface of the site is contaminated with waste materials that will stick to boots. Disposable boot covers will be used if terrain and ground conditions are such that the use of disposable boot covers does not present a slipping hazard. If disposable boot covers are not used, particular attention must be applied to decontaminating boots thoroughly.
- If suit is heavily soiled, rinse it off. If disposable boot covers are used, they will be removed at this station.
- Remove outer gloves; inspect and discard if damaged. Leave inner gloves on. Personnel will remove their outer garment and gloves, dispose of them, and properly label container or drum. Personnel will then decontaminate their hard hats and boots with an aqueous solution of detergent or other appropriate cleaning solution. These items then will be hand-carried to the next station. Remove protective suit and then inner gloves.
- Thoroughly wash hands and face before leaving CRZ.

8.1.3 Sampling and Processing Equipment Decontamination

To prevent sample cross-contamination, sampling, and processing equipment in contact with soil, sediment, biota, or water samples will undergo the following decontamination procedures when work is completed in the CRZ and prior to additional use:

1. Rinse with potable water and wash with scrub brush.
2. Scrub with phosphate-free detergent (Alconox®).
3. Visually inspect the sampler and repeat the scrub and rinse step, if necessary. If scrubbing and rinsing with Alconox® is insufficient to remove visually observable contamination on equipment, the equipment will be scrubbed and rinsed using hexane (or similar type solution) until all visual signs of contamination are absent.
4. Rinse external sampling equipment with potable water three times prior to use. Rinse homogenizing equipment once with potable water and three times with distilled water prior to and between sample processing.

8.1.4 Handling of Investigation-Derived Waste

All remaining soil or sediment, fluids used for decontamination of sampling equipment, and sample collection disposable wastes (e.g., gloves, paper towels, foil, or others) will be placed into appropriate containers and staged on site for disposal.

8.1.4.1 Disposable PPE

Disposable PPE may include Tyvek suits, inner latex gloves, outer gloves, and disposable boot covers. Dispose of PPE according to the requirements of the client and state and federal agencies.

8.1.4.2 Non-disposable PPE

Non-disposable PPE includes items such as boots.

When decontaminating non-disposable PPE, observe the following practices and procedures:

- Decontaminate the PPE outside with a solution of detergent and water; rinse with water prior to leaving the site.

- Protect the PPE from exposure by covering with disposable covers such as plastic to minimize required decontamination activities.

8.1.5 Sanitizing of Personal Protective Equipment

Reusable protective clothing and other personal articles must not only be decontaminated before being reused, but also sanitized. The insides of face shields and protective clothing become soiled due to exhalation, body oils, and perspiration. If practical, reusable protective clothing should be machine-washed after a thorough decontamination; otherwise, it must be cleaned by hand.

8.1.6 Emergency Personnel Decontamination

Personnel with medical problems or injuries may also require decontamination. There is the possibility that the decontamination may aggravate or cause more serious health effects. If prompt lifesaving, first aid, and medical treatment are required, decontamination procedures will be omitted. In either case, a member of the site management team will accompany contaminated personnel to the medical facility to advise on matters involving decontamination.

8.1.7 Containment of Decontamination Fluids

As necessary, spill control measures will be used to contain contaminated runoff that may enter into clean areas. Use plastic sheeting, hay bales, or install a spill control system to prevent spills and contain contaminated water.

8.1.8 Pressure Washing

The following procedure is required when using high-pressure washing equipment for decontamination purposes:

- Wear modified Level D protection, including a face shield and safety goggles.
- Ensure that other personnel are out of the area prior to decontamination.
- Secure the area around the decontamination pad with cones, caution tape, or barricades.

- Ensure that safe work practices and precautions are taken to minimize the potential for physical injury from high-pressure water spray. Follow the manufacturer's operating instructions.
- The pressure washer wand must be equipped with a safety release handle.
- Ensure that the area is clean after equipment is decontaminated. Barricades, cones, or caution tape must be left in place and secured at all times.

9 HEALTH AND SAFETY TRAINING AND INFORMATIONAL PROGRAMS

This section describes the health and safety training and informational programs that Anchor QEA project site personnel must comply with.

9.1 Initial Project Site Orientation

Work on all Anchor QEA project sites will require participation in an initial health and safety orientation presented by the PM or FL that will consist of, at a minimum, the following topics:

- A review of the contents of this HASP, including the anticipated Scope of Work and associated site hazards and control methods and procedures.
- Provisions of this plan are mandatory for all Anchor QEA personnel assigned to the project.
- Other contractors working at the Site are also expected to follow the provisions of this plan unless they have their own HASP that covers their specific activities related to this project and includes the minimum requirements of this HASP.
- All visitors to the work site will also be required to abide by the requirements of this plan.
- Personnel assigned to perform work at the project site, working under the provisions of this HASP, will be required to read the plan and must sign the Health and Safety Plan Acknowledgement Form to confirm that they understand and agree to abide by the provisions of this plan.

9.2 Daily Safety Meetings

Daily safety meetings ("tailgate meetings") make accident prevention a top priority for everyone and reinforce awareness of important accident-prevention techniques. The following daily safety meeting procedures and practices are required:

- Daily safety meetings will be held each morning prior to conducting site activities.
- The daily safety meeting form in Appendix A will be used to document each meeting.
- Copies of the completed daily safety meeting forms will be maintained on-site during the course of the project.

9.3 Hazardous Waste Operations Training

All personnel working on the Site shall be trained in accordance with the requirements of the 29 CFR 1910.120 (HAZWOPER) regulation. Training requirements will consist of the following:

- Field personnel must complete a minimum of 40 hours of hazardous waste activity instruction.
- Field personnel must complete a minimum of 3 days of supervised field instruction.
- Field personnel assigned to the site will also have received 8 hours of refresher training if time elapsed since their previous training has exceeded 1 year (i.e., refresher training is required annually).
- The PM and FL, or other staff directly responsible for employees engaged in hazardous waste operations, will receive an additional 8 hours of supervisory training.
- At a minimum, two people per field team shall be current in first aid/CPR and bloodborne pathogen training.

9.4 Hazard Communication Program

The purpose of hazard communication (Employee Right-to-Know) is to ensure that the hazards of all chemicals located at the field project site are communicated to all Anchor QEA personnel and other contractors according to 29 CFR 1926.59.

Every container of hazardous materials must be labeled by the manufacturer, who must also provide a MSDS upon initial order of the product and upon request thereafter. The actual format may differ from company to company (e.g., National Fire Protection Association [NFPA], Hazardous Material Information System [HMIS], or other), but the labels must contain similar types of information. Maintain manufacturer labels if at all possible. The label may use words or symbols to communicate the following:

- The name of the chemical
- The name, address, and emergency telephone number of the company that made or imported the chemical
- The physical hazards (Will it explode or catch fire? Is it reactive? Is it radioactive?)
- Any important storage or handling instruction

- The health hazards (Is it toxic? Could it cause cancer? Is it an irritant? What is the target organ?)
- The basic protective clothing, equipment, and procedures that are recommended when working with the chemical

MSDS for all chemicals brought onto the site or anticipated to be encountered on site shall be provided in Appendix B of this HASP. These MSDS shall be readily available for reference by site personnel and emergency response personnel.

Hazardous materials received without proper labels shall be set aside and not distributed for use until properly labeled.

If a hazardous chemical is transferred into a portable container (approved safety can), even if it is for immediate use only, the contents of the portable container (for example, acetone, gasoline, etc.) must be identified.

10 GENERAL PPE REQUIREMENTS

The minimum level of PPE should be selected according to the hazards that may be encountered during site activities in accordance with established U.S. Environmental Protection Agency (EPA) levels of protection (D and Modified D). Only PPE that meets American National Standards Institute (ANSI) standards shall be worn. Workers must maintain proficiency in the use and care of PPE.

Refer to Section 5 of this plan for site-specific job task and level-of-protection requirements.

10.1 Minimum Requirements – Level D Protection

The minimum level of protection on project sites will be Level D protection, which consists of the following equipment:

- Standard work uniform/coveralls
- Work boots with safety toe (meets ANSI Z41 – 1991 requirements for foot protection)
- Approved safety glasses or goggles (meets ANSI Z87.1 – 1989 requirements for eye protection)
- Hard hat if overhead or falling object hazards are present (meets ANSI Z89.1 – 1986 requirements for head protection)
- Traffic safety vest if working near heavy equipment or vehicular traffic
- Hearing protection when there are high noise levels

Level D protection will be used only when:

- The atmosphere contains no known hazards
- Work functions preclude splashes, immersions, or the potential for unexpected inhalation of, or contact with, hazardous concentrations of chemicals
- Atmospheric concentrations of contaminants are less than the Permissible Exposure Limit (PEL) and/or Threshold Limit Value (TLV)

Level D protection, without modification, may be appropriate for observation of construction activities where soils do not need to be handled and where work activities do not require

walking across contaminated materials. Level D would also be appropriate for handling sample coolers or other containers where contaminated materials are fully contained.

10.1.1 Modified Level D Protection Requirements

Level D protection shall be modified, as warranted by site conditions and tasks performed, to include additional protective equipment such as USCG-approved PFDs, face shields/goggles, chemical-resistant clothing, rain gear, and disposable gloves of varying materials depending on the chemical substances involved. Modified Level D protection is the baseline gear for many of the sampling activities described in this HASP.

10.2 Respiratory Protection Requirements

Respiratory protection devices may potentially be used for protection against particulates and organic vapors during the course of an Anchor QEA field project. The need for respiratory protection will be determined by air monitoring results and site conditions. However, engineering and administrative controls must first be evaluated for use as the primary controls for protection against site respiratory hazards. In the event that engineering and administrative controls are deemed not feasible, respiratory protection will be required. As stated previously in this HASP, the use of respiratory protection is <u>not</u> anticipated. If significant concentrations of organic vapors are encountered, as discussed in Section 5, work will be suspended and this HASP will be modified, if necessary, to incorporate respiratory protection requirements.

11 GENERAL AIR MONITORING REQUIREMENTS

11.1 General Requirements

As discussed in Section 5, air monitoring will be performed during initial sample collection activities as a precaution; although the results of previous investigations indicate that respiratory protection will not be required. Site-specific air monitoring action levels are provided in Section 5.2 of this HASP.

11.2 Real-Time Air Monitoring Equipment

As applicable, organic vapor concentrations shall be monitored in the field with either a photoionization detector (PID) or flame ionization detector (FID). Flammable vapors and/or gasses are monitored with an oxygen/lower-explosive level (O_2/LEL) real-time instrument. Organic vapor measurements are usually taken in the breathing zone of the worker while O_2/LEL measurements are taken at the point of operation (e.g., monitoring well head or auger point).

As applicable, airborne dust/particulate concentrations shall be measured using a real-time aerosol monitor (using a scattered light photometric sensing cell) when there are visible signs of potentially contaminated airborne dust. Both area and personal air monitoring readings are to be taken to characterize site activities.

Air monitoring results shall be documented on the Daily Air Monitoring Record Form (see Appendix A) or in the field logbook.

11.3 Equipment Calibration and Maintenance

Calibration and maintenance of air monitoring equipment shall follow manufacturer specifications and must be documented. Recalibration and adjustment of air monitoring equipment shall be completed as site conditions and equipment operation warrant. Record all air monitoring equipment calibration and adjustment information on a Daily Air Monitoring Record form and in the field logbook.

11.4 Air Monitoring Action Levels

Air monitoring action levels have been developed that stipulate the chemical concentrations in the breathing zone that require an upgrade in level of PPE.

Air monitoring action levels are typically set at one-half of the OSHA PEL, NIOSH Recommended Exposure Limit (REL), or the American Conference of Governmental Industrial Hygienists (ACGIH) TLVs. The rationale for establishing action levels is based on the available data that characterize COCs in site media.

Air monitoring measurements shall generally be taken in the breathing zone of the worker most likely to have the highest exposure. Transient peaks will not automatically trigger action. Action will be taken when levels are consistently exceeded in a 5-minute period. Similarly, if chemical odors are detected that are a nuisance, bothersome, or irritating, an upgrade in respiratory protection can provide an extra level of comfort or protection when conducting site activities.

12 HEALTH AND SAFETY PROCEDURES AND PRACTICES

In addition to the task-specific JSAs presented in Appendix C of this HASP, this section lists the health and safety procedures and practices applicable to this project. For additional information, consult with the PM.

12.1 Physical Hazards and Controls

12.1.1 General Site Activities

Observe the following general procedures and practices to prevent physical hazards:

- Legible and understandable precautionary labels shall be affixed prominently to containers of potentially contaminated soil, sediment, water, and clothing.
- No food or beverages shall be present or consumed in areas that have the potential to contain COCs and/or contaminated materials or equipment.
- No tobacco products or cosmetics shall be present or used in areas that have the potential to contain COCs and/or contaminated materials or equipment.
- An emergency eyewash unit shall be located immediately adjacent to employees who handle hazardous or corrosive materials, including decontamination fluids. All operations involving the potential for eye injury or splash must have approved field eyewash units locally available.
- On a project-specific basis, personnel working on or near bodies of water shall wear USCG-approved PFDs.
- Generally, all on-site activities will be conducted during daylight hours. If work after dusk is planned or becomes necessary due to an emergency, adequate lighting must be provided.
- Hazardous work, such as handling hazardous materials and heavy loads and equipment operation, should not be conducted during severe storms.
- All temporary electrical power must have a ground fault circuit interrupter (GFCI) as part of its circuit if the circuit is not part of permanent wiring. All equipment must be suitable and approved for the class of hazard present.
- The PM or FL and appropriate personnel from other contractors will review site access routes and work locations for adequate clearance (overhead and laterally) slope, and ground stability prior to moving equipment on-site.

12.1.2 Slip/Trip/Fall

Observe the following procedures and practices to prevent slips, trips, and falls:

- Inspect each work area for slip/trip/fall potential prior to each work task.
- Slip/trip/fall hazards identified must be communicated to all personnel. Hazards identified shall be corrected or labeled with warning signs to be avoided.
- All personnel must be aware of their surroundings and maintain constant communication with each other at all times.

12.1.3 Underground/Overhead Utility Line Contact Prevention

Observe the following underground/overhead utility line contact prevention procedures and practices:

- Prior to conducting work, the PM or FL shall ensure that all existing underground or overhead utilities in the work area are located per the state or local mark-out methods, including identification of utility lines that may be submerged in waterways. Documentation of utility mark-out shall be completed using a Utility Contact Prevention Checklist form. No excavation work is to be performed until all utility mark-outs are verified.
- The PM or FL shall conduct a site survey to search for signs of other buried or overhead utilities. The results of such surveys shall be documented on the Utility Mark-out documentation form.
- The property owner or facility operator shall be consulted on the issue of underground utilities. As-built drawings shall be reviewed, when available, to verify that underground utility locations are consistent with the utility location mark-outs. All knowledge of past and present utilities must be evaluated prior to conducting work.
- If on-site subsurface utility locations are in question, a private locating service shall be contacted to verify locations. If the investigation calls for boreholes in an area not covered by the municipal One-Call system, then a private utility locate firm shall be contacted to determine the location of other underground utilities.
- The PM shall have documented verbal contact and an agreement with the fiber optic company for all work within 50 feet of any fiber optic cables.

- **Only hand digging is permitted within 3 feet of underground high voltage, product, or gas lines.** Once the line is exposed, heavy equipment can be used, but must remain at least 3 feet from the exposed line.
- Elevated superstructures (e.g., drill rig, backhoe, scaffolding, ladders, and cranes) shall remain a distance of 200 feet away from utility lines and 30 feet away from power lines. Distance from utility lines may be adjusted by the FL depending on actual voltage of the lines.
- Overhead utility locations shall be marked with warning tape or flags where equipment has the potential for contacting overhead utilities.

12.1.4 Electric Shock

Observe the following procedures and practices to prevent electric shock:

- Use GFCIs as required.
- Perform lockout/tagout (LO/TO) procedures in accordance with regulatory requirements, if applicable.
- Use three-pronged plugs and extension cords.
- Contact your local underground utility-locating service.
- Follow code requirements for electrical installations in hazardous locations.
- Always use qualified electricians to install electrical equipment and when conducting troubleshooting activities within 10 feet of exposed live wires.

12.1.5 Hand and Power Tools

Observe the following procedures and practices when working with hand and power tools:

- Keep hand tools sharp, clean, oiled, dressed, and not abused.
- Worn tools are dangerous. For example, the “teeth” in a pipe wrench can slip if worn smooth, an adjustable wrench will slip if the jaws are sprung, and hammerheads can fly off loose handles.
- Tools subject to impact (e.g., chisels, star drills, and caulking irons) tend to “mushroom.” Keep them dressed to avoid flying spalls. Use tool holders.
- Do not force tools beyond their capacity.

- Flying objects can result from operating almost any power tool, so always warn people in the vicinity and use proper eye protection.
- Each power tool should be examined before use for damaged parts, loose fittings, and frayed or cut electric cords. Tag and return defective tools for repairs. Also inspect for adequate lighting, proper lubrication, and abandoned tools or material that could "vibrate into trouble."
- Compressed air must be shut off or the electric cord unplugged before making tool adjustments. Air must be "bled down" before replacement or disconnection.
- Proper guards or shields must be installed on all power tools before issue. Do not use improper tools or tools without guards in place.
- Replace all guards before start-up. Remove cranks, keys, or wrenches used in service work.

12.1.6 Vehicular Traffic

Observe the following procedures and practices regarding vehicular traffic:

- Wear a traffic safety vest when vehicle hazards exist.
- Use cones, flags, barricades, and caution tape to define the work area.
- Use a vehicle to block work area.
- Engage a police detail for high-traffic situations.
- Always use a spotter in tight or congested areas for material deliveries.
- As necessary, develop traffic control plans and train personnel as flaggers in accordance with the DOT MUTCD and/or local requirements.

See Section 7.4.2 for additional information regarding work in roadways.

12.1.7 Boating Operations

The following precautions shall be followed when conducting boating trailer and launch activities:

- Follow the trailer and boat manufacturers' instructions for securing the boat to the trailer.

- Follow the trailer manufacturer's instructions for securing the trailer to the towing vehicle.
- Prohibit workers from moving into trailer/vehicle pinch points without advising the vehicle operator.
- Use experienced operators when backing trailers on boat ramps.
- Wear proper work gloves when the possibility of pinching or other injury may be caused by moving or handling large or heavy objects.
- Maintain all equipment in a safe condition.
- Launch boats one at a time to avoid collisions.
- Use a spotter for vehicles backing boats to the launch area.
- Understand and review hand signals.
- Wear boots with non-slip soles when launching boats.
- Wear USCG-approved PFDs when working on or near the water.
- Keep ropes and lines coiled and stowed to eliminate trip hazards.
- Maintain three-point contact on dock/pier or boat ladders.
- Ensure that drain plugs are in place, as present.

The following precautions shall be followed when conducting boating operations:

- Maintain a current boater's license(s) as required.
- Wear USCG-approved PFDs for work activities on or near the water.
- Provide a floating ring buoy with at least 90 feet of line in the immediate boat launch/landing areas.
- Step into the center of the boat (small boats only).
- Keep your weight low when moving on the boat (small boats only).
- Move slowly and deliberately.
- Steer directly across other boat wakes at a 90-degree angle to avoid capsizing.
- Steer the boat facing forward.
- Watch for floating objects in the water.
- Right-of-way is yielded to vessels on your boat's right, or starboard, and vessels with limited ability to maneuver such as any wind-propelled vessel.

The following precautions shall be followed when working on a boat:

- Observe proper lifting techniques.
- Obey lifting limits.
- Use mechanical lifting equipment (i.e., pulleys or winches) to move large or awkward loads.
- Wear USCG-approved PFDs for work activities on or near the water.

The safety-related items listed in Table 12-1 shall be available when conducting boating operations:

Table 12-1
Safety Equipment Specific to In-water Work

Additional Safety Equipment for Sampling Vessel per U.S. Coast Guard (USCG) Requirements:	
• Proper vessel registration, numbering, and documentation (registered with state, certificate of vessel registration number displayed, and carrying a valid certificate of number) • USCG-approved personal flotation devices (PFDs; or life jackets) for every person on the sampling vessel (Type II PFD required, Type I PFD preferred as it will turn most unconscious wearers face up in the water) • Appropriate, non-expired, visual distress devices for day and night use from the following: - Three hand-held red flares (day and night), or - One hand-held red flare and two parachute flares (day and night), or - One hand-held orange smoke signal, two floating orange smoke signals (day), and one electric distress light (night only) • Alternate means of propulsion (oars or paddles) • Dewatering device (pump or bailer) • Properly maintained and inspected USCG-approved fire extinguishers (no fixed system = (2) B-1 or (1) B-2 type extinguishers; fixed system = (1) B-1 type extinguisher) • Proper ventilation of gasoline-powered vessels • Sound-producing device (whistle, bell, or horn) • VHF 2-way radio or cellular telephone • Proper navigational light display • Throwable life ring with attached line (any vessel larger than 16 feet is required to carry one Type IV [throwable] PFD)	
Additional USCG Recommended Equipment Includes:	
• Extra visual distress signals • Primary and spare anchor • Heaving line • Fenders • First aid kit • Flashlight • Mirror • Searchlight • Sunburn lotion • Tool kit • Spare fuel	• Boat hook • Spare propeller • Mooring line • Food and water • Binoculars • Spare batteries • Sunglasses • Marine hardware • Extra clothing • Spare parts • Pertinent navigational chart(s) and compass

12.1.8 Working Over or Near Water

12.1.8.1 Personal Flotation Devices

Type III, Type V, or better USCG-approved PFD shall be provided and properly worn by all personnel in the following circumstances:

1. On floating pipelines, pontoons, rafts, or stages.
2. On structures extending over or next to the water, except where guard rails or safety nets are provided for employees.
3. Working alone at night where there are drowning hazards, regardless of other safeguards provided.
4. In skiffs, small boats, or launches, unless in an enclosed cabin or cockpit.
5. Whenever there is a drowning hazard.

The following precautions shall be followed when using PFDs:

- Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects that would alter their strength or buoyancy. Defective devices or devices with less than 13 pounds buoyancy shall be removed from service.
- All PFDs shall be equipped with reflective tape as specified in 46 CFR 25.25-15.
- Thirty-inch USCG-approved ring buoys with at least 150 feet of 600-pound capacity line shall be provided and readily available for emergency rescue operations. The distance between ring buoys shall not exceed 200 feet.
- PFD lights conforming to 46 CFR 161.012 shall be required whenever there is a potential need for life rings to be used after dark. On shore installations, at least one life ring, and every third one thereafter, shall have a PFD light attached. PFD lights on life rings are required only in locations where adequate general lighting (e.g., floodlights or light stanchions) is not provided.

12.1.9 Excavation and Trenching Activities

12.1.9.1 Definitions

Angle of Repose – The greatest angle above the horizontal plane at which a material will lie without sliding.

Benching – A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels of steps, usually with vertical or near-vertical surfaces between levels.

Competent Person – An employee who is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has the authority to take prompt corrective measures to eliminate them.

Excavation – Any man-made cut, cavity, trench, or depression in an earth surface, including its sides, walls, or faces, formed by earth removal.

Registered Professional Engineer – An individual currently registered as a P.E. (preferably civil) in the state where work is to be performed.

Sheeting – Members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system.

Shield – A structure that is able to withstand the forces imposed on it by a cave-in and thereby protects employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Shields may be pre-manufactured or job-built in accordance with CFR 1926.652(c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

Shoring – Structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and that is designed to prevent cave-ins.

Sloping – A method of protecting employees from cave-ins by excavating to form sides of a trench that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

Support System – A structure such as underpinning, bracing, or shoring, that provides support to an adjacent structure, underground installation, or the sides of an excavation.

Trench – A narrow (in relation to its length) excavation made below the surface of the ground. In general, the depth is greater than the width at the bottom, but the width of a trench at the bottom is not greater than 15 feet.

Type A Soil – Cohesive soils with an unconfined compressive strength of 1.5 tons per square foot (tsf) (144 kilopascal [kPa]) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam, and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, soil is NOT Type A if:

- The soil is fissured
- The soil is subject to vibration from heavy traffic, pile driving, or similar effects
- The soil has been previously disturbed
- The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of 4H:1V or greater
- The material is subjected to other factors that would require it to be classified as a less stable material

Type B Soil – This classification refers to:

- Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa), but less than 1.5 tsf (144 kPa)
- Granular, cohesionless soils including angular gravel (similar to crushed rock), silt, silt loam, sandy loam, and, in some cases, silty clay loam and sandy clay loam
- Previously disturbed soils except those that would otherwise be classified as Type C soil
- Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subjected to vibration
- Dry rock that is not stable
- Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than 4H:1V, but only if the material would otherwise be classified as Type B

Type C Soil – This classification refers to:

- Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less
- Granular soils including gravel, sand, and loamy sand
- Submerged soil or soil from which water is freely seeping
- Submerged rock that is not stable
- Material in a sloped, layered system where the layers dip into the excavation or a slope of 4H:1V or steeper

12.1.9.2 Pre-Excavation Requirements

Underground Installations – Prior to opening an excavation, the estimated locations of underground utilities such as sewer, telephone, fuel, electric, water, or any other underground installations that may reasonably be expected to be encountered during the excavation work shall be determined.

The property owner and/or utility location service shall be contacted within the established pre-notification time, advised of the proposed work, and asked to delineate the location of all underground utilities. Employees should be careful to protect and preserve the utility markings until they are no longer required for safe excavation. At least 3 feet of clearance between any underground utility and the cutting edge or point of powered excavation equipment will be maintained until the precise location of the utility is determined. Initial excavation within this 3-foot area will be conducted manually.

Surface Encumbrances – All surface encumbrances (e.g., trees, poles, or boulders) that may create a hazard to employees shall be removed or supported.

Vehicular Traffic – Employees exposed to vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material. Traffic control devices (e.g., barricades, signs, cones, or flagpersons) shall be specified and used in accordance with regulations applicable to the roadway or area in which excavation activities are occurring.

12.1.9.3 Training

Those who supervise the entry of personnel into an excavation, a "Competent Person," must have completed a training course that included instruction in:

- Types of hazards associated with excavation operations
- Safe work practices and techniques
- A review of applicable federal, state, and local regulations
- A review of this procedure

Employees who enter excavations are required to complete a site-specific training session to enable them to recognize unsafe conditions in and around the excavation. This training can be conducted during a tailgate safety meeting that emphasizes the specific excavation hazards that may be encountered.

Training documentation shall be maintained in the project files. As part of the standard employee supervision process, training shall be complemented with on-the-job instruction and reinforcement of accepted practices to the extent necessary to ensure compliance with this procedure and all other applicable regulations.

12.1.9.4 Excavation Work Practices

General – Each employee working within an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with 29 CFR 1926 Subpart P, except when the excavation is made entirely in stable rock or when the excavation is less than 5 feet deep and examination of the ground by a competent person provides no indication of a potential cave-in. A competent person shall ensure that protective systems, when required, are installed and maintained per the design specifications. No employees shall be permitted to enter an excavation unless it is absolutely essential to do so and all requirements of this procedure are met.

Supervision – Work in an excavation shall be supervised at all times by a competent person. This individual will remain outside of the excavation at all times, and will be responsible for identifying any unusual developments aboveground that may warn of impending earth movement.

Soil Classification – Based on their training, the competent person will classify each soil or rock deposit as stable rock, Type A, Type B, or Type C. When layers of soil or rock exist, the weakest layer will be classified; however, each layer may be classified individually when a more stable layer lies under a less stable layer. If the properties or conditions of a soil or rock deposit change in any way, re-evaluation will be required.

Access and Egress – Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.

A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 or more feet in depth so as to require no more than 25 feet of lateral travel for employees.

Protective Systems – Protective systems shall be designed in accordance with 29 CFR 1926.652(b) or (c) and shall have the capacity to resist, without failure, all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

Exposure to Falling Loads – No employees shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded provided the vehicles are equipped with a cab shield and/or canopy adequate to protect the operator from shifting or falling materials.

Warning System for Mobile Equipment – When mobile equipment is operated adjacent to an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs.

Hazardous Atmospheres – Where an oxygen-deficient (less that 19.5% O_2) or hazardous atmosphere exists, or could reasonably be expected to exist, the excavation shall be tested

before employees enter. Testing shall be conducted as often as necessary to ensure that the atmosphere remains safe. Some excavations may be considered confined spaces that require compliance with appropriate procedures. If entry into a confined space is required, work will be suspended until this HASP is amended to include appropriate procedures. Adequate precautions shall be taken to prevent employee exposure to oxygen-deficient or hazardous atmospheres.

Water Accumulation Hazards – Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. If water is controlled or prevented from accumulating by the use of water removal equipment, the process shall be monitored by a competent person to ensure proper operation.

If the excavation work interrupts the natural drainage of surface water (e.g., streams or run-off channels), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to run-off from heavy rains shall be regularly inspected by a competent person.

Stability of Adjacent Structures – Structures adjoining an excavation shall be evaluated to assess their stability. Excavation below the level of the base or footing of any foundation or retaining wall that could reasonably be expected to pose a hazard to employees shall only be permitted when:

- A support system (underpinning) is provided to ensure the safety of employees and the stability of the structure
- The excavation is in stable rock
- A registered P.E. has determined that the structure will be unaffected by the excavation
- A registered P.E. has determined that such excavation will not pose a hazard to employees

Sidewalks, pavements, and other surface structures shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

Protection from Loose Rock or Soil – Employees shall be protected from loose rock or soil that could fall or roll from the excavation face or edge. Such protection could consist of scaling to remove loose materials, or the installation of protective barriers. All spoil shall be placed at least 2 feet from the edge of the excavation. It is strongly recommended that spoil be placed 4 or more feet from the excavation edge so as not to cover surface indicators of subsidence (such as fissures or cracks).

Inspections – A competent person shall make daily inspections of excavations, adjacent areas, and protective systems for evidence of conditions that could result in a cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. The inspection shall be made prior to start of work, and as needed throughout the shift. Inspections shall be made after each rainstorm or other hazard-increasing event, and will be documented. Where the inspection finds evidence of any hazardous condition, exposed employees shall immediately be removed from the hazardous area until necessary precautions have been taken.

Fall Protection – Where employees or equipment are permitted to cross over excavations, walkways or bridges shall be provided. Standard guard rails shall be provided where walkways are 6 feet or more above lower levels. Adequate barriers or other types of physical protection shall be provided at all remotely located excavations. All wells, pits, or shafts, shall be barricaded or covered, and shall be backfilled as soon as possible.

12.1.10 Noise

Excessive noise is hazardous not only because of its potential to damage hearing, but also because of its potential to disrupt communications and instructions. The following procedures and practices shall be followed to prevent noise-related hazards:

- All employees will have access to disposal ear plugs with a Noise Reduction Rating of not less than 30.

- Ear plugs must be worn in any environment where workers must raise their voices to be heard while standing at a distance of 3 feet or less.
- Ear plugs must be worn by any personnel operating concrete cutting or sawing equipment.

12.1.11 Lifting and Material Handling

Observe the following procedures and practices for lifting and material handling:

- Use leather gloves when handling metal, wire rope, sharp debris, or transporting materials (e.g., wood, piping, drums, etc.). Chemically protective gloves must be worn in addition to leather gloves if contaminated materials are handled; leather gloves to not offer adequate protection from COCs with dermal exposure routes of concern.
- The size, shape, and weight of the object to be lifted must first be considered. No individual employee is permitted to lift any object that weighs over 60 pounds. Multiple employees or mechanical lifting devices are required for objects over the 60-pound limit.
- Plan a lift before doing it. Bend at the knees and lift with the legs; keep the natural curves of the back; do not use back muscles.
- Check the planned route for clearance.
- Use the buddy system when lifting heavy or awkward objects.
- Do not twist your body while lifting.
- Know the capacity of any handling device (e.g., crane, forklift, chain fall, or come-along) that you intend to use.
- Use tag lines to control loads.
- Ensure that your body, material, tools, and equipment are safe from such unexpected movement as falling, slipping, rolling, tripping, bowing, or any other uncontrolled motion.
- Trucks (i.e., flat beds) hauling equipment or materials must not be moved once rigging has been released.
- Chock all material and equipment (such as pipe, drums, tanks, reels, trailers, and wagons) as necessary to prevent rolling.
- Tie down all light, large-surface-area material that might be moved by the wind.

- When working at heights, secure tools, equipment, and wrenches against falling.
- Do not store materials or tools on ducts, lighting fixtures, beam flanges, hung ceilings, or similar elevated locations.
- Fuel-powered tools used inside buildings or enclosures shall be vented and checked for excessive noise.

12.1.12 Fire Control

Observe the following fire control procedures and practices:

- Smoke only in designated areas.
- Keep flammable liquids in closed containers.
- Keep the work site clean; avoid accumulating combustible debris such as paper.
- Obtain and follow property owner hot work safety procedures when welding or performing other activities requiring an open flame.
- Isolate flammable and combustible materials from ignition sources.
- Ensure fire safety integrity of equipment installations according to NEC specifications.

12.1.13 Static Electricity and Transfer of Flammable Liquids

Observe the following procedures and practices regarding static electricity when transferring flammable liquids:

- Electrically bond and ground pumps, transfer vessels, tanks, drums, bailers, and probes when moving flammable liquids.
- Electrically bond and ground vacuum trucks and the tanks they are emptying.
- Do not splash fill containers with flammable liquids.
- Pour flammable liquids slowly and carefully.
- Two fire extinguishers (2A20:BC) must be available, charged, inspected, and readily accessible.

12.1.14 Cleaning Equipment

Observe the following procedures and practices when cleaning equipment:

- Wear appropriate PPE to avoid skin and eye contact with isopropyl alcohol, Alconox®, or other cleaning materials.
- Stand upwind to minimize any potential inhalation exposure.
- Dispose of spent cleaning solutions and rinses accordingly.

12.2 Environmental Hazards and Controls

12.2.1 Heat Stress

Observe the following general procedures and practices regarding heat stress:

- Increase the number of rest breaks and/or rotate workers in shorter work shifts.
- Watch for signs and symptoms of heat stress and fatigue (see Section 12.2.1.1).
- During hot months, plan work for early morning or evening.
- Use ice vests when necessary.
- Rest in cool, dry areas.

12.2.1.1 Signs, Symptoms, and Treatment

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal illness, and increased accident probability to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn since they prevent evaporative body cooling. Wearing PPE places employees at considerable risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses, regular monitoring and other preventive precautions are vital.

Heat Rash. Heat rash can be caused by continuous exposure to hot and humid air and skin abrasion from sweat-soaked clothing. The condition is characterized by a localized red skin rash and reduced sweating. Heat rash reduces the ability to tolerate heat. To treat, keep skin hygienically clean and allow it to dry thoroughly after using chemical protective clothing.

Heat Cramps. Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. This often robs the larger muscle groups (stomach and quadriceps) of blood, which can cause painful muscle spasms and pain in the extremities and abdomen. To treat, remove the employee to a cool place and give sips of water or an electrolytic drink. Watch for signs of heat exhaustion or heat stroke.

Heat Exhaustion. Heat exhaustion is a mild form of shock caused by increased stress on various organs to meet increased demand to cool the body. Onset is gradual and symptoms should subside within 1 hour. Symptoms include a weak pulse; shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; and fatigue. To treat, remove the employee to a cool place and remove as much clothing as possible. Give sips of water or electrolytic solution and fan the person continuously to remove heat by convection. Do not allow the affected person to become chilled. Treat for shock if necessary.

Heat Stroke. Heat stroke is the most severe form of heat stress; the body must be cooled immediately to prevent severe injury and/or death. ***This is a medical emergency!*** Symptoms include red, hot, dry skin; a body temperature of 105° F or higher; no perspiration; nausea; dizziness and confusion; and a strong, rapid pulse. Since heat stroke is a true medical emergency, transport the patient to a medical facility immediately. Prior to transport, remove as much clothing as possible and wrap the patient in a sheet soaked with water. Fan the patient vigorously while transporting to help reduce body temperature. If available, apply cold packs under the arms, around the neck, or any other place where they can cool large surface blood vessels. If transportation to a medical facility is delayed, reduce body temperature by immersing the patient in a cool-water bath (however, be careful not to over-chill the patient once body temperature is reduced below 102° F). If this is not possible, keep the patient wrapped in a sheet and continuously douse with water and fan.

12.2.1.2 Prevention

The implementation of preventative measures is the most effective way to limit the effects of heat-related illnesses. During periods of high heat, adequate liquids must be provided to replace lost body fluids. Replacement fluids can be a 0.1% saltwater solution, a commercial mix such as Gatorade, or a combination of these with fresh water. The replacement fluid

temperature should be kept cool, 50° F to 60° F, and should be placed close to the work area. Employees must be encouraged to drink more than the amount required to satisfy thirst. Employees should also be encouraged to salt their foods more heavily during hot times of the year.

Cooling devices such as vortex tubes or cooling vests can be worn beneath impermeable clothing. If cooling devices are worn, only physiological monitoring will be used to determine work activity.

All workers are to rest when any symptoms of heat stress are noticed. Rest breaks are to be taken in a cool, shaded rest area. Employees shall remove chemical protective garments during rest periods and will not be assigned other tasks.

All employees shall be informed of the importance of adequate rest and proper diet, including the harmful effects of excessive alcohol and caffeine consumption.

12.2.1.3 Monitoring

Heat stress monitoring should be performed when employees are working in environments exceeding 90° F ambient air temperature. If employees are wearing impermeable clothing, this monitoring should begin at 77° F. There are two general types of monitoring that the health and safety representative can designate to be used: wet bulb globe temperature (WBGT), and physiological. A Heat Stress Monitoring Record form will be used to record the results of heat stress monitoring.

Wet Bulb Globe Temperature (WBGT). The WBGT index is the simplest and most suitable technique to measure the environmental factors that most nearly correlate with core body temperature and other physiological responses to heat. When WBGT exceeds 25° C (77° F), the work regiment in Table 12-2 should be followed.

Table 12-2
Permissible Heat Exposure Threshold Limit Values

Work/Rest Regimen	Workload Light	Moderate	Heavy
Continuous work	86° F (30.0° C)	80° F (26.7° C)	77° F (25.0° C)
75% work, 25% rest each hour	87° F (30.6° C)	82° F (28.0° C)	78° F (25.9° C)
50% work, 50% rest, each hour	89° F (31.4° C)	85° F (29.4° C)	82° F (27.9° C)
25% work, 75% rest, each hour	90° F (32.2° C)	88° F (31.1° C)	86° F (30.0° C)
These TLVs are based on the assumption that nearly all acclimated, fully-clothed workers with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 100.4° F (38° C).			

(From OSHA Technical Manual, Section III: Chapter 4 - Heat Stress)

The TLVs denoted in Table 12-2 apply to physically fit and acclimatized individuals wearing light, summer clothing. If heavier clothing that impedes sweat or has a higher insulation value is required, the permissible heat exposure TLVs should be adjusted based on the WBGT Correction Factors in Table 12-3.

Table 12-3
WBGT Correction Factors

Clothing Type	WBGT Correction
Summer lightweight working clothing	32° F (0° C)
Cotton coveralls	28° F (-2° C)
Winter work clothing	25° F (-4° C)
Water barrier, permeable	86° F (-6° C)
Fully encapsulating	14° F (-10° C)

Physiological. Physiological monitoring can be used in lieu of, or in addition to, WBGT. This monitoring can be self-performed once the health and safety representative demonstrates appropriate techniques to affected employees. Since individuals vary in their susceptibility to heat, this type of monitoring has its advantages. The two parameters that are to be monitored at the beginning of each rest period are:

- **Heart Rate** – The maximum heart rate (MHR) is the amount of work (beats) per minute a healthy person's heart can be expected to safely deliver. Each individual will count his/her radial (wrist) pulse for 1 minute as early as possible during each rest period. If the heart rate of any individual exceeds 75% of their calculated MHR (MHR = 200 - age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75% of their calculated MHR.
- **Temperature** – Each individual will measure his/her temperature with a thermometer for 1 minute as early as possible in the first rest period. If the temperature exceeds 99.6° F at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work if his/her temperature exceeds 100.4° F

12.2.1.4 Training

Employees potentially exposed to heat stress conditions will be instructed on the contents of this procedure. This training can be conducted during daily tailgate safety meetings.

12.2.2 Cold Stress

Observe the following procedures and practices regarding cold stress:

- Take breaks in heated shelters when working in extremely cold temperatures.
- Upon entering the shelter, remove the outer layer of clothing and loosen other layers to promote evaporation of perspiration.
- Drink warm liquids to reduce the susceptibility to cold stress.
- Be aware of cold stress symptoms, including shivering, numbness in the extremities, and sluggishness.
- Provide adequate insulating dry clothing to maintain warmth if work is performed in air temperature below 40° F. Wind chill cooling rates and the cooling power of air are critical factors. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required.
- If the air temperature is 32° F or less, hands should be protected.

- If only light work is involved and if the clothing on the worker may become wet on the job site, the outer layer of the clothing in use should be impermeable to water. With more severe work under such conditions, the outer layer should be water repellent, and the outer wear should be changed as it becomes wetted. The outer garments should include provisions for easy ventilation in order to prevent wetting of the inner layer by sweat.
- If available clothing does not give adequate protection to prevent cold injury, work should be modified or suspended until adequate clothing is made available, or until weather conditions improve.
- Implement a buddy system in which workers are responsible for observing fellow workers for early signs and symptoms of cold stress.

12.2.2.1 Signs, Symptoms, and Treatment

Cold stress can range from frostbite to hypothermia. The signs and symptoms of cold stress are listed below. The appropriate guidelines should be followed if any personnel exhibit these symptoms:

Frostbite. Frostbite is characterized by pain in the extremities and loss of manual dexterity. "Frostnip," or reddening of the tissue, is accompanied by a tingling or loss of sensation in the extremities and continuous shivering.

Hypothermia. Hypothermia is characterized by pain in the extremities and loss of manual dexterity, with severe, uncontrollable shivering, and an inability to maintain the level of activity. Symptoms include excessive fatigue, drowsiness, irritability, or euphoria. Severe hypothermia includes clouded consciousness, low blood pressure, pupil dilation, cessation of shivering, unconsciousness, and possible death.

Remove the patient to a warm, dry place. If the patient's clothing is wet, remove it and replace it with dry clothing. Keep the patient warm. Re-warming of the patient should be gradual to avoid stroke symptoms. Dehydration, or the loss of body fluids, may result in a cold injury due to a significant change in blood flow to the extremities. If the patient is conscious and alert, warm sweet liquids should be provided. Coffee and other caffeinated

liquids should be avoided because of diuretic and circulatory effects. Extremities affected by frostbite should be gradually warmed up and returned to normal temperature. Moist compresses should be applied; begin with lukewarm compresses and slowly increase the temperature as changes in skin temperature are detected. Keep the patient warm and calm and remove them to a medical facility as soon as possible.

12.2.3 Inclement Weather

Observe the following procedures and practices regarding inclement weather:

- Stop outdoor work during electrical storms (lightning strikes), hailstorms, high winds, and other extreme weather conditions such as extreme heat or cold
- Take cover indoors or in a vehicle
- Listen to local forecasts for warnings about specific weather hazards such as tornadoes, hurricanes, and flash floods

12.2.4 Insects/Spiders

Observe the following general procedures and practices regarding insects/spiders:

- Tuck pants into socks
- Wear long sleeves
- Use insect repellent
- Avoid contact by always looking ahead to where you will be walking, standing, sitting, leaning, grabbing, lifting, or reaching
- Check for signs of insect/spider bites, such as redness, swelling, and flu-like symptoms

The most dangerous spiders to humans in North America are black widows and brown spiders (also known as brown recluse or fiddleback spiders). A guide to identifying these spiders is presented in Table 12-4.

Table 12-4
North American Hazardous Spider Identification Guide

Hazardous Spider Identification Guide	
Black Widow Spider • Abdomen usually shows hourglass marking. • Female is 3 to 4 centimeters in diameter. • Have been found in well casings and flush-mount covers. • Not aggressive, but more likely to bite if guarding eggs. • Light, local swelling and reddening are early signs of a bite, followed by intense muscular pain, rigidity of the abdomen and legs, difficulty breathing, and nausea. • If bitten, see a physician as soon as possible.	
Brown Spiders (aka Brown Recluse or Fiddleback) • Found in the central and southern United States, although in some other areas, as well. • 1/4-to-1/2-inch-long body and size of a silver dollar. • Hide in baseboards, ceiling cracks, and undisturbed piles of material. • Bite may either go unnoticed or may be followed by a severe localized reaction, including scabbing, necrosis of the affected tissue, and very slow healing. • If bitten, see a physician as soon as possible.	

12.2.5 Bees and Wasps

Many encounters with bees and wasps occur when nests built in well casings or excavation areas are disturbed. Before opening a well casing, take a few moments to observe whether or not insects are entering or exiting. If they are flying to and from the casing, avoid it if possible. If you must be in an area where disturbing a nest is likely, be sure to wear long pants and a long-sleeved shirt. Stinging insects fly around the top of their target, so if you get into trouble, pull a portion of your shirt over your head and run away.

If you get stung, look for a stinger, and, if present, remove it as soon as possible. Several over-the-counter products or a simple cold compress can be used to alleviate the pain of the

sting. If the sting is followed by severe symptoms, or if it occurs in the neck or the mouth, seek medical attention immediately because swelling could cause suffocation.

If you need to destroy a nest, consult with the PM and project FL first. Commercially available stinging insect control aerosols are very effective, but could potentially contaminate the well. Once the nest is destroyed, fine mesh may be applied over the exit and entry points of a well casing to prevent re-infestation.

12.2.6 Ticks

Ticks in North America can be carriers of several diseases, including Lyme's Disease, Rocky Mountain Spotted Fever, and ehrlichiosis.

Limiting exposure to ticks reduces the likelihood of infection when exposed to tick-infested habitats. Measures to prevent tick exposure include the following:

- Remove leaf litter and brush in areas where you will be working prior to tick season.
- Wear light-colored clothing so that ticks are visible.
- Tuck your pant legs into your socks.
- Apply repellents to discourage tick attachment.
- Promptly inspect your body and remove crawling or attached ticks when you leave a tick-infested area.
- Conduct tick checks on buddies upon exiting any suspect area (may be needed multiple times per work day).
- Be aware of seasonal activity; ticks are often most active in the spring.

Observe the following procedures and practices if you are bitten by a tick:

- Use fine-tipped tweezers or shield your fingers with tissue, paper towel, or rubber gloves.
- Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause mouthparts to break off and remain in the skin.
- Do not squeeze, crush, or puncture the body of the tick because its fluids may contain infectious organisms.

- Do not handle the tick with bare hands because infectious agents may enter through mucous membranes or breaks in the skin.
- After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.
- You may wish to save the tick for identification in case you become ill within 2 to 3 weeks. Place the tick in a sealed plastic bag in the freezer, and mark the bag with the date of the bite.

12.2.7 Mosquitoes

Mosquitoes in the United States have been known to carry West Nile Virus, St. Louis encephalitis, and Dengue Fever. To avoid mosquito bites:

- Apply insect repellent containing DEET (N,N-diethyl-meta-toluamide) when outdoors. DEET is very effective, but could potentially contaminate samples.
- Read and follow the product directions whenever you use insect repellent.
- Wear long-sleeved clothes and long pants treated with repellent to further reduce your risk, or stay indoors during peak mosquito feeding hours (dusk until dawn).
- Limit the number of places available for mosquitoes to lay their eggs by eliminating standing water sources from around the work area.
- If you need to destroy a nest, consult with the PM and project FL first.
- Check to see if there is an organized mosquito control program near the project site. If no program exists, work with the local government officials to establish a program.

12.2.8 Poisonous Snakes

Observe the following procedures and practices regarding poisonous snakes:

- Avoid walking in areas where snakes may nest or hide. When walking, always look ahead for signs of snakes.
- Use extreme caution when moving or lifting objects that could be used by snakes as cover.
- Never reach under or behind objects or into other areas where snakes may hide.
- Wear sturdy leather boots.

- Poisonous snakebites are medical emergencies. If bitten by any type of snake, immediately seek medical attention.

12.2.9 Waterborne Pathogens

A potentially life-threatening bacterium, *Vibrio vulnificus*, occurs naturally in estuarine and marine waters and in associated filter-feeding shellfish, such as oysters and mussels. The organism is able to cause infection though ingestion or through a wound. *Vibrio vulnificus* is common in Texas coastal waters from May to September (when waters are the warmest). Most healthy people are resistant to infection with this bacterium. Those who are at risk are persons with underlying diseases (especially liver diseases), blood disorders, diabetes, cancer, or any condition that affects the immune system. Persons considered to be at risk for bacterial infections should not perform field tasks associated with this project.

The symptoms of developing a *Vibrio vulnificus* infection include, but may not be limited to:

- Fever and chills
- Redness and swelling of affected area
- Pain
- Decreased blood pressure
- Tissue destruction at the site of the wound

Persons developing a *Vibrio vulnificus* infection require immediate medical attention including antibiotics, and potentially the removal of affected tissue or limbs. To reduce the possibility of *Vibrio vulnificus* or any other infection during field activities, care shall be taken not to allow any exposure of cuts or abrasions to the waters of the project area or the equipment or samples that have been in contact with the waters. Any cuts or abrasions that occur while performing the sampling activities shall be immediately treated with a topical antibacterial agent and bandaged. Should the affected area exhibit redness, swelling, or any other abnormal symptom, immediate medical attention should be sought.

Potential parasitic hazards may be present in surface waters, sediment, and soil. These include, but are not limited to: roundworm, whipworm, and hookworm. People can become infected with intestinal worms through contact with soil that has been contaminated with

human or animal feces. Parasites can enter the body through ingestion as well as dermal contact. Hookworm larvae, which may be present in animal feces (including nutria [*Myocastor coypus*] feces), can burrow through skin. Intestinal parasites can cause symptoms such as:

- Diarrhea
- Abdominal cramps
- Loss of appetite
- Distended abdomen
- Coughing, fever, and vomiting

Anyone experiencing these or any abnormal symptoms should seek medical attention. To reduce the potential for exposure to parasites, skin contact with water and sediment/soil will be avoided through the use of rubber gloves or any other appropriate PPE.

12.2.10 Poisonous Plants

Poisonous plants include poison ivy, poison oak, and poison sumac as shown in Table 12-5. Observe the following procedures and practices regarding poisonous plants:

- Avoid entering areas infested with poisonous plants.
- Immediately wash any areas that come into contact with poisonous plants.
- Use PPE when there is a possibility of contact with poisonous plants.

Table 12-5
Hazardous Plant Identification Guide

Hazardous Plant Identification Guide		
Poison Ivy • Grows in West, Midwest, Texas, and the East Coast • Several forms—vine, trailing shrub, or shrub • Three leaflets (can vary from 3 to 9) • Leaves are green in summer, and red in fall • Yellow or green flowers • White berries		
Poison Oak • Grows in the East (New Jersey to Texas) and Pacific Coast • 6-foot tall shrubs or long vines • Oak-like leaves in clusters of three • Yellow berries		
Poison Sumac • Grows in boggy areas, especially in the Southwest and Northern states • Shrub up to 15 feet tall • Seven to 13 smooth-edged leaflets • Glossy pale yellow or cream-colored berries		

If you have been exposed to poison ivy, oak, or sumac, act quickly because the toxin in the plants penetrates the skin within minutes. If possible, stay outdoors until you complete the first two steps:

1. Cleanse the exposed skin with generous amounts of isopropyl alcohol.
2. Wash the skin with water.
3. Take a regular shower with soap and warm water. Do not use soap until this point because it will pick up the toxin from the surface and move it around.
4. Wash clothes, tools, and anything else that may have been in contact with the toxin, with alcohol and water. Be sure to wear hand protection during that process.

Signs and symptoms of exposure include redness and swelling that appears 12 to 48 hours after exposure. Blistering and itching will follow. If you have had a severe reaction in the past, you should see a physician right away. Over-the-counter products that are available to alleviate symptoms include Cortaid®, Lanacort®, baking soda, Aveeno® oatmeal baths, and calamine lotion.

13 MEDICAL SURVEILLANCE PROGRAM

This section describes the medical surveillance program that Anchor QEA field personnel must comply with when working on sites where there is a potential for exposure to hazardous wastes or other hazardous substances.

13.1 General Requirements

Anchor QEA employees shall be enrolled in a medical surveillance program in compliance with OSHA standards (29 CFR 1910.120(f)) under the following circumstances:

If they are involved with any of the following operations:

- *Cleanup operations* required by a governmental body, whether federal, state, local, or other involving hazardous substances that are conducted at uncontrolled hazardous waste sites (including, but not limited to, the EPA's National Priority List [NPL] sites, state priority list sites, sites recommended for the EPA NPL, and initial investigation of government-identified sites that are conducted before the presence or absence of hazardous substances has been ascertained).
- *Corrective actions* involving cleanup operations at sites covered by the Resource Conservation and Recovery Act of 1976 (RCRA) as amended (42 U.S.C. 6901 et seq).
- *Voluntary cleanup operations* at sites recognized by federal, state, local, or other governmental bodies as uncontrolled hazardous waste sites.
- *Operations involving hazardous wastes* that are conducted at treatment, storage, and disposal (TSD) facilities regulated by 40 CFR Parts 264 and 265 pursuant to RCRA or by agencies under agreement with the EPA to implement RCRA regulations.
- *Emergency response operations* for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard.

And, if the employee(s) meets the following criteria:

- Are or may be exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more per year.

In addition, employees are required to be enrolled in the medical surveillance program if they meet any of the following conditions:

- Wear a respirator for 30 days or more per year
- 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 operations
- Are members of a Hazardous Materials (HAZMAT) team

Anchor QEA employees required to be enrolled in a medical surveillance program under 29 CFR 1910.120(f) shall have medical examinations and consultations made available to them by Anchor QEA on the following schedule:

- Prior to assignment
- At least once every 12 months unless the attending physician believes a longer interval (not greater than biennially) is appropriate
- At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last 6 months
- As soon as possible upon notification that the employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that the employee has been injured or exposed above the PEL or published exposure levels in an emergency situation
- At more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary

The content of medical examinations or consultations made available to employees shall be determined by the attending physician but shall include, at a minimum, a medical and work history with special emphasis on symptoms related to the handling of hazardous substances and health hazards, and to fitness for duty including the ability to wear any required PPE under conditions (i.e., temperature extremes) that may be expected at the work site.

The attending physician shall provide Anchor QEA with a written opinion for each examined employee that contains the following information:

- Whether the employee has any detected medical conditions that would place the employee at an increased risk of impairment of the employee's health from hazardous waste operations work, emergency response, or respirator use
- Any recommended limitations on the employee's assigned work
- A statement that the employee has been informed of the results of the medical examination and any medical conditions that require further examination or treatment

The written opinion obtained by Anchor QEA shall not reveal specific findings or diagnoses unrelated to occupational exposures. Medical surveillance and other employee-related medical records shall be retained for at least the duration of employment plus 30 years.

13.2 Crew Self Monitoring

All personnel will be instructed to look for and inform each other of any deleterious changes in their physical or mental condition during the performance of all field activities. Examples of such changes are as follows:

- Headaches
- Dizziness
- Nausea
- Blurred vision
- Cramps
- Irritation of eyes, skin, or respiratory system
- Changes in complexion or skin color
- Changes in apparent motor coordination
- Increased frequency of minor mistakes
- Excessive salivation or changes in papillary response
- Changes in speech ability or speech pattern
- Symptoms of heat stress or heat exhaustion
- Symptoms of hypothermia

If any of these conditions develop, the affected person will be moved from the immediate work location and evaluated. If further assistance is needed, personnel at the local hospital

will be notified, and an ambulance will be summoned if the condition is thought to be serious. If the condition is the result of sample collection or processing activities, procedures and/or PPE will be modified to address the problem.

APPENDIX A
HEALTH AND SAFETY LOGS AND FORMS

ANCHOR QEA

DATE: _____

PROJECT NAME: _____

PROJECT NO: _____

DAILY SAFETY BRIEFING

PERSON CONDUCTING MEETING: _____ **HEALTH & SAFETY OFFICER:** _____ **PROJECT MANAGER:** _____

TOPICS COVERED:

- ☐ Emergency Procedures and Evacuation Route
- ☐ Directions to Hospital
- ☐ HASP Review and Location
- ☐ Safety Equipment Location
- ☐ Proper Safety Equipment Use
- ☐ Employee Right-to-Know/MSDS Location
- ☐ Fire Extinguisher Location
- ☐ Eye Wash Station Location
- ☐ Buddy System
- ☐ Self and Coworker Monitoring
- ☐ Lines of Authority
- ☐ Communication
- ☐ Site Security
- ☐ Vessel Safety Protocols
- ☐ Work Zones
- ☐ Vehicle Safety and Driving/Road Conditions
- ☐ Equipment Safety and Operation
- ☐ Proper Use of PPE
- ☐ Decontamination Procedures
- ☐ Other:
- ☐ Lifting Techniques
- ☐ Slips, Trips, and Falls
- ☐ Hazard Exposure Routes
- ☐ Heat and Cold Stress
- ☐ Overhead and Underfoot Hazards
- ☐ Chemical Hazards
- ☐ Flammable Hazards
- ☐ Biological Hazards
- ☐ Eating/Drinking/Smoking

WEATHER CONDITIONS: _____

DAILY WORK SCOPE: _____

SITE-SPECIFIC HAZARDS: _____

SAFETY COMMENTS: _____

ATTENDEES

PRINTED NAME	SIGNATURE

ANCHOR QEA

MODIFICATION TO HEALTH AND SAFETY PLAN

DATE ___/___/___

Project: _____

Modification:

_____

_____

_____

Reasons for Modification:

_____

_____

_____

_____

Site Personnel Briefed:

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Approvals:

Site Supervisor: _____

Site Safety and Health Officer: _____

CERCLA Project Coordinator: _____

President: _____

Other: _____

ANCHOR QEA

Heat Stress Monitoring Record

Project/Location _____ Date _____

Employee Name	Initial Reading Time	First Work Period Time		Second Work Period Time		Third Work Period Time		Fourth Work Period Time		Fifth Work Period Time		Sixth Work Period Time	
	WBGT (°F)	WBGT (°F)		WBGT (°F)		WBGT (°F)		WBGT (°F)		WBGT (°F)		WBGT (°F)	
	Air Temp. (°F)	Air Temp. (°F)		Air Temp. (°F)		Air Temp. (°F)		Air Temp. (°F)		Air Temp. (°F)		Air Temp. (°F)	
	Initial Temp.	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp
	Initial H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.
	Initial Temp.	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp
	Initial H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.
	Initial Temp.	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp
	Initial H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.
	Initial Temp.	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp
	Initial H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.
	Initial Temp.	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp	Initial Temp	Final Temp
	Initial H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.

ANCHOR QEA

DAILY AIR MONITORING RECORD
(PID/FID/LEL/O2)

PROJECT NAME _____ **PROJECT LOCATION** _____ **PROJECT NO.** _____

Date	Analyst	Time	Manufacturer Model/Serial No.	Concentration (Units)	Location/Activity

UTILITY MARK-OUT DOCUMENTATION

Project Name: _____ Location: _____
Task/Activity: _____ Date: _____
Utility Called: _____ Confirmation #: _____
County of work: _____ Municipality of work: _____

Before work is done on any site, contact the appropriate local utility locating service (One Call, Miss Dig, Uloco, etc.) or a local utility contractor to have sub grade utilities marked. NOTE: Boring locations to be placed not in the public right of way are typically not marked out by the public utility mark-out, and a private utility locate service must be engaged. Indicate to the utility locator the nearest intersecting street for the site: _____

_____Confirmation No:_____.

List utility firms (public and private) and the utility they will mark.

Utility Marker Emergency Telephone Numbers Major Utilities Marked by Color Code			
Name of Utility Company	Utility	Color Code	Emergency Telephone Number
	Water	Blue	
	Gas	Yellow	
	Electric	Red	
	Telephone/Cable/ Communication	Orange	
	Sewer	Green	
"ALL UNDERGROUND UTILITIES MAY NOT BE LOCATED BY THE LOCAL UTILITY SERVICE." Accordingly, you must list other known utilities in the area that the "One Call" service will not contact:			

Attach photos of the area prior to placing boreholes.
Take photos of the area indicating minimum 5 feet hand dig, post hole dig, probe, GPR, or other.
NOTE: For any borehole, should 5 feet minimum clearance not be obtained, you must contact Business Line VP or equivalent (Operations Director or other on the Federal Business Line) and obtain a variance.

Completed by:

_____ _____ _____
Name Signature Date

APPENDIX B
MATERIAL SAFETY DATA SHEETS (MSDS)

Close

Material Safety Data Sheet

ULTRA Scientific · 250 Smith Street · North Kingstown, RI, USA 02852 · 401-294-9400

Product # RPE-044A **Last Updated: 11/14/2006**

Section I *Product Identification*

Name: 1,2,3,4,6,7,8-Heptachlorodibenzofuran
Matrix: neat compound

Section II *Composition / Information on Ingredients*

Component	CAS #	% by Wt.	LD50	OSHA PEL	ACGIH TLV	RTECS #	Codes
1,2,3,4,6,7,8-heptachlorodibenzofuran	067562-39-4	100	N/A	N/A	N/A	N/A	G

Codes: A-OSHA regulated carcinogen; B-IARC Group 1 carcinogen; C-IARC Group 2A carcinogen; D-IARC Group 2B carcinogen; E-NTP Group 1 carcinogen; F-NTP Group 2 carcinogen; G-SARA Title III compound; H-California Proposition 65 compound.

Section III *Hazards Identification*

Contains carcinogen(s) or cancer suspect agent(s)

All chemicals should be considered hazardous - direct physical contact should be avoided.

Section IV *First Aid Measures*

Inhalation: If inhaled, remove to fresh air. Give oxygen, if necessary. Contact a physician.

Skin Contact: In case of skin contact, flush with copious amounts of water. Remove contaminated clothing. Contact a physician.

Eye Contact: In case of eye contact, flush with copious amounts of water, lifting eyelids occasionally. Contact a physician.

Ingestion: If ingested, contact poison center immediately for recommended procedure. Contact a physician.

Section V *Fire Fighting Measures*

Fire and Explosion Hazard Data for Compound

Fire Hazard: N/A

Extinguishing Media: Carbon dioxide, dry chemical powder, or water spray.

Section VI *Accidental Release Measures*

Ventilate area of the leak or spill. Wear appropriate personal protective equipment as specified in Section VIII. A leaking bottle, vial, or ampule may be placed in a plastic bag, and normal disposal procedures followed. Take up spilled material with sand or other non-combustible absorbant material, and place in an appropriate container for later disposal. Flush spill area with water.

Section VII *Handling and Storage*

May be stored at room temperature

Keep in a tightly closed container, and store in a corrosion proof area.
This product should only be used by persons trained in the safe handling of hazardous chemicals.

Section VIII Exposure Controls / Personal Protection

Ensure that there is adequate ventilation to prevent airborne levels from exceeding recommended exposure limits (see Section II). Use appropriate MSHA/NIOSH approved safety equipment. Wear chemical goggles, face shield, gloves, and chemical resistant clothing, such as a laboratory coat and/or a rubber apron, to prevent contact with eyes, skin, and clothing.

Section IX Physical and Chemical Properties

Physical Data for Compound

Melting Pt.: N/A	***Boiling Pt.:*** N/A	***Density:*** N/A
Vapor Pressure: N/A	***Vapor Density:*** N/A	***Water Solubility:*** N/A
Appearance: N/A	***Odor:*** N/A	***Flash Point:*** N/A
Auto-Ignition Temperature: N/A	***LEL:*** N/A	***UEL:*** N/A

Section X Stability and Reactivity

Reactivity Data for Compound

Stability: stable ***Incompatibilities:*** N/A
Hazardous Decomposition Products: N/A
Hazardous Effects of Polymerization: no

Section XI Toxicological Information

See Section II for specific toxicological information for the ingredients of this product.

Section XII Ecological Information

No information is available.

Section XIII Disposal Considerations

Recycle, if possible. Any material which cannot be saved for recovery or recycling should be disposed of at an appropriate and approved waste disposal facility. Processing, use, and/or contamination of this product may change waste management requirements. Observe all applicable federal, state, and local environmental regulations concerning disposal.

Section XIV Transport Information

Shipment Type: Dangerous Goods in Excepted Quantity (US DOT Small Quantity Exemption)
UN Number: UN3316 ***Shipping Class:*** 9 ***Packing Group:*** N/A

Section XV Regulatory Information

No information is available.

Section XVI Other Information

The above information is believed to be correct, but does not purport to be all-inclusive. This data should be used only as a guide in handling this material. ULTRA Scientific, Inc., shall not be held liable for any damage resulting from handling or from contact with the above product.

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Material Safety Data Sheet

ULTRA Scientific · 250 Smith Street · North Kingstown, RI, USA 02852 · 401-294-9400

Product # RPE-063A **Last Updated: 11/14/2006**

Section I *Product Identification*

Name: 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin
Matrix: neat compound

Section II *Composition / Information on Ingredients*

Component	CAS #	% by Wt.	LD50	OSHA PEL	ACGIH TLV	RTECS #	Codes
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	035822-46-9	100	N/A	N/A	N/A	N/A	G

Codes: A-OSHA regulated carcinogen; B-IARC Group 1 carcinogen; C-IARC Group 2A carcinogen; D-IARC Group 2B carcinogen; E-NTP Group 1 carcinogen; F-NTP Group 2 carcinogen; G-SARA Title III compound; H-California Proposition 65 compound.

Section III *Hazards Identification*

All chemicals should be considered hazardous - direct physical contact should be avoided.

Section IV *First Aid Measures*

Inhalation: If inhaled, remove to fresh air. Give oxygen, if necessary. Contact a physician.

Skin Contact: In case of skin contact, flush with copious amounts of water. Remove contaminated clothing. Contact a physician.

Eye Contact: In case of eye contact, flush with copious amounts of water, lifting eyelids occasionally. Contact a physician.

Ingestion: If ingested, contact poison center immediately for recommended procedure. Contact a physician.

Section V *Fire Fighting Measures*

Fire and Explosion Hazard Data for Compound

Fire Hazard: N/A

Extinguishing Media: Carbon dioxide, dry chemical powder, or water spray.

Section VI *Accidental Release Measures*

Ventilate area of the leak or spill. Wear appropriate personal protective equipment as specified in Section VIII. A leaking bottle, vial, or ampule may be placed in a plastic bag, and normal disposal procedures followed. Take up spilled material with sand or other non-combustible absorbant material, and place in an appropriate container for later disposal. Flush spill area with water.

Section VII *Handling and Storage*

May be stored at room temperature

Keep in a tightly closed container, and store in a corrosion proof area.

This product should only be used by persons trained in the safe handling of hazardous chemicals.

Section VIII Exposure Controls / Personal Protection

Ensure that there is adequate ventilation to prevent airborne levels from exceeding recommended exposure limits (see Section II). Use appropriate MSHA/NIOSH approved safety equipment. Wear chemical goggles, face shield, gloves, and chemical resistant clothing, such as a laboratory coat and/or a rubber apron, to prevent contact with eyes, skin, and clothing.

Section IX Physical and Chemical Properties

Physical Data for Compound

Melting Pt.: N/A	***Boiling Pt.:*** N/A	***Density:*** N/A
Vapor Pressure: N/A	***Vapor Density:*** N/A	***Water Solubility:*** N/A
Appearance: N/A	***Odor:*** N/A	***Flash Point:*** N/A
Auto-Ignition Temperature: N/A	***LEL:*** N/A	***UEL:*** N/A

Section X Stability and Reactivity

Reactivity Data for Compound

Stability: stable ***Incompatibilities:*** N/A

Hazardous Decomposition Products: N/A

Hazardous Effects of Polymerization: no

Section XI Toxicological Information

See Section II for specific toxicological information for the ingredients of this product.

Section XII Ecological Information

No information is available.

Section XIII Disposal Considerations

Recycle, if possible. Any material which cannot be saved for recovery or recycling should be disposed of at an appropriate and approved waste disposal facility. Processing, use, and/or contamination of this product may change waste management requirements. Observe all applicable federal, state, and local environmental regulations concerning disposal.

Section XIV Transport Information

Shipment Type: Dangerous Goods in Excepted Quantity (US DOT Small Quantity Exemption)

UN Number: UN3316 ***Shipping Class:*** 9 ***Packing Group:*** N/A

Section XV Regulatory Information

No information is available.

Section XVI Other Information

The above information is believed to be correct, but does not purport to be all-inclusive. This data should be used only as a guide in handling this material. ULTRA Scientific, Inc., shall not be held liable for any damage resulting from handling or from contact with the above product.

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Material Safety Data Sheet

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Product # RPE-043A **Last Updated: 11/14/2006**

Section I *Product Identification*

Name: 1,2,3,4,7,8-Hexachlorodibenzofuran
Matrix: neat compound

Section II *Composition / Information on Ingredients*

Component	CAS #	% by Wt.	LD50	OSHA PEL	ACGIH TLV	RTECS #	Codes
1,2,3,4,7,8-hexachlorodibenzofuran	070648-26-9	100	N/A	N/A	N/A	N/A	G

Codes: A-OSHA regulated carcinogen; B-IARC Group 1 carcinogen; C-IARC Group 2A carcinogen; D-IARC Group 2B carcinogen; E-NTP Group 1 carcinogen; F-NTP Group 2 carcinogen; G-SARA Title III compound; H-California Proposition 65 compound.

Section III *Hazards Identification*

Contains carcinogen(s) or cancer suspect agent(s)
Toxic
All chemicals should be considered hazardous - direct physical contact should be avoided.

Section IV *First Aid Measures*

Inhalation: If inhaled, remove to fresh air. Give oxygen, if necessary. Contact a physician.
Skin Contact: In case of skin contact, flush with copious amounts of water. Remove contaminated clothing. Contact a physician.
Eye Contact: In case of eye contact, flush with copious amounts of water, lifting eyelids occasionally. Contact a physician.
Ingestion: If ingested, contact poison center immediately for recommended procedure. Contact a physician.

Section V *Fire Fighting Measures*

Fire and Explosion Hazard Data for Compound
Fire Hazard: N/A
Extinguishing Media: Carbon dioxide, dry chemical powder, or water spray.

Section VI *Accidental Release Measures*

Ventilate area of the leak or spill. Wear appropriate personal protective equipment as specified in Section VIII. A leaking bottle, vial, or ampule may be placed in a plastic bag, and normal disposal procedures followed. Take up spilled material with sand or other non-combustible absorbant material, and place in an appropriate container for later disposal. Flush spill area with water.

Section VII *Handling and Storage*

May be stored at room temperature
Keep in a tightly closed container, and store in a corrosion proof area.
This product should only be used by persons trained in the safe handling of hazardous chemicals.

Section VIII Exposure Controls / Personal Protection

Ensure that there is adequate ventilation to prevent airborne levels from exceeding recommended exposure limits (see Section II). Use appropriate MSHA/NIOSH approved safety equipment. Wear chemical goggles, face shield, gloves, and chemical resistant clothing, such as a laboratory coat and/or a rubber apron, to prevent contact with eyes, skin, and clothing.

Section IX Physical and Chemical Properties

Physical Data for Compound

Melting Pt.: N/A	***Boiling Pt.:*** N/A	***Density:*** N/A
Vapor Pressure: N/A	***Vapor Density:*** N/A	***Water Solubility:*** N/A
Appearance: N/A	***Odor:*** N/A	***Flash Point:*** N/A
Auto-Ignition Temperature: N/A	***LEL:*** N/A	***UEL:*** N/A

Section X Stability and Reactivity

Reactivity Data for Compound

Stability: stable ***Incompatibilities:*** N/A
Hazardous Decomposition Products: N/A
Hazardous Effects of Polymerization: no

Section XI Toxicological Information

See Section II for specific toxicological information for the ingredients of this product.

Section XII Ecological Information

No information is available.

Section XIII Disposal Considerations

Recycle, if possible. Any material which cannot be saved for recovery or recycling should be disposed of at an appropriate and approved waste disposal facility. Processing, use, and/or contamination of this product may change waste management requirements. Observe all applicable federal, state, and local environmental regulations concerning disposal.

Section XIV Transport Information

Shipment Type: Dangerous Goods in Excepted Quantity (US DOT Small Quantity Exemption)
UN Number: UN3316 ***Shipping Class:*** 9 ***Packing Group:*** N/A

Section XV Regulatory Information

No information is available.

Section XVI Other Information

The above information is believed to be correct, but does not purport to be all-inclusive. This data should be used only as a guide in handling this material. ULTRA Scientific, Inc., shall not be held liable for any damage resulting from handling or from contact with the above product.

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Material Safety Data Sheet

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Product # RPE-058A **Last Updated: 11/14/2006**

Section I *Product Identification*

Name: 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin
Matrix: neat compound

Section II *Composition / Information on Ingredients*

Component	CAS #	% by Wt.	LD50	OSHA PEL	ACGIH TLV	RTECS #	Codes
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	039227-28-6	100	0.825 mg/kg oral rat	N/A	N/A	N/A	G

Codes: A-OSHA regulated carcinogen; B-IARC Group 1 carcinogen; C-IARC Group 2A carcinogen; D-IARC Group 2B carcinogen; E-NTP Group 1 carcinogen; F-NTP Group 2 carcinogen; G-SARA Title III compound; H-California Proposition 65 compound.

Section III *Hazards Identification*

Contains carcinogen(s) or cancer suspect agent(s)
Toxic
All chemicals should be considered hazardous - direct physical contact should be avoided.

Section IV *First Aid Measures*

Inhalation: If inhaled, remove to fresh air. Give oxygen, if necessary. Contact a physician.
Skin Contact: In case of skin contact, flush with copious amounts of water. Remove contaminated clothing. Contact a physician.
Eye Contact: In case of eye contact, flush with copious amounts of water, lifting eyelids occasionally. Contact a physician.
Ingestion: If ingested, contact poison center immediately for recommended procedure. Contact a physician.

Section V *Fire Fighting Measures*

Fire and Explosion Hazard Data for Compound
Fire Hazard: N/A
Extinguishing Media: Carbon dioxide, dry chemical powder, or water spray.

Section VI *Accidental Release Measures*

Ventilate area of the leak or spill. Wear appropriate personal protective equipment as specified in Section VIII. A leaking bottle, vial, or ampule may be placed in a plastic bag, and normal disposal procedures followed. Take up spilled material with sand or other non-combustible absorbant material, and place in an appropriate container for later disposal. Flush spill area with water.

Section VII *Handling and Storage*

May be stored at room temperature
Keep in a tightly closed container, and store in a corrosion proof area.
This product should only be used by persons trained in the safe handling of hazardous chemicals.

Section VIII Exposure Controls / Personal Protection

Ensure that there is adequate ventilation to prevent airborne levels from exceeding recommended exposure limits (see Section II). Use appropriate MSHA/NIOSH approved safety equipment. Wear chemical goggles, face shield, gloves, and chemical resistant clothing, such as a laboratory coat and/or a rubber apron, to prevent contact with eyes, skin, and clothing.

Section IX Physical and Chemical Properties

Physical Data for Compound

Melting Pt.: N/A	***Boiling Pt.:*** N/A	***Density:*** N/A
Vapor Pressure: N/A	***Vapor Density:*** N/A	***Water Solubility:*** N/A
Appearance: N/A	***Odor:*** N/A	***Flash Point:*** N/A
Auto-Ignition Temperature: N/A	***LEL:*** N/A	***UEL:*** N/A

Section X Stability and Reactivity

Reactivity Data for Compound

Stability: stable ***Incompatibilities:*** N/A
Hazardous Decomposition Products: N/A
Hazardous Effects of Polymerization: no

Section XI Toxicological Information

See Section II for specific toxicological information for the ingredients of this product.

Section XII Ecological Information

No information is available.

Section XIII Disposal Considerations

Recycle, if possible. Any material which cannot be saved for recovery or recycling should be disposed of at an appropriate and approved waste disposal facility. Processing, use, and/or contamination of this product may change waste management requirements. Observe all applicable federal, state, and local environmental regulations concerning disposal.

Section XIV Transport Information

Shipment Type: Dangerous Goods in Excepted Quantity (US DOT Small Quantity Exemption)
UN Number: UN3316 ***Shipping Class:*** 9 ***Packing Group:*** N/A

Section XV Regulatory Information

No information is available.

Section XVI Other Information

The above information is believed to be correct, but does not purport to be all-inclusive. This data should be used only as a guide in handling this material. ULTRA Scientific, Inc., shall not be held liable for any damage resulting from handling or from contact with the above product.

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MATERIAL SAFETY DATA SHEET

AccuStandard
125 Market Street • New Haven, CT USA 06513
Phone No: (203) 786-5290 • Fax No: (203) 786-5287

Product Number : D-602N

Product Name : 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin

Synonyms : N/A

Formula : C12 H2 Cl6 O2 **Molecular Weight :** 390.84

Section 2 - Composition / Information on Ingredients

Component(s) (1)	CAS #	Appr. %	ACGIH TLV TWA mg/m3	ACGIH TLV SKIN	OSHA PEL TWA mg/m3	OSHA PEL SKIN
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7	100%				

Section 3 - Hazards Identification

Symptoms of Exposure:

May be harmful if inhaled, swallowed, or absorbed through the skin.

Potential Health Effects:

No applicable information found.

Routes of Entry:

Inhalation, ingestion or skin contact.

Carcinogenicity:

Suspected human carcinogenic substance. Suspect Cancer Hazard.

WARNING: This product contains a chemical(s) known to the state of California to cause cancer.

Section 4 - First Aid Measures

First Aid Procedures:

GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE.

Skin: Immediately flush thoroughly with large amounts of water.

Eyes: Immediately flush thoroughly with water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers.

Inhalation: Remove to fresh air; give artificial respiration if breathing has stopped. Contact a physician

Ingestion: If conscious, drink water and induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Remove contaminated clothing and wash before reuse

Alteration of any information contained herein without written permission from AccuStandard strictly prohibited.

Section 5 - Fire Fighting Measures

Fire fighting measures for the Compound

Flammable Properties:

Flash Point (°F): N/A

Flammable Limits LEL (%): N/A

Flammable Limits UEL (%): N/A

Thermal decomposition produces toxic fumes.

Extinguishing Media:

Use water spray, dry chemical, CO2, or "alcohol" foam.

Protection of Firefighters:

Wear self-contained breathing apparatus and protective clothing.

Section 6 - Accidental Release Measures

Spill Response:

Wear suitable protective equipment listed under Expose /Personal Protection. Eliminate any ignition sources until the area is determined to be free from explosion or fire hazards. Contain the release and eliminate its source, if this can be done without risk. Dispose as hazardous waste. Comply with Federal, State and local regulations.

Section 7 - Handling and Storage

Keep container closed.
Store in a cool area away from ignition sources and oxidizers.
Do not breathe vapor.
Do not get in eyes, on skin, or on clothing.

Section 8 - Exposure Controls / Personal Protection

Personal Protection Equipment (PPE):

Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), a NIOSH/MSHA approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators (negative pressure type) under specified conditions (see your safety equipment supplier). Engineering and/or administrative controls should be implemented to reduce exposure.

Material should be handled or transferred in an approved fume hood or with adequate ventilation.

Alteration of any information contained herein without written permission from AccuStandard strictly prohibited.

Protective gloves must be worn to prevent skin contact.

(Butyl Rubber, Viton or equivalent)

Safety glasses with side shields must be worn at all times.

General Hygiene Considerations:

Wash thoroughly after handling. Do not take internally. Eye wash and safety equipment should be readily available.

Section 9 - Physical and Chemical Properties

Physical and chemical properties for the Compound

Appearance: White crystals
Boiling Point: N/A
Melting Point: N/A
Specific Gravity (Water = 1): N/A
Vapor Pressure: N/A
Vapor Density (Air = 1): N/A
Percent Volatile (by volume): N/A
Evaporation Rate (Butyl acetate = 1): N/A
Flash Point: N/A
Explosion Limits (%): N/A to N/A
Solubility in water (%): N/A

Section 10 - Stability and Reactivity

Stability and reactivity for the Compound

Stability: Stable
Materials to Avoid: Oxidizers

Hazardous Decomposition: Oxides of carbon
Hazardous Polymerization: Does not occur
Conditions to Avoid:

Alteration of any information contained herein without written permission from AccuStandard strictly prohibited.

Section 11 - Toxicological Information

See section 3 for specific toxicological information for the ingredients of this product.

Section 12 - Ecological Information

By complying with sections 6 and 7 there will be no release to the environment.

Section 13 - Disposal Considerations

Recycle or incinerate at any EPA approved facility or dispose in compliance with Federal, State and local regulations. Empty containers must be triple-rinsed prior to disposal.

Section 14 - Transport Information

DOT	Shipping Class:	6.1	Packing Group:	II	UN Number:	UN2811

Section 15 - Regulatory Information

In addition to Federal and state regulations, local regulations may apply. Check with your local regulatory authorities.

The following regulations apply:

None.

Section 16 - Other Information

This document has been designed to meet the requirements of OSHA, ANSI and CHIPs regulations.

The statements contained herein are offered for informational purposes only and are based on technical data that we believe to be accurate. It is intended for use only by persons having the necessary technical skill and at their own discretion and risk. Since conditions and manner of use are outside our control, we make NO WARRANTY, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS OR OTHERWISE.

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MATERIAL SAFETY DATA SHEET

AccuStandard
125 Market Street • New Haven, CT USA 06513
Phone No: (203) 786-5290 • Fax No: (203) 786-5287

Product Number : D-605N

Product Name : 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin.

Synonyms : N/A

Formula : C12H2Cl6O2 **Molecular Weight :** N/A

Section 2 - Composition / Information on Ingredients

Component(s) (1)	CAS #	Appr. %	ACGIH TLV TWA mg/m3	ACGIH TLV SKIN	OSHA PEL TWA mg/m3	OSHA PEL SKIN
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3	100%				

Section 3 - Hazards Identification

Symptoms of Exposure:

Harmful if inhaled, swallowed, or absorbed through the skin.

Potential Health Effects:

No applicable information found.

Routes of Entry:

Inhalation, ingestion or skin contact.

Carcinogenicity:

Proven animal carcinogenic substance. Possible Cancer Hazard.

Section 4 - First Aid Measures

First Aid Procedures:

GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE.

Skin: Immediately flush thoroughly with large amounts of water.

Eyes: Immediately flush thoroughly with water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers.

Inhalation: Remove to fresh air; give artificial respiration if breathing has stopped. Contact a physician

Ingestion: If conscious, drink water and induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Remove contaminated clothing and wash before reuse.

Alteration of any information contained herein without written permission from AccuStandard strictly prohibited.

Section 5 - Fire Fighting Measures

Fire fighting measures for the Compound

Flammable Properties:

Flash Point (°F): N/A

Flammable Limits LEL (%): N/A

Flammable Limits UEL (%): N/A

Thermal decomposition produces toxic fumes.

Extinguishing Media:

Use water spray, dry chemical, CO2, or "alcohol" foam.

Protection of Firefighters:

Wear self-contained breathing apparatus and protective clothing.

Section 6 - Accidental Release Measures

Spill Response:

Wear suitable protective equipment listed under Expose /Personal Protection. Eliminate any ignition sources until the area is determined to be free from explosion or fire hazards. Contain the release and eliminate its source, if this can be done without risk. Dispose as hazardous waste. Comply with Federal, State and local regulations.

Section 7 - Handling and Storage

Keep container closed.
Store in a cool area away from ignition sources and oxidizers.
Do not breathe vapor.
Do not get in eyes, on skin, or on clothing.

Section 8 - Exposure Controls / Personal Protection

Personal Protection Equipment (PPE):

Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), a NIOSH/MSHA approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators (negative pressure type) under specified conditions (see your safety equipment supplier). Engineering and/or administrative controls should be implemented to reduce exposure.

Material should be handled or transferred in an approved fume hood or with adequate ventilation.

Alteration of any information contained herein without written permission from AccuStandard strictly prohibited.

Protective gloves must be worn to prevent skin contact.

(Butyl Rubber, Viton or equivalent)

Safety glasses with side shields must be worn at all times.

General Hygiene Considerations:

Wash thoroughly after handling. Do not take internally. Eye wash and safety equipment should be readily available.

Section 9 - Physical and Chemical Properties

Physical and chemical properties for the Compound

Appearance: Orange powder.
Boiling Point: N/A
Melting Point: N/A
Specific Gravity (Water = 1): N/A
Vapor Pressure: N/A
Vapor Density (Air = 1): N/A
Percent Volatile (by volume): N/A
Evaporation Rate (Butyl acetate = 1): N/A
Flash Point: N/A
Explosion Limits (%): N/A to N/A
Solubility in water (%): Soluble

Section 10 - Stability and Reactivity

Stability and reactivity for the Compound

Stability: Stable
Materials to Avoid: Oxidizers

Hazardous Decomposition: Oxides of carbon
Hazardous Polymerization: Does not occur
Conditions to Avoid: None indicated

Alteration of any information contained herein without written permission from AccuStandard strictly prohibited.

Section 11 - Toxicological Information

See section 3 for specific toxicological information for the ingredients of this product.

Section 12 - Ecological Information

By complying with sections 6 and 7 there will be no release to the environment.

Section 13 - Disposal Considerations

Recycle or incinerate at any EPA approved facility or dispose in compliance with Federal, State and local regulations. Empty containers must be triple-rinsed prior to disposal.

Section 14 - Transport Information

DOT	Shipping Class:	6.1	Packing Group:	II	UN Number:	UN2811

Section 15 - Regulatory Information

In addition to Federal and state regulations, local regulations may apply. Check with your local regulatory authorities.

The following regulations apply:

The CAS number of this product is NOT listed on the TSCA Inventory. For reasearch and development use only. Not for manufacturing or commercial purposes.

Section 16 - Other Information

This document has been designed to meet the requirements of OSHA, ANSI and CHIPs regulations.

The statements contained herein are offered for informational purposes only and are based on technical data that we believe to be accurate. It is intended for use only by persons having the necessary technical skill and at their own discretion and risk. Since conditions and manner of use are outside our control, we make NO WARRANTY, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS OR OTHERWISE.

* * * End of document * * *

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Material Safety Data Sheet

ULTRA Scientific · 250 Smith Street · North Kingstown, RI, USA 02852 · 401-294-9400

Product # RPE-042A **Last Updated: 11/14/2006**

Section I *Product Identification*

Name: 1,2,3,7,8-Pentachlorodibenzofuran
Matrix: neat compound

Section II *Composition / Information on Ingredients*

Component	CAS #	% by Wt.	LD50	OSHA PEL	ACGIH TLV	RTECS #	Codes
1,2,3,7,8-pentachlorodibenzofuran	057117-41-6	100	N/A	N/A	N/A	N/A	G

Codes: A-OSHA regulated carcinogen; B-IARC Group 1 carcinogen; C-IARC Group 2A carcinogen; D-IARC Group 2B carcinogen; E-NTP Group 1 carcinogen; F-NTP Group 2 carcinogen; G-SARA Title III compound; H-California Proposition 65 compound.

Section III *Hazards Identification*

Contains carcinogen(s) or cancer suspect agent(s)
Toxic
All chemicals should be considered hazardous - direct physical contact should be avoided.

Section IV *First Aid Measures*

Inhalation: If inhaled, remove to fresh air. Give oxygen, if necessary. Contact a physician.
Skin Contact: In case of skin contact, flush with copious amounts of water. Remove contaminated clothing. Contact a physician.
Eye Contact: In case of eye contact, flush with copious amounts of water, lifting eyelids occasionally. Contact a physician.
Ingestion: If ingested, contact poison center immediately for recommended procedure. Contact a physician.

Section V *Fire Fighting Measures*

Fire and Explosion Hazard Data for Compound
Fire Hazard: N/A
Extinguishing Media: Carbon dioxide, dry chemical powder, or water spray.

Section VI *Accidental Release Measures*

Ventilate area of the leak or spill. Wear appropriate personal protective equipment as specified in Section VIII. A leaking bottle, vial, or ampule may be placed in a plastic bag, and normal disposal procedures followed. Take up spilled material with sand or other non-combustible absorbant material, and place in an appropriate container for later disposal. Flush spill area with water.

Section VII *Handling and Storage*

May be stored at room temperature
Keep in a tightly closed container, and store in a corrosion proof area.
This product should only be used by persons trained in the safe handling of hazardous chemicals.

Section VIII Exposure Controls / Personal Protection

Ensure that there is adequate ventilation to prevent airborne levels from exceeding recommended exposure limits (see Section II). Use appropriate MSHA/NIOSH approved safety equipment. Wear chemical goggles, face shield, gloves, and chemical resistant clothing, such as a laboratory coat and/or a rubber apron, to prevent contact with eyes, skin, and clothing.

Section IX Physical and Chemical Properties

Physical Data for Compound

Melting Pt.: N/A	***Boiling Pt.:*** N/A	***Density:*** N/A
Vapor Pressure: N/A	***Vapor Density:*** N/A	***Water Solubility:*** N/A
Appearance: N/A	***Odor:*** N/A	***Flash Point:*** N/A
Auto-Ignition Temperature: N/A	***LEL:*** N/A	***UEL:*** N/A

Section X Stability and Reactivity

Reactivity Data for Compound

Stability: stable ***Incompatibilities:*** N/A
Hazardous Decomposition Products: N/A
Hazardous Effects of Polymerization: no

Section XI Toxicological Information

See Section II for specific toxicological information for the ingredients of this product.

Section XII Ecological Information

No information is available.

Section XIII Disposal Considerations

Recycle, if possible. Any material which cannot be saved for recovery or recycling should be disposed of at an appropriate and approved waste disposal facility. Processing, use, and/or contamination of this product may change waste management requirements. Observe all applicable federal, state, and local environmental regulations concerning disposal.

Section XIV Transport Information

Shipment Type: Dangerous Goods in Excepted Quantity (US DOT Small Quantity Exemption)
UN Number: UN3316 ***Shipping Class:*** 9 ***Packing Group:*** N/A

Section XV Regulatory Information

No information is available.

Section XVI Other Information

The above information is believed to be correct, but does not purport to be all-inclusive. This data should be used only as a guide in handling this material. ULTRA Scientific, Inc., shall not be held liable for any damage resulting from handling or from contact with the above product.

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M A T E R I A L S A F E T Y D A T A S H E E T

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

Company: AccuStandard, Inc.
125 Market Street
New Haven, CT 06513

Date MSDS Printed: 9/10/2007
Preparation Date: 9/10/2007
Information Phone Number: 203-786-5290
Emergency Phone Number: 203-786-5290
Hours: Mon. to Fri. 8am-5pm EDT

Catalog Number: D-501S
Product Name: 1,2,3,7,8-Pentachlorodibenzo-p-dioxin
Synonyms: N/A
Formula: N/A

Molecular Weight: N/A

SECTION 2 - COMPOSITION / INFORMATION ON INGREDIENTS

Component(s) (1)	CAS #	Appr. %	ACGIH-TLV (mg/m3) TWA	ACGIH-TLV (mg/m3) STEL	ACGIH-TLV (mg/m3) skin	OSHA-PEL (mg/m3) TWA	OSHA-PEL (mg/m3) STEL	OSHA-PEL (mg/m3) skin
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4	0.005						
Toluene	108-88-3	99.995	188		x			

SECTION 3 - HAZARDS IDENTIFICATION

Health and Environmental Hazards/Symptoms of Exposure:

Exposure may cause lung irritation, chest pain, and pulmonary edema. Inhalation studies on toluene have demonstrated the development of inflammatory and ulcerous lesions of the penis, prepuce, and scrotum in animals. Vapors may cause drowsiness and dizziness. Aspiration of material into lungs can cause chemical pneumonitis.

HMIS® III	*	2	3	0	
NFPA		2	3	0	

Potential Health Effects:

May be irritating to eyes.
May be irritating to skin.
May be harmful if absorbed through the skin.
May be irritating to mucous membrane and upper respiratory system.
May be harmful if inhaled.
May be harmful if swallowed.

Routes of Entry:

Inhalation, ingestion or skin contact.

Carcinogenicity:

Notification of carcinogenic ingredients in quantity less than 0.1% is not required under Federal Hazard Communication Law.
Contains one or more components that are classified (ACGIH, IARC, NTP, OSHA) as a possible cancer hazard in quantities less than 0.1%.

SECTION 4 - FIRST AID MEASURES

Emergency First Aid:

Get medical assistance for all cases of overexposure.
Skin contact: Wash thoroughly with soap and water. Get medical attention if irritation develops or persists.
Eye contact: Immediately flush with plenty of water. After initial flushing, remove and contact lenses and continue flushing for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers.
Inhalation: Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Seek immediate medical attention.

Alteration of any information contained herein without written permission from AccuStandard strictly prohibited.

Ingestion: Do NOT induce vomiting. Call a physician immediately. Never give anything by mouth to an unconscious person.

SECTION 5 - FIRE FIGHTING MEASURES

Flammable Properties:

Flash Point: 40 °F (4 °C) (cc)
Flammable Limits LEL (%): 1.3
Flammable Limits UEL (%): 7.1
Autoignition Temperature: 535 °C

Dangerous fire hazard.
Containers can build up pressure if exposed to heat.
Vapors can travel to a source of ignition and flash back.
During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media:

Use alcohol foam, carbon dioxide, dry chemical, or water spray when fighting fires involving this material.
Water spray to cool fire-exposed containers and disperse vapors.

Fire Fighting Procedures:

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

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Spill Response:

Wear suitable protective equipment listed under Exposure Controls / Personal Protection. Eliminate any ignition sources until the area is determined to be free from explosion or fire hazards. Contain the release and eliminate its source, if this can be done without risk. Dispose as hazardous waste. Comply with Federal, State and local regulations.

SECTION 7 - HANDLING AND STORAGE

Store in a tighly closed container.
Store in a cool area away from ignition sources and oxidizers.
Electrically ground all equipment when handling this product.
Avoid breathing vapors or mists.
Use with adequate ventilation.
Do not get in eyes, on skin or clothing.
Avoid prolonged or repeated exposure.

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls and Personal Protection Equipment (PPE):

Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), a NIOSH/MSHA approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators (negative pressure type) under specified conditions (see your safety equipment supplier). Engineering and/or administrative controls should be implemented to reduce exposure.
Material must be handled or transferred in an approved fume hood or with equivalent ventilation.
(Nitrile or equivalent)
Safety glasses with side shields must be worn at all times.
Safety glasses with side shields should be worn at all times.

General Hygiene Considerations:

Wash thoroughly after handling. Do not take internally. Eye wash and safety equipment should be readily available.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Clear liquid
Odor: Aromatic
pH: N/A

Alteration of any information contained herein without written permission from AccuStandard strictly prohibited.

Vapor Pressure: 21.9 mmHg (20 °C)
Vapor Density (Air = 1): 3.2 g/l
Boiling Point: 110.6 °C
Melting Point: -93 °C
Solubility in Water (%): Insoluble
Specific Gravity (H_2O = 1): 0.866 g/cm3
Flash Point: 40 °F (4 °C) (cc)
Explosion Limits (%): 1.3 to 7.1
Autoignition Temperature: 535 °C
Percent Volatile: 99+
Evaporation Rate (BuAc = 1): 2.2
Molecular Weight: N/A
Molecular Formula: N/A

SECTION 10 - STABILITY AND REACTIVITY

Stability: Stable

Conditions To Avoid: Heat; Contact with ignition sources
Materials To Avoid: Oxidizers
Strong mineral acids

Hazardous Decomposition: Carbon oxides
Hazardous Polymerization: Will not occur

SECTION 11 - TOXICOLOGICAL INFORMATION

See section 3 for specific toxicological information for the ingredients of this product.

SECTION 12 - ECOLOGICAL INFORMATION

By complying with sections 6 and 7 there will be no release to the environment.

SECTION 13 - DISPOSAL CONSIDERATIONS

Recycle or incinerate at any EPA approved facility or dispose in compliance with Federal, State and local regulations. Empty containers must be triple-rinsed prior to disposal.

SECTION 14 - TRANSPORT INFORMATION

DOT UN Number: UN1294 Shipping Class: 3 Packing Group: II FLAMMABLE

SECTION 15 - REGULATORY INFORMATION

In addition to Federal and state regulations, local regulations may apply. Check with your local regulatory authorities.

Not all components are listed on the TSCA Inventory. For research and development use only. Not for manufacturing or commercial purposes.
WARNING: This product contains chemical(s) known to the state of California to cause cancer and to cause birth defects or other reproductive harm.

SECTION 16 - OTHER INFORMATION

This document has been designed to meet the requirements of OSHA, ANSI and CHIPs regulations.

Alteration of any information contained herein without written permission from AccuStandard strictly prohibited.

The statements contained herein are offered for informational purposes only and are based on technical data that we believe to be accurate. It is intended for use only by persons having the necessary technical skill and at their own discretion and risk. Since conditions and manner of use are outside our control, we make
NO WARRANTY, EXPRESSED OR IMPLIED, OF MERCHANTABILITY, FITNESS OR OTHERWISE.

Legend : N/A = Not Available ND = Not Determined NR = Not Regulated

* * * End of Document * * *

Alteration of any information contained herein without
written permission from AccuStandard strictly prohibited.

MATERIAL SAFETY DATA SHEET

MSDS Number
F-502S-0.1X

AccuStandard
125 Market Street • New Haven, CT USA 06513
Phone No: (203) 786-5290 • Fax No: (203) 786-5287

Emergency Phone Number
203-786-5290
Mon. to Fri. 8am-5pm EDT

Product Number : F-502S-0.1X

Product Name : 2,3,4,7,8-Pentachlorodibenzofuran Solution.

Synonyms : N/A

Formula : N/A **Molecular Weight :** N/A

Section 2 - Composition / Information on Ingredients

Component(s) (2)	CAS #	Appr. %	ACGIH TLV TWA mg/m3	ACGIH TLV SKIN	OSHA PEL TWA mg/m3	OSHA PEL SKIN
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	0.0005%				
Toluene	108-88-3	99.99%	375		188	X

Section 3 - Hazards Identification

Symptoms of Exposure:

HARMFUL OR FATAL IF SWALLOWED.

HARMFUL IF INHALED.

Symptoms: headache, dizziness, hallucinations, distorted perceptions, changes in motor activity, nausea, respiratory irritation, central nervous system depression and unconsciousness as well as liver, kidney and lung damage.

May Cause Damage To Liver, Kidneys, and Respiratory System.

Causes severe eye irritation.

MAY CAUSE SKIN IRRITATION.

Potential Health Effects:

May Cause Damage To Liver, Kidneys, and Respiratory System.

Routes of Entry:

Inhalation, ingestion or skin contact.

Carcinogenicity:

The material is not listed (IARC, NTP, OSHA) as cancer causing agent.

Section 4 - First Aid Measures

First Aid Procedures:

Alteration of any information contained herein without written permission from AccuStandard strictly prohibited.

GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE.

Eyes: Immediately flush thoroughly with water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers.

Skin: Immediately flush thoroughly with large amounts of water.

Inhalation: Remove to fresh air; give artificial respiration if breathing has stopped. Contact a physician

Ingestion: Call a physician immediately. ONLY induce vomiting at the instructions of a physician. Never give anything by mouth to an unconscious person.

Section 5 - Fire Fighting Measures

Fire fighting measures for the Solvent

Flammable Properties:

Flash Point (°F):	40F (tcc)
Flammable Limits LEL (%):	1.30
Flammable Limits UEL (%):	7.10

Dangerous fire and explosive hazard.

Vapor can travel distances to ignition source and flash back.

Extinguishing Media:

Use dry chemical, foam, or CO_2.

Water spray to cool fire-exposed containers.

Protection of Firefighters:

Wear self-contained breathing apparatus and protective clothing.

Section 6 - Accidental Release Measures

Spill Response:

Wear suitable protective equipment listed under Expose /Personal Protection. Eliminate any ignition sources until the area is determined to be free from explosion or fire hazards. Contain the release and eliminate its source, if this can be done without risk. Dispose as hazardous waste. Comply with Federal, State and local regulations.

Section 7 - Handling and Storage

Keep container tightly closed.
Store in a cool area away from ignition sources and oxidizers.
Do not breath vapor or mist.
Do not get in eyes, on skin, or on clothing.
Electrically ground all equipment when handling this product.

Section 8 - Exposure Controls / Personal Protection

Alteration of any information contained herein without written permission from AccuStandard strictly prohibited.

Section 8 - Exposure Controls / Personal Protection

Personal Protection Equipment (PPE):

Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), a NIOSH/MSHA approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators (negative pressure type) under specified conditions (see your safety equipment supplier). Engineering and/or administrative controls should be implemented to reduce exposure.

Material should be handled or transferred in an approved fume hood or with adequate ventilation.

Protective gloves should be worn to prevent skin contact.

(Viton or equivalent)

Safety glasses with side shields should be worn at all times.

General Hygiene Considerations:

Wash thoroughly after handling. Do not take internally. Eye wash and safety equipment should be readily available.

Section 9 - Physical and Chemical Properties

Physical and chemical properties for the Solvent

Appearance: Clear liquid, aromatic odor
Boiling Point: 111
Melting Point: -95
Specific Gravity (Water = 1): 0.87
Vapor Pressure: 21.9 20C
Vapor Density (Air = 1): 3.2
Percent Volatile (by volume): 99+%
Evaporation Rate (Butyl acetate = 1): 2.2
Flash Point: 40F (tcc)
Explosion Limits (%): 1.30 to 7.10
Solubility in water (%): Insoluble

Section 10 - Stability and Reactivity

Alteration of any information contained herein without written permission from AccuStandard strictly prohibited.

Stability: Stable

Materials to Avoid: Oxidizers
Other

Strong mineral acids

Hazardous Decomposition: CO>>x<< Hydrocarbons

Hazardous Polymerization: Does not occur

Conditions to Avoid: Heat; contact with ignition sources

Section 11 - Toxicological Information

See section 3 for specific toxicological information for the ingredients of this product.

Section 12 - Ecological Information

By complying with sections 6 and 7 there will be no release to the environment.

Section 13 - Disposal Considerations

Recycle or incinerate at any EPA approved facility or dispose in compliance with Federal, State and local regulations. Empty containers must be triple-rinsed prior to disposal.

Section 14 - Transport Information

DOT Shipping Class: 3 Packing Group: II UN Number: UN1294

Section 15 - Regulatory Information

In addition to Federal and state regulations, local regulations may apply. Check with your local regulatory authorities.

The following regulations apply:

Toluene is listed by the State of California as being known to the state to cause reproductive toxicity.

Section 16 - Other Information

This document has been designed to meet the requirements of OSHA, ANSI and CHIPs regulations.

The statements contained herein are offered for informational purposes only and are based on technical data that we believe to be accurate. It is intended for use only by persons having the necessary technical skill and at their own discretion and risk. Since conditions and manner of use are outside our control, we make NO WARRANTY, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS OR OTHERWISE.

* * * End of document * * *

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Close

Material Safety Data Sheet

ULTRA Scientific · 250 Smith Street · North Kingstown, RI, USA 02852 · 401-294-9400

Product # RPE-037 **Last Updated: 11/14/2006**

Section I *Product Identification*

Name: 2,3,7,8-Tetrachlorodibenzofuran
Matrix: neat compound

Section II *Composition / Information on Ingredients*

Component	CAS #	% by Wt.	LD50	OSHA PEL	ACGIH TLV	RTECS #	Codes
2,3,7,8-tetrachlorodibenzofuran	051207-31-9	100	N/A	N/A	N/A	N/A	G

Codes: A-OSHA regulated carcinogen; B-IARC Group 1 carcinogen; C-IARC Group 2A carcinogen; D-IARC Group 2B carcinogen; E-NTP Group 1 carcinogen; F-NTP Group 2 carcinogen; G-SARA Title III compound; H-California Proposition 65 compound.

Section III *Hazards Identification*

Contains carcinogen(s) or cancer suspect agent(s)
Toxic
All chemicals should be considered hazardous - direct physical contact should be avoided.

Section IV *First Aid Measures*

Inhalation: If inhaled, remove to fresh air. Give oxygen, if necessary. Contact a physician.
Skin Contact: In case of skin contact, flush with copious amounts of water. Remove contaminated clothing. Contact a physician.
Eye Contact: In case of eye contact, flush with copious amounts of water, lifting eyelids occasionally. Contact a physician.
Ingestion: If ingested, contact poison center immediately for recommended procedure. Contact a physician.

Section V *Fire Fighting Measures*

Fire and Explosion Hazard Data for Compound
Fire Hazard: N/A
Extinguishing Media: Carbon dioxide, dry chemical powder, or water spray.

Section VI *Accidental Release Measures*

Ventilate area of the leak or spill. Wear appropriate personal protective equipment as specified in Section VIII. A leaking bottle, vial, or ampule may be placed in a plastic bag, and normal disposal procedures followed. Take up spilled material with sand or other non-combustible absorbant material, and place in an appropriate container for later disposal. Flush spill area with water.

Section VII *Handling and Storage*

May be stored at room temperature
Keep in a tightly closed container, and store in a corrosion proof area.
This product should only be used by persons trained in the safe handling of hazardous chemicals.

Section VIII Exposure Controls / Personal Protection

Ensure that there is adequate ventilation to prevent airborne levels from exceeding recommended exposure limits (see Section II). Use appropriate MSHA/NIOSH approved safety equipment. Wear chemical goggles, face shield, gloves, and chemical resistant clothing, such as a laboratory coat and/or a rubber apron, to prevent contact with eyes, skin, and clothing.

Section IX Physical and Chemical Properties

Physical Data for Compound

Melting Pt.: N/A	***Boiling Pt.:*** N/A	***Density:*** N/A
Vapor Pressure: N/A	***Vapor Density:*** N/A	***Water Solubility:*** N/A
Appearance: N/A	***Odor:*** N/A	***Flash Point:*** N/A
Auto-Ignition Temperature: N/A	***LEL:*** N/A	***UEL:*** N/A

Section X Stability and Reactivity

Reactivity Data for Compound

Stability: stable ***Incompatibilities:*** N/A
Hazardous Decomposition Products: N/A
Hazardous Effects of Polymerization: no

Section XI Toxicological Information

See Section II for specific toxicological information for the ingredients of this product.

Section XII Ecological Information

No information is available.

Section XIII Disposal Considerations

Recycle, if possible. Any material which cannot be saved for recovery or recycling should be disposed of at an appropriate and approved waste disposal facility. Processing, use, and/or contamination of this product may change waste management requirements. Observe all applicable federal, state, and local environmental regulations concerning disposal.

Section XIV Transport Information

Shipment Type: Dangerous Goods in Excepted Quantity (US DOT Small Quantity Exemption)
UN Number: UN3316 ***Shipping Class:*** 9 ***Packing Group:*** N/A

Section XV Regulatory Information

No information is available.

Section XVI Other Information

The above information is believed to be correct, but does not purport to be all-inclusive. This data should be used only as a guide in handling this material. ULTRA Scientific, Inc., shall not be held liable for any damage resulting from handling or from contact with the above product.

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M A T E R I A L S A F E T Y D A T A S H E E T

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

Manufacturer: AccuStandard, Inc.
125 Market Street
New Haven, CT 06513

Date MSDS Printed: 3/15/2006
Preparation Date: 3/15/2006
Information Phone Number: 203-786-5290
Emergency Phone Number: 203-786-5290
Hours: Mon. to Fri. 8am-5pm EDT

MSDS Number: D-404N
Product Name: 2,3,7,8-Tetrachlorodibenzo-p-dioxin
Synonyms: 2,3,7,8-Tetrachlorodibenzo-p-dioxin; TCDD; TCDBD; Tetradioxin; Dioxin
Formula: $C_{12}H_4Cl_4O_2$ Molecular Weight: 321.96

SECTION 2 - COMPOSITION / INFORMATION ON INGREDIENTS

Component(s) (1)	CAS #	Appr. %	ACGIH-TLV (mg/m3) TWA	STEL	skin	OSHA-PEL (mg/m3) TWA	STEL	skin
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	100						

SECTION 3 - HAZARDS IDENTIFICATION

Symptoms of Exposure:

Irritating to eyes, mucous membranes and upper respiratory system.

Causes skin redness and irritation. Repeated or prolonged exposure may cause dermatitis.

May cause stomach cramps and gastro-intestinal disturbances.

Possible reproductive and teratogenic hazard.

Potential Health Effects:

Considered HIGHLY TOXIC.

May be fatal if inhaled, absorbed through skin, or swallowed.

May cause eye, kidney, liver, and skin damage.

Routes of Entry:

Inhalation, ingestion or skin contact.

Carcinogenicity:

This product is or contains a component that is classified (ACGIH, IARC, NTP, OSHA) as a cancer hazard.

SECTION 4 - FIRST AID MEASURES

Emergency First Aid:

Alteration of any information contained herein without
written permission from AccuStandard strictly prohibited.

Get medical assistance for all cases of overexposure.

Skin contact: Immediately wash skin with soap and plenty of water. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.

Eye contact: Immediately flush with plenty of water. After initial flushing, remove and contact lenses and continue flushing for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers.

Inhalation: Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Seek immediate medical attention.

Ingestion: Drink water and induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

SECTION 5 - FIRE FIGHTING MEASURES

Flammable Properties:

Flash Point: N/A

Flammable Limits LEL (%): N/A

Flammable Limits UEL (%): N/A

Autoignition Temperature: N/A

During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media:

Use alcohol foam, carbon dioxide, dry chemical, or water spray when fighting fires involving this material.

Fire Fighting Procedures:

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

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Spill Response:

Wear suitable protective equipment listed under Exposure Controls / Personal Protection. Eliminate any ignition sources until the area is determined to be free from explosion or fire hazards. Contain the release and eliminate its source, if this can be done without risk. Dispose as hazardous waste. Comply with Federal, State and local regulations.

SECTION 7 - HANDLING AND STORAGE

Store in a tighly closed container.

Store in a cool area away from ignition sources and oxidizers.

Do not breathe dust.

Do not get in eyes, on skin or clothing.

Avoid prolonged or repeated exposure.

This product should only by used by persons trained in the safe handling of hazardous chemicals.

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls and Personal Protection Equipment (PPE):

Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), a NIOSH/MSHA approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators (negative pressure type) under specified conditions (see your safety equipment supplier). Engineering and/or administrative controls should be implemented to reduce exposure.

Material must be handled or transferred in an approved fume hood or with equivalent ventilation.

Compatible chemical-resistant protective gloves must be worn to prevent skin contact.

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Safety glasses with side shields must be worn at all times.

General Hygiene Considerations:

Wash thoroughly after handling. Do not take internally. Eye wash and safety equipment should be readily available.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Colorless to while crystalline solid
Odor: N/A
pH: N/A
Vapor Pressure: Negligible
Vapor Density (Air = 1): N/A
Boiling Point: Decomposes (750 - 800 °C)
Melting Point: 305 °C (581 °F)
Solubility in Water (%): Insoluble
Specific Gravity (H_2O = 1): 1.8 g/cm3
Flash Point: N/A
Explosion Limits (%): N/A to N/A
Autoignition Temperature: N/A
Percent Volatile: N/A
Evaporation Rate (BuAc = 1): N/A
Molecular Weight: 321.96
Molecular Formula: $C_{12}H_4Cl_4O_2$

SECTION 10 - STABILITY AND REACTIVITY

Stability: Stable
Conditions To Avoid: Light
Materials To Avoid: Oxidizers

Hazardous Decomposition: Carbon oxides; Produces chlorine on exposure to light
Hazardous Polymerization: Will not occur

SECTION 11 - TOXICOLOGICAL INFORMATION

See section 3 for specific toxicological information for the ingredients of this product.

SECTION 12 - ECOLOGICAL INFORMATION

By complying with sections 6 and 7 there will be no release to the environment.

SECTION 13 - DISPOSAL CONSIDERATIONS

Recycle or incinerate at any EPA approved facility or dispose in compliance with Federal, State and local regulations. Empty containers must be triple-rinsed prior to disposal.

SECTION 14 - TRANSPORT INFORMATION

DOT UN Number: UN2811 Shipping Class: 6.1 Packing Group: I VERY TOXIC

Alteration of any information contained herein without written permission from AccuStandard strictly prohibited.

SECTION 15 - REGULATORY INFORMATION

In addition to Federal and state regulations, local regulations may apply. Check with your local regulatory authorities.

The following regulations apply:

WARNING: This product contains chemical(s) known to the state of California to cause cancer and to cause birth defects or other reproductive harm.

The CAS number of this product is NOT listed on the TSCA Inventory. For reasearch and development use only. Not for manufacturing or commercial purposes.

SECTION 16 - OTHER INFORMATION

This document has been designed to meet the requirements of OSHA, ANSI and CHIPs regulations.

The statements contained herein are offered for informational purposes only and are based on technical data that we believe to be accurate. It is intended for use only by persons having the necessary technical skill and at their own discretion and risk. Since conditions and manner of use are outside our control, we make
NO WARRANTY, EXPRESSED OR IMPLIED, OF MERCHANTABILITY, FITNESS OR OTHERWISE.

Legend : N/A = Not Available ND = Not Determined NR = Not Regulated

* * * End of Document * * *

Alteration of any information contained herein without
written permission from AccuStandard strictly prohibited.

MATERIAL SAFETY DATA SHEET

ALDON CORPORATION
221 Rochester Street
Avon, New York 14414-9409
(585) 226-6177

MSDS No.: AA0135 AA0136 AA0143 AA0144 AA0145 AA0146 AA0147
Effective Date: January 1, 2007

SECTION I NAME

Product	Aluminum Metal
Chemical Synonyms	Granular, Shot, Sheet, Strips, Turnings
Formula	Al
Unit Size	up to 2.5 Kg.
C.A.S. No.	7429-90-5

24 HOUR EMERGENCY ASSISTANCE

CHEMTREC 800-424-9300
Day 585-226-6177

NFPA

Health	0
Fire	1
Reactivity	1

HMIS *

HAZARD RATING

MINIMAL	SLIGHT	MODERATE	SERIOUS	SEVERE
0	1	2	3	4

SECTION II INGREDIENTS OF MIXTURES

Principal Component(s)	%	TLV Units
Aluminum metal	>99.5	See Section V.
CAUTION! INHALATION AS DUST OR FUME MAY CAUSE IRRITATION.		

SECTION III PHYSICAL DATA

Melting Point (°F)	660°C (1220°F)	Specific Gravity (H_2O = 1)	N/A
Boiling Point (°F)	N/A	Percent Volatile by Volume (%)	N/A
Vapor Pressure (mm Hg)	N/A	Evaporation Rate (=1)	N/A
Vapor Density (Air=1)	0.095 - 0.113 lb/in^3		
Solubility in Water	Insoluble.		
Appearance & Odor	Silver gray colored metal, granular, shot, sheet, strips, turnings. No odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)	N/A	Flammable Limits in Air % by Volume	Lower	Upper
		N/A		

Extinguisher Media: Halogenated extinguishing agents should not be used. To control the spread of fire, do not use water. Ring small fire with sand, eliminate drafts, let fire extinguish itself.

SPECIAL FIREFIGHTING PROCEDURES

In fire conditions, wear a NIOSH/MSHA-approved self-contained breathing apparatus and full protective clothing.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Dust clouds may be explosive. Prevent formation of a dust cloud. Bulk dust when damp may heat spontaneously. Hazard greater as fineness increases. Reacts with some acids and caustic solutions to produce hydrogen. Molten aluminum may explode on contact with water. It may also react violently with rust, certain metal oxides (e.g. oxides of copper, iron and lead) and nitrates (e.g. ammonium nitrate and fertilizers containing ammonium nitrate).

D.O.T. **Non Regulated.**

Approved by U.S. Department of Labor "essentially similar" to form OSHA-20

SECTION V HEALTH HAZARD DATA

AA0135

Threshold Limited Value

TWA: 10 mg/m^3 (ACGIH 2001) as aluminum metal dust.

Effects of Overexposure

INGESTION: May cause irritation. Exercise appropriate procedures to minimize potential hazards. **EYES:** Particles of aluminum in the eye may cause injury to the cornea. **INHALATION:** It has been reported in the literature that chronic exposure to aluminum dust has been suspected of causing lung injury. Target organs: None known.

Emergency and First Aid Procedures

INGESTION: Call physician or Poison Control Center immediately. Induce vomiting only if advised by appropriate medical personnel. Never give anything by mouth to an unconscious person. **EYES:** Check for and remove contact lenses. Flush thoroughly with water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get immediate medical attention. **SKIN:** Remove contaminated clothing. Flush thoroughly with mild soap and water. If irritation occurs, get medical attention. **INHALATION:** Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

SECTION VI REACTIVITY DATA

Stability			**Conditions to Avoid**
	Unstable		Heat, spark, flame, water and strong oxidizing agents.
	Stable	X	

Incompatibility (Materials to Avoid): Strong oxidizers, acids, alkalies, halogenated compounds, heat and water.

Hazardous Decomposition Products: Aluminum reacts with water, acids or alkalies to generate hydrogen.

Hazardous Polymerization		**Conditions to Avoid**
May Occur	**Will Not Occur**	Not applicable.
	X	

SECTION VII SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released or spilled

Recover when possible. Sweep material onto paper. Place in a fiber carton. Wash spill area well with soap and water.

Waste Disposal Method

Discharge, treatment, or disposal may be subject to Federal, State or Local laws. These disposal guidelines are intended for the disposal of catalog-size quantities only.

Dispose of in accordance with federal, state and local regulations.

SECTION VIII SPECIAL PROTECTION INFORMATION

Respiration Protection (Specify Type): None needed in normal laboratory handling. If dusty conditions prevail, wear a NIOSH/MSHA-approved dust mask or work in ventilation hood.

Ventilation				
	Local Exhaust	Recommended.	**Special**	No.
	Mechanical (General)	Recommended.	**Other**	No.

Protective Gloves	Rubber.	**Eye Protection**	Chemical safety glasses.

Other Protective Equipment: Goggles, safety glasses, lab coat, fire extinguisher, eye wash station.

SECTION IX SPECIAL PRECAUTIONS

Precautions to be Taken in Handling & Storing

Keep container tightly closed when not in use.

Store in a dry place away from acids, alkalies and oxidizers.
Dangerous when wet, take precautions. Wash thoroughly after handling.

Other Precautions

Read label on container before using. Do not wear contact lenses when working with chemicals.
For laboratory use only. Not for drug, food or household use. Keep out of reach of children.

Sheets and/or strips have sharp edges. Use caution when handling.
Remove and wash contaminated clothing.

Revision No. 12	Date 01/01/07	Approved James A. Bertsch	Chemical Safety Coordinator JAB

The information contained herein is furnished without warranty of any kind. Employers should use this information only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use of these materials and the safety and health of employees. * Hazardous Materials Industrial Standards. Printed on recycled paper.

MATERIAL SAFETY DATA SHEET

ScholAR Chemistry™

5100 W. Henrietta Rd.
West Henrietta, NY 14586
TEL: (866) 260-0501

MSDS No. 9500302
Effective Date: December 1, 2005

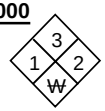
SECTION I NAME

24 HOUR EMERGENCY ASSISTANCE

416-984-3000

Product	Barium Metal
Chemical Synonyms	Barium
Formula	Ba
CAS No.	7440-39-3

NFPA



Health	1
Flammability	3
Reactivity	2

HAZARD RATING **WHMIS**

Minimal	Slight	Moderate	Serious	Severe
0	1	2	3	4

SECTION II DANGEROUS INGREDIENTS

Name	%	TLV Units
Barium metal - Immersed in mineral oil	100%	N/A
DANGER! FLAMMABLE SOLID! DANGEROUS WHEN WET!		

SECTION III PHYSICAL DATA

Melting Point (°C)	850°C	Specific Gravity (H_2O = 1)	3.74
Boiling Point (°C)	1695°C	Percent Volatile by Volume (%)	N/A
Vapor Pressure (mm Hg)	N/A	Evaporation Rate (=1)	N/A
Vapor Density (Air=1)	N/A		
Solubility in Water	Reacts violently with water. Produces extremely flammable gases.		
Appearance & Odor	Soft, silvery, lustrous metal immersed in heavy mineral oil; no odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash point	Flammable solid.	Flammable Limits in Air % by Volume	Lower	Upper
		N/A		

Firefighting Procedures

DO NOT USE WATER. Use dry sand, earth, dolomite or sodium chloride. In fire conditions, fire-fighters should wear an appropriate mask or a self-containing breathing apparatus.

Flammability and Explosion Hazards

Reaction with water produces explosive hydrogen gas and enough heat to ignite gas/air mixture plus toxic, corrosive Barium hydroxide solution.

TDG **Class 4.3 Material that emits flammable gases on contact with water. UN2813**

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SECTION V REACTIVITY DATA

BB0003

Chemical Stability	Yes	X	If no, under what conditions?
	No		
Incompatible with Other products	Yes	X	Water, acids, oxidizers, chlorinated and fluorinated hydrocarbons such as CCl4.
	No		
Hazardous Decomposition Products	Hydrogen (explosive), barium hydroxide solution (caustic/toxic).		
Reactive under what conditions	Reacts violently with water, the humidity in moist air and moisture in other substances, releasing explosive hydrogen gas.		

SECTION VI TOXICOLOGICAL PROPERTIES

Route of Entry	Inhalation. Ingestion. Eyes. Skin.
TLV	Barium and soluble compounds, as Ba ACGIH 2001: TWA: 0.5 mg/m^3.
Toxicity for animals	Not available.
Chronic effects on humans	Repeated or prolonged exposure to the substance can produce target organ damage. Target organs: Central nervous system, kidneys.
Acute effects on humans	Contact causes severe burns to the skin and eyes. May cause blindness.

SECTION VII PREVENTIVE MEASURES

Waste Disposal	Discharge, treatment, or disposal may be subject to local laws. Consult your local or regional authorities.
Storage	Keep container in a cool, well ventilated place. Keep away from heat. Keep away from incompatible materials. Keep away from sources of ignition and open flames. Keep baryum metal immersed in mineral oil or argon.
Precautions	Avoid contact with skin and eyes. Do not ingest. If ingested, seek immediate medical attention.
Spill or leak	To prevent ignition, coat with mineral oil, soaking thoroughly and place in oiled steel container and secure tightly. Keep away from water, rain, snow, etc. Wash spill area with soap and water.
Protective Clothing	Gloves, safety glasses, lab coat, dust respirator.

SECTION VIII FIRST AID MEASURES

Specific first aid measures

Ingestion: Call physician or Poison Control Center immediately. Induce vomiting only if advised by the appropriate medical personnel. Eye contact: Check for and remove any contact lenses. Do NOT flush with water. Carefully remove particles with cotton-tipped applicator. Seek immediate medical attention. Skin contact: Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Inhalation: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Allow victim to rest in a well ventilated area. Seek immediate medical attention.

SECTION IX PREPARATION OF THE MSDS

Rev. No.	1	Date	December 1, 2005	Approved	Michael Raszeja

MATERIAL SAFETY DATA SHEET

ScholAR Chemistry

5100 West Henrietta Road
West Henrietta, NY 14586
(866) 260-0501

MSDS No. 9409804 9409904
Effective Date: February 16, 2007

SECTION I NAME

Product	Chromium Metal
Chemical Synonyms	Chromium; Chrome
Formula	Cr
CAS No.	7440-47-3

24 HOUR EMERGENCY ASSISTANCE

CHEMTREC
1-800-424-9300

NFPA

Health	0
Flammability	0
Reactivity	0

WHMIS

HAZARD RATING

Minimal	Slight	Moderate	Serious	Severe
0	1	2	3	4

SECTION II DANGEROUS INGREDIENTS

Name	%	TLV Units
Chromium metal	100%	TWA: 0.5 mg/m^3
CAUTION!		

SECTION III PHYSICAL DATA

Melting Point (°C)	1830°C	Specific Gravity (H_2O = 1)	7.20 @ 20°C
Boiling Point (°C)	2200°C	Percent Volatile by Volume (%)	N/A
Vapor Pressure (mm Hg)	N/A	Evaporation Rate (=1)	N/A
Vapor Density (Air=1)	N/A		
Solubility in Water	Insoluble.		
Appearance & Odor	Steel-grey pieces or granules; no odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

			Lower	Upper
Flash point	Not flammable.	Flammable Limits in Air % by Volume N/A		

Firefighting Procedures

Use dry chemical, CO_2, alcohol foam, or water spray. In fire conditions, fire-fighters should wear an appropriate mask or a self-containing breathing apparatus.

Flammability and Explosion Hazards

Negligible fire hazard in metallic form; however, possible fire and explosion hazard in dust form when exposed to heat or flame.

Auto-ignition temperature: 400°C as dust.

TDG **Not a TDG controlled material.**

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SECTION V REACTIVITY DATA

CC0285

Chemical Stability	Yes	X	If no, under what conditions?
	No		
Incompatible with Other products	Yes	X	Attacked by caustic alkalies and alkali carbonates, acids, strong oxidizers.
	No		
Hazardous Decomposition Products	Chromium fumes.		
Reactive under what conditions	Not applicable.		

SECTION VI TOXICOLOGICAL PROPERTIES

Route of Entry	Inhalation. Ingestion.
TLV	TWA: 0.5 mg/m^3 as Cr and inorganic compounds
Toxicity for animals	Not available.
Chronic effects on humans	**WARNING: THIS PRODUCT CONTAINS A CHEMICAL KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.** Suspect cancer hazard. Repeated or prolonged exposure to the substance can produce target organ damage. Risk of cancer depends on level and duration of exposure. Target organs: Lungs, kidneys.
Acute effects on humans	May be harmful if inhaled or swallowed. Contact may cause irritation to the skin and eyes.

SECTION VII PREVENTIVE MEASURES

Waste Disposal	Discharge, treatment, or disposal may be subject to local laws. Consult your local or regional authorities.
Storage	Keep container in a cool, well ventilated place. Keep away from heat. Keep away from incompatible materials. Keep away from sources of ignition and open flames.
Precautions	Avoid contact with skin and eyes. Do not breathe dust. Use with adequate ventilation. Do not ingest. If ingested, seek immediate medical attention.
Spill or leak	Use appropriate tools to put the spilled solid in a convenient waste disposal container. Wash spill area with soap and water.
Protective Clothing	Gloves, safety glasses, lab coat, dust respirator.

SECTION VIII FIRST AID MEASURES

Specific first aid measures

Ingestion: Call physician or Poison Control Center immediately. Induce vomiting only if advised by the appropriate medical personnel. Eye contact: Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention. Skin contact: Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Inhalation: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Allow victim to rest in a well ventilated area. Seek immediate medical attention.

SECTION IX PREPARATION OF THE MSDS

Rev. No.	3	Date	February 16, 2007	Approved	James A. Bertsch

GARDENA, CA
NEW BRUNSWICK, NJ

Material Safety Data Sheet

NFPA	HMIS	Personal Protective Equipment
0 / 1 / 0	Health Hazard 1 Fire Hazard 0 Reactivity 0	See Section 15.

Section 1. Chemical Product and Company Identification

Common Name/ Trade Name	**Iron Metal**	**Catalog Number(s).**	I1197, I1030, I1041, I1042
		CAS#	7439-89-6
Manufacturer	SPECTRUM LABORATORY PRODUCTS INC. 14422 S. SAN PEDRO STREET GARDENA, CA 90248	**RTECS**	NO4565500
		TSCA	TSCA 8(b) inventory: Iron Metal
Commercial Name(s)	Not available.	**CI#**	Not applicable.
Synonym	Iron metal filings; Iron Metal Wire; Iron Metal Wire, 0.25mm; Iron metal, granular	**IN CASE OF EMERGENCY CHEMTREC (24hr) 800-424-9300**	
Chemical Name	Iron		
Chemical Family	Inert material.	CALL (310) 516-8000	
Chemical Formula	Fe		
Supplier	SPECTRUM LABORATORY PRODUCTS INC. 14422 S. SAN PEDRO STREET GARDENA, CA 90248		

Section 2.Composition and Information on Ingredients

		Exposure Limits			
Name	**CAS #**	**TWA (mg/m^3)**	**STEL (mg/m^3)**	**CEIL (mg/m^3)**	**% by Weight**
1) Iron Metal	7439-89-6				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. Non-hazardous in case of inhalation.

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 liver, cardiovascular system, upper respiratory tract, pancreas.
Repeated or prolonged exposure to the substance can produce target organs damage.

Continued on Next Page

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. 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 available.
Flash Points	Not available.
Flammable Limits	Not available.
Products of Combustion	Some metallic oxides.
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	Chlorine Trifluoride reacts with iron with incandescence. Powdered iron reacts with fluorine below redness with incandescence. Reduced iron decomposes with nitrogen dioxide @ ordinary temperature with incandescence. Reacting mass formed by mixture of phosphorus and iron can become incandescent when heated. This material is flammable in powder form only.
Special Remarks on Explosion Hazards	Material in powdered form can explode when exposed to heat or 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.

Continued on Next Page

Section 7. Handling and Storage

Precautions	Do not ingest. Do not breathe dust. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids.
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	Goggles. Boots. Gloves.
Exposure Limits	Not available.

Section 9. Physical and Chemical Properties

Physical state and appearance	Solid. (Metal solid.)	**Odor**	Odorless.
Molecular Weight	55.85 g/mole	**Taste**	Tasteless.
pH (1% soln/water)	Not applicable.	**Color**	Silver-white Grey.

Boiling Point	3000°C (5432°F)
Melting Point	1535°C (2795°F)
Critical Temperature	Not available.
Specific Gravity	Density: 7.86 (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, diethyl ether. Insoluble in alcohol, alkali. Soluble in acids.

Section 10. Stability and Reactivity Data

Stability	The product is stable.
Instability Temperature	Not available.
Conditions of Instability	Excess heat, incompatible materials, water/moisture, air
Incompatibility with various substances	Reactive with oxidizing agents, acids.
Corrosivity	Not considered to be corrosive for metals and glass.

Continued on Next Page

Special Remarks on Reactivity	Hot iron(wire) burns in Chlorine gas. Violent decompositon of hydrogen peroxide (53% by weight or greater) may be caused by contact with iron. Readily oxidizes in moist air forming rust. Reactive with halogens. Incompatible with acetaldehyde, ammonium peroxodisulfate, chloroformamidinum, chloric acid, ammonium nitrate, dinitorgen tetroxide, nitryl fluoride, polystyrene, sodium acetylide, potassium dichromate, peroxyformic acid, sulfuric acid, sodium carbide. Readily attacked by dilute mineral acids and or attacked or dissolved by organic acids. Not appreciably attacked by cold sulfuric acid, or nitric acid, but is attacked by hot acids.
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): 30000 mg/kg [Rat].
Chronic Effects on Humans	May cause damage to the following organs: liver, cardiovascular system, upper respiratory tract, pancreas.
Other Toxic Effects on Humans	Slightly hazardous in case of skin contact (irritant), 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: Iron metal filings, granular, or dust: May cause skin irritation by mechanical action. Iron metal wire: Not likely to cause skin irritation Eyes: Iron metal filings, granular, or dust: Can irritate eyes by mechanical action. Iron metal wire: No hazard. Will not cause eye irritation. Inhalation: Iron dust: Can irritate the respiratory tract by mechanical action. Iron metal wire, granular, or filings: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Iron metal wire: Not an ingestion hazard: Iron metal filings, granular, or dust: The amount of ingested iron which constitutes a toxic dose is not well defined. Proposed toxic doses of elemental iron are 20 mg/kg for gastrointestinal irritation to greater than 60 mg/kg for systemic toxicity. Gastrointestinal effects are the first signs to appear, with hemorrhagic vomiting and diarrhea, hematochezia, abdominal pain, lethargy, metabolic acidosis, coagulaopathy, shock, coma and convulsions developing from 0 to 6 hours after ingestion. Leukocytosis may also occur. An asymptomatic phase may ensue at 6 to 12 hours postingestion, followed by hypoglycemia or hyperglycemia, hepatic and renal failure, severe acidosis, cyanosis, fever, CNS depression (lethargy, restlessness and/or confusion seizures), hypotension, and cardiovascular collapse/cardiac failure in 12 to 48 hours. Hepatic cirrhosis, gastrointestinal scarring and/or strictures may arise in 2 to 6 weeks. It may also cause an anaphylactoid reaction. Non-cardiogenic pulmonary edema also develop in severe cases of iron intoxication. Chronic Potential Health Effects: Inhalation: Chronic inhalation of iron dust can lead to accumulation in the lungs and a characteristic stippled appearance on X-rays. This condition, called SIDEROSIS, is considered benign in that it does not interfere with lung function and does not predispose to other disease. Chronic inhalation of iron dust may also cause fibrosis in the lungs. Ingestion: Clinical signs of iron overload appear when the total body iron is 5 to 10 times higher than normal. Neurobehavioral defects including depression, decreased activity, habituation, reflex startle, and conditioned avoidance response performance may occur. However, similiar effects were also seen in iron defficiency. It is therefore likely that these behavioral effects are secondary to general toxicity. High serum iron levels may be associated with an increased risk of fatal acute myocardial infarction (MI). Skin: Prolonged or repeated contact may cause hypersensivity.

Continued on Next Page

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.
DOT (Pictograms)	

Section 15. Other Regulatory Information and Pictograms

Federal and State Regulations	California Director's List of Hazardous Substances: Iron Metal TSCA 8(b) inventory: Iron Metal		
California Proposition 65 Warnings	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. 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.		
Other Regulations	EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.		
Other Classifications	**WHMIS (Canada)**	Not controlled under WHMIS (Canada).	
	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 B	**National Fire Protection Association (U.S.A.)**	Health, Flammability, Reactivity, Specific hazard

Continued on Next Page

WHMIS (Canada) (Pictograms)

DSCL (Europe) (Pictograms)

TDG (Canada) (Pictograms)

ADR (Europe) (Pictograms)

Protective Equipment

Gloves

Lab coat.

Safety glasses.

Section 16. Other Information

MSDS Code	I3240
References	Not available.
Other Special Considerations	Not available.

Validated by Sonia Owen on 11/17/2008.	**Verified by Sonia Owen.** **Printed 12/2/2008.**

CALL (310) 516-8000

Notice to Reader

All chemicals may pose unknown hazards and should be used with caution. This Material Safety Data Sheet (MSDS) applies only to the material as packaged. If this product is combined with other materials, deteriorates, or becomes contaminated, it may pose hazards not mentioned in this MSDS. It shall be the user's responsibility to develop proper methods of handling and personal protection based on the actual conditions of use. While this MSDS is based on technical data judged to be reliable, Spectrum Quality Products, Inc. assumes no responsibility for the completeness or accuracy of the information contained herein.

MATERIAL SAFETY DATA SHEET

ALDON CORPORATION
221 Rochester Street
Avon, New York 14414-9409
(585) 226-6177

MSDS No.: LL0070 LL0077 LL0079 LL0080 LL0081 LL0082 LL0085 LL0086
Effective Date: January 12, 2007

SECTION I NAME

Product	Lead Metal
Chemical Synonyms	N/A
Formula	Pb
Unit Size	up to 2.5 Kg.
C.A.S. No.	7439-92-1

24 HOUR EMERGENCY ASSISTANCE

CHEMTREC 800-424-9300
Day 585-226-6177

NFPA

Health	3
Fire	0
Reactivity	0

HMIS *

HAZARD RATING

MINIMAL	SLIGHT	MODERATE	SERIOUS	SEVERE
0	1	2	3	4

SECTION II INGREDIENTS OF MIXTURES

Principal Component(s)	%	TLV Units
Lead metal, shot, granular, sheet, foil	99+%	See Section V.
CAUTION!		

MAY BE HARMFUL OR FATAL IF SWALLOWED OR INHALED AS FUMES OR DUST.

SECTION III PHYSICAL DATA

Melting Point (°F)	Approx. 327.4°C (621°F)	Specific Gravity (H_2O = 1)	11.34 (20/4°C)
Boiling Point (°F)	1753°C (3187°F)	Percent Volatile by Volume (%)	0% at ambient temp.
Vapor Pressure (mm Hg)	N/A	Evaporation Rate (=1)	Non-volatile (N/A).
Vapor Density (Air=1)	N/A		
Solubility in Water	Insoluble.		
Appearance & Odor	Bluish, silvery, gray soft metal, granular, shot, sheet, foil; no odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)	Non-flammable.	Flammable Limits in Air % by Volume N/A	Lower - - - - - - - -	Upper - - - - - - - -
Extinguisher Media	Dry chemical or carbon dioxide should be used on surrounding fire. Do not use water on fires where molten metal is present.			

SPECIAL FIREFIGHTING PROCEDURES

In fire conditions, wear a NIOSH/MSHA-approved self-contained breathing apparatus and full protective clothing.

UNUSUAL FIRE AND EXPLOSION HAZARDS

When heated emits toxic fumes of lead which can react vigorously with oxidizing materials.

D.O.T. **Non Regulated.**

Approved by U.S. Department of Labor "essentially similar" to form OSHA-20

SECTION V HEALTH HAZARD DATA

LL0070

Threshold Limited Value

Lead as inorganic compounds, as Pb: TWA 0.05 mg/m^3 (ACGIH 2001).

Effects of Overexposure

Suspect cancer hazard. **SKIN:** Not absorbed through skin. **EYES:** No specific hazard known. Contact may cause transient irritation. **INGESTION:** May produce anorexia, vomiting, malaise, convulsions due to increased intracranial pressure. **INHALATION:** Of dust or fumes can cause lead poisoning. Risk of cancer depends on level and duration of exposure. Target organs: Lungs, kidneys.

Emergency and First Aid Procedures

INGESTION: Call physician or Poison Control Center immediately. Induce vomiting only if advised by appropriate medical personnel. Never give anything by mouth to an unconscious person. **EYES:** Check for and remove contact lenses. Flush thoroughly with water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get immediate medical attention. **SKIN:** Remove contaminated clothing. Flush thoroughly with mild soap and water. If irritation occurs, get medical attention. **INHALATION:** Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

SECTION VI REACTIVITY DATA

Stability	**Unstable**		**Conditions to Avoid**
	Stable	X	High temperatures to produce fumes.

Incompatibility (Materials to Avoid) Strong oxidizing materials.

Hazardous Decomposition Products When heated, emits toxic fumes of lead.

Hazardous Polymerization		**Conditions to Avoid**
May Occur	**Will Not Occur**	Not applicable.
	X	

SECTION VII SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released or spilled

Carefully sweep up without producing dust and recycle for use or place in a suitable container for disposal.

Waste Disposal Method

Discharge, treatment, or disposal may be subject to Federal, State or Local laws. These disposal guidelines are intended for the disposal of catalog-size quantities only.

Dispose of in an approved chemical landfill or contract with a licensed waste disposal service.

SECTION VIII SPECIAL PROTECTION INFORMATION

Respiration Protection (Specify Type) None should be needed in normal laboratory use at room temperature. If dusty conditions prevail, work in ventilation hood or wear a NIOSH/MSHA-approved dust mask or respirator.

Ventilation				
	Local Exhaust	None needed.	**Special**	No.
	Mechanical (General)	None needed.	**Other**	No.

Protective Gloves	Recommended - leather.	**Eye Protection**	Chemical safety glasses.

Other Protective Equipment Smock, apron, eye wash station, lab coat, ventilation hood.

SECTION IX SPECIAL PRECAUTIONS

Precautions to be Taken in Handling & Storing

Keep container tightly closed when not in use.

Store in a cool, dry place away from fire hazards. Wash thoroughly after handling. Remove and wash contaminated clothing.

Other Precautions

Read label on container before using. Do not wear contact lenses when working with chemicals. For laboratory use only. Not for drug, food or household use. Keep out of reach of children.

Lead can react violently with oxidizing materials. Water may become trapped within surface cracks which may cause an explosion when the metal is molten.

WARNING: THIS PRODUCT CONTAINS A CHEMICAL KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Revision No. 10	Date 01/12/07	Approved James A. Bertsch	Chemical Safety Coordinator JAB

The information contained herein is furnished without warranty of any kind. Employers should use this information only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use of these materials and the safety and health of employees. * Hazardous Materials Industrial Standards. Printed on recycled paper.

Magnesium Metal

MSDS # 426.20

Section 1: Product and Company Identification

Magnesium Metal

Synonyms/General Names: N/A
Product Use: For educational use only
Manufacturer: Columbus Chemical Industries, Inc., Columbus, WI 53925.

24 Hour Emergency Information Telephone Numbers

CHEMTREC (USA): 800-424-9300 **CANUTEC (Canada): 613-424-6666**

ScholAR Chemistry; 5100 W. Henrietta Rd, Rochester, NY 14586; (866) 260-0501; www.Scholarchemistry.com

Section 2: Hazards Identification

Silver metal chips, granules, ribbon, turnings, no odor
WARNING! Flammable solid, dangerous when wet.
Flammable solid, keep away from all ignition sources. Contact with water produces flammable gas.
Target organs: Skin, eyes and respiratory system.

HMIS (0 to 4)

Health	1
Fire Hazard	2
Reactivity	2

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

Section 3: Composition / Information on Ingredients

Magnesium (7439-95-4), >99%

Section 4: First Aid Measures

Always seek professional medical attention after first aid measures are provided.

Eyes: Immediately flush eyes with excess water for 15 minutes, lifting lower and upper eyelids occasionally.
Skin: Immediately flush skin with excess water for 15 minutes while removing contaminated clothing.
Ingestion: Call Poison Control immediately. Rinse mouth with cold water. Give victim 1-2 tbsp of activated charcoal mixed with 8 oz water.
Inhalation: Remove to fresh air. If not breathing, give artificial respiration.

Section 5: Fire Fighting Measures

Flammable solid. When heated to decomposition, emits acrid fumes

Protective equipment and precautions for firefighters: Do Not Use carbon dioxide, foam, water or halogenated extinguishing agents. Use class D extinguisher or smother with dry sand, dry clay, dry ground limestone or dry graphite. Firefighters should wear full fire fighting turn-out gear and respiratory protection (SCBA). Material is not sensitive to mechanical impact or static discharge.

Section 6: Accidental Release Measures

Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Remove all ignition sources and ventilate area. Sweep up spill and place material in a dry container for disposal. See Section 13 for disposal information.

Section 7: Handling and Storage Red

Handling: Use with adequate ventilation and do not breathe dust or vapor. Avoid contact with skin, eyes, or clothing. Wash hands thoroughly after handling.
Storage: Store in Flammable Area [Red Storage] with other flammable materials and away from any strong oxidizers. Store in a dedicated flammables cabinet. Store in a cool, dry, well-ventilated, locked store room away from incompatible materials.

Section 8: Exposure Controls / Personal Protection

Use ventilation to keep airborne concentrations below exposure limits. Have approved eyewash facility, safety shower, and fire extinguishers readily available. Wear chemical splash goggles and chemical resistant clothing such as gloves and aprons. Wash hands thoroughly after handling material and before eating or drinking. Use NIOSH-approved respirator with a dust cartridge. Exposure guidelines: Magnesium: OSHA PEL: N/A and ACGIH TLV: N/A, STEL: N/A.

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Section 9: Physical and Chemical Properties

Molecular formula	Mg.	**Appearance**	Silver metal chips, granules, or turnings.
Molecular weight	24.31.	**Odor**	No odor.
Specific Gravity	1.74 g/mL @ 20°C.	**Odor Threshold**	N/A.
Vapor Density (air=1)	N/A.	**Solubility**	Acids.
Melting Point	651°C.	**Evaporation rate**	N/A. *(Butyl acetate = 1).*
Boiling Point/Range	1107°C.	**Partition Coefficient**	N/A. *(log P_{OW}).*
Vapor Pressure (20°C)	N/A.	**pH**	N/A.
Flash Point:	N/A.	**UEL**	N/A.
Autoignition Temp.:	473°C (883°F).	**LEL**	N/A.

N/A = Not available or applicable

Section 10: Stability and Reactivity

Avoid heat and ignition sources
Stability: Stable under normal conditions of use.
Incompatibility: Water, acids, chlorine, iodine, bromine and oxidizing agents.
Shelf life: Indefinite if stored properly.

Section 11: Toxicology Information

Acute Symptoms/Signs of exposure: ***Eyes***: Stinging pain, burns, watering of eyes, inflammation of eyelids and conjunctivitis. Avoid looking at burning magnesium. ***Skin***: Irritation, redness, burns. Powdered metal ignites readily on skin causing burns. ***Ingestion***: Nausea, vomiting and headache. ***Inhalation***: Rapid irregular breathing, headache, burns to mucous membranes. Inhalation of dust or fumes causes metal fume fever.
Chronic Effects: Repeated/prolonged skin contact may cause dryness or rashes.
Sensitization: none expected
Magnesium: LD50 [oral, rat]; Not Available; LC50 [rat]; Not Available; LD50 Dermal [rabbit]; Not Available
Material has not been found to be a carcinogen nor produce genetic, reproductive, or developmental effects.

Section 12: Ecological Information

Ecotoxicity (aquatic and terrestrial): Ecological impact has not been determined

Section 13: Disposal Considerations

Check with all applicable local, regional, and national laws and regulations. Local regulations may be more stringent than regional or national regulations. Use a licensed chemical waste disposal firm for proper disposal.

Section 14: Transport Information

DOT Shipping Name:	Magnesium.	**Canada TDG:**	Magnesium.
DOT Hazard Class:	4.1, pg III.	**Hazard Class:**	4.1, pg III.
Identification Number:	UN1869.	**UN Number:**	UN1869.

Section 15: Regulatory Information

EINECS: Listed (231-104-6).
TSCA: All components are listed or are exempt.
WHMIS Canada: B4, B6: Flammable solid, Reactive flammable material.
California Proposition 65: Not listed.

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

Section 16: Other Information

Current Issue Date: January 23, 2009

Disclaimer: Scholar Chemistry and Columbus Chemical Industries, Inc., ("S&C") believes that the information herein is factual but is not intended to be all inclusive. The information relates only to the specific material designated and does not relate to its use in combination with other materials or its use as to any particular process. Because safety standards and regulations are subject to change and because S&C has no continuing control over the material, those handling, storing or using the material should satisfy themselves that they have current information regarding the particular way the material is handled, stored or used and that the same is done in accordance with federal, state and local law. ***S&C makes no warranty, expressed or implied, including (without limitation) warranties with respect to the completeness or continuing accuracy of the information contained herein or with respect to fitness for any particular use.***

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Material Safety Data Sheet

Manganese metal

ACC# 88704

Section 1 - Chemical Product and Company Identification

MSDS Name: Manganese metal
Catalog Numbers: M78
Synonyms: Colloidal manganese; Magnacat
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7439-96-5	Manganese	100%	231-105-1

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: reddish-gray or silvery solid.
Caution! Causes respiratory tract irritation. Causes eye and skin irritation. May cause digestive tract irritation. Moisture sensitive.
Target Organs: Central nervous system.

Potential Health Effects

Eye: Causes eye irritation.
Skin: Causes skin irritation.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea.
Inhalation: May cause irritation of the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema. May cause motor incoordination and speech abnormalities.
Chronic: Prolonged or repeated inhalation of dusts may cause neurological damage. May cause reproductive and fetal effects.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid imme diately.
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Get medical aid immediately.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Dusts may be combustible when exposed to heat, flame, or oxidizing agents.
Extinguishing Media: Use dry chemical to fight fire. DO NOT USE WATER!
Flash Point: Not available.
Autoignition Temperature: Not available.
Explosion Limits, Lower:Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 2; Flammability: 1; Instability:

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Avoid ingestion and inhalation. Use only in a chemical fume hood.
Storage: Store in a tightly closed container. Keep under a nitrogen blanket.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Manganese	0.2 mg/m3 TWA	1 mg/m3 TWA (fume) 500 mg/m3 IDLH	5 mg/m3 Ceiling (fume)

OSHA Vacated PELs: Manganese: 1 mg/m3 TWA (fume)
Personal Protective Equipment
Eyes: 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: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: 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.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: reddish-gray or silvery
Odor: None reported.
pH: Not available.
Vapor Pressure: 1 mm Hg @ 1292C
Vapor Density: Not available.
Evaporation Rate:Not available.
Viscosity: Not available.
Boiling Point: 1900 deg C
Freezing/Melting Point:1260 deg C
Decomposition Temperature:Not available.
Solubility: Insoluble in water.
Specific Gravity/Density:7.20
Molecular Formula:Mn
Molecular Weight:54.938

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, dust generation, moisture, excess heat.
Incompatibilities with Other Materials: Acids; bases; moisture; halogens; phosphorous and sulfur oxides.
Hazardous Decomposition Products: No data available.
Hazardous Polymerization: Has not been reported

Section 11 - Toxicological Information

RTECS#:
CAS# 7439-96-5: OO9275000
LD50/LC50:
CAS# 7439-96-5:
Draize test, rabbit, eye: 500 mg/24H Mild;
Draize test, rabbit, skin: 500 mg/24H Mild;
Oral, rat: LD50 = 9 gm/kg;
.

Carcinogenicity:
CAS# 7439-96-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No data available.
Teratogenicity: No data available.
Reproductive Effects: No data available.
Mutagenicity: No data available.
Neurotoxicity: No data available.
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Not regulated as a hazardous material	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7439-96-5 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
Section 313
This material contains Manganese (CAS# 7439-96-5, 100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 7439-96-5 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
XI
Risk Phrases:
R 2 Risk of explosion by shock, friction, fire or other sources of ignition.
R 36/37/38 Irritating to eyes, respiratory system and skin.
R 48 Danger of serious damage to health by prolonged exposure.

Safety Phrases:
S 36/37/39 Wear suitable protective clothing, gloves and eye/face pr otection.

WGK (Water Danger/Protection)
CAS# 7439-96-5: No information available.
Canada - DSL/NDSL
CAS# 7439-96-5 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2B.

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

Canadian Ingredient Disclosure List

CAS# 7439-96-5 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/02/1997
Revision #3 Date: 10/03/2005

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 Fisher 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 Fisher has been advised of the possibility of such damages.

MATERIAL SAFETY DATA SHEET

ALDON CORPORATION

221 Rochester Street
Avon, New York 14414-9409
(585) 226-6177

MSDS No.: MM0320
Effective Date: January 12, 2007

SECTION I NAME

Product	Mercury Metal
Chemical Synonyms	Quick Silver
Formula	Hg
Unit Size	up to 500 g.
C.A.S. No.	7439-97-6

24 HOUR EMERGENCY ASSISTANCE

CHEMTREC
800-424-9300
Day 585-226-6177

NFPA

Health	4
Fire	0
Reactivity	1

HMIS *

HAZARD RATING

MINIMAL	SLIGHT	MODERATE	SERIOUS	SEVERE
0	1	2	3	4

SECTION II INGREDIENTS OF MIXTURES

Principal Component(s)	%	TLV Units
Mercury metal	100%	See Section V.
DANGER! CORROSIVE! HARMFUL IF INHALED OR		
ABSORBED THROUGH SKIN. VAPOR HIGHLY TOXIC.		

SECTION III PHYSICAL DATA

Melting Point (°F)	-30°C (-38°F)	Specific Gravity (H_2O = 1)	13.6
Boiling Point (°F)	357°C (674°F)	Percent Volatile by Volume (%)	100%
Vapor Pressure (mm Hg)	0.002 mm @ 25°C	Evaporation Rate (=1)	N/A
Vapor Density (Air=1)	7.0		
Solubility in Water	Insoluble.		
Appearance & Odor	Silver-white, heavy mobile metallic liquid; no odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)	Non-flammable.	Flammable Limits in Air % by Volume N/A	Lower	Upper
Extinguisher Media	Use any media suitable for extinguishing supporting fire.			

SPECIAL FIREFIGHTING PROCEDURES

In fire conditions, wear a NIOSH/MSHA-approved self-contained breathing apparatus and full protective clothing. Mercury is non-flammable and non-explosive in air.

(2004 EMERGENCY RESPONSE GUIDEBOOK, RSPA P 5800.9, GUIDE PAGE NO. 172)

UNUSUAL FIRE AND EXPLOSION HAZARDS

Dangerous, when heated mercury evaporates to yield highly toxic fumes of mercury.

D.O.T. **Mercury, 8, UN2809, PG III, RQ ≤ 1 lb.**

Approved by U.S. Department of Labor "essentially similar" to form OSHA-20

SECTION V HEALTH HAZARD DATA

MM0320

Threshold Limited Value

TWA: 0.025 mg/m^3 as Hg elemental and inorganic compounds. (ACGIH 2001). Human, oral LDLO 1429 mg/kg.

Effects of Overexposure

If the mercury in a small clinical thermometer were dispersed in a closed 100' x 100' x 15' room, the TLV would be exceeded. Unsafe conditions are not indicated by odor.

Severe poisoning can occur with less than two hours exposure to high concentrations of vapor. Mercury may be absorbed slowly through the skin. Repeated or prolonged contacts may result in poisoning. A single ingestion of a small amount of **pure metallic mercury** would not be expected to cause severe injury. However, if the mercury contained **mercury compounds**, poisoning could result. In all cases of overexposure to mercury, get medical attention!! Target organs: Central nervous system, liver, kidneys.

Emergency and First Aid Procedures

INGESTION: Call physician or Poison Control Center immediately. Induce vomiting only if advised by appropriate medical personnel. Never give anything by mouth to an unconscious person. **EYES:** Check for and remove contact lenses. Flush thoroughly with water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get immediate medical attention. **SKIN:** Remove contaminated clothing. Flush thoroughly with mild soap and water. If irritation occurs, get medical attention. **INHALATION:** Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

SECTION VI REACTIVITY DATA

Stability	**Unstable**		**Conditions to Avoid**	Will react slowly with oxygen when heated and it reacts with halogens. Excessive temperature.
	Stable	X		

Incompatibility (Materials to Avoid)

Acetylinic compounds, ammonia, boron, diiodphosphide, ethylene oxide, metals, methyl azide, methylsilane, oxygen, oxidants, nitric acid, tetracarbonylnickel, nitromethane, silver perchlorate.

Hazardous Decomposition Products

Thermal decomposition products include toxic mercury vapors and oxygen.

Hazardous Polymerization		Conditions to Avoid
May Occur	**Will Not Occur**	Not applicable.
	X	

SECTION VII SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released or spilled

Collect all droplets and pools at once by means of suction pump and aspirator bottle with a long capillary tube. Cover fine droplets in non-accessible cracks with calcium polysulfide and excess sulfur. Combine all contaminated mercury in a tightly stoppered bottle. Clean and recycle.

Waste Disposal Method

Discharge, treatment, or disposal may be subject to Federal, State or Local laws. These disposal guidelines are intended for the disposal of catalog-size quantities only.

Mercury can be purified for reuse, or it can be sold to a mercury salvage company when large amounts are involved. Dispose of in an approved chemical landfill or contract with a licensed waste disposal service.

SECTION VIII SPECIAL PROTECTION INFORMATION

Respiration Protection (Specify Type) Work in a fume hood or wear NIOSH/MSHA-approved respirator with mercury cartridge.

Ventilation	**Local Exhaust**	Acceptable.	**Special**	No.
	Mechanical (General)	Preferred.	**Other**	No.

Protective Gloves	Rubber, Plastic.	**Eye Protection**	Chemical safety glasses.

Other Protective Equipment Goggles, smock, apron, eye wash station, ventilation hood, proper gloves.

SECTION IX SPECIAL PRECAUTIONS

Precautions to be Taken in Handling & Storing

Keep container tightly closed when not in use.

Store in a cool, dry place away from fire hazards. Clean up all spills at once. Wash thoroughly after handling.

Other Precautions

Read label on container before using. Do not wear contact lenses when working with chemicals. For laboratory use only. Not for drug, food or household use. Keep out of reach of children.

Do not breathe Mercury fumes. Mercury should not be heated without proper precautions to safely handle highly toxic mercury vapor. Remove and wash contaminated clothing.

Revision No. 9	Date 01/12/07	Approved James A. Bertsch	Chemical Safety Coordinator JAB

The information contained herein is furnished without warranty of any kind. Employers should use this information only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use of these materials and the safety and health of employees. * Hazardous Materials Industrial Standards. Printed on recycled paper.

Material Safety Data Sheet
Nickel Metal

ACC# 16240

Section 1 - Chemical Product and Company Identification

MSDS Name: Nickel Metal
Catalog Numbers: N40-500
Synonyms:
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7440-02-0	NICKEL	100.0	231-111-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white to gray white solid.
Caution! May cause allergic skin reaction. May cause eye irritation. May cause respiratory tract irritation. May cause cancer in humans. May cause liver and kidney damage.
Target Organs: Kidneys, liver, respiratory system.

Potential Health Effects

Eye: May cause eye irritation.
Skin: May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. May cause severe irritation and possible burns. May cause dermatitis.
Ingestion: Causes gastrointestinal irritation with nausea, vomiting and diarrhea.
Inhalation: 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. Inhalation of a mist of this material may cause respiratory tract irritation. Breathing Nickel (Dust and Fume) can cause a sore or hole in the "bone" (septum) dividing the inner nose.
Chronic: Prolonged or repeated skin contact may cause sensitization dermatitis and possible destruction and/or ulceration. May cause respiratory tract cancer.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.
Skin: Get medical aid if irritation develops or persists. Wash clothing before reuse. Flush skin with plenty of soap and water.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid if cough or other symptoms appear.
Notes to Physician: Treat symptomatically and supportively.
Antidote: There exists several chelation agents. The determination of there use should be made only by qualified medical personnel.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Dusts at sufficient concentrations can form explosive mixtures with air. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Dust can be an explosion hazard when exposed to heat or flame.
Extinguishing Media: Confining and smothering is preferable to applying water. DO NOT USE WATER, CO2, OR FOAM DIRECTLY ON FIRE ITSELF. Use DRY sand, sodium chloride powder, graphite powder, copper powder or Lith-X powder. Dousing metallic fires with water may generate hydrogen gas, an extremely dangerous explosion hazard, particularly if fire is in a confined environment.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 1; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Very fine particles can cause a fire or explosion. Eliminate all ignition sources. Reduce airborne dust and prevent scattering by moistening with water. Sweep up, then place into a suitable container for disposal. Carefully scoop up and place into appropriate disposal container. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with skin and eyes. Avoid ingestion and inhalation.
Storage: Store in a cool, dry, well-ventilated area away from incompatible substances. Keep containers tightly closed.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
NICKEL	1.5 mg/m3 TWA (inhalable fraction)	0.015 mg/m3 TWA 10 mg/m3 IDLH	1 mg/m3 TWA

OSHA Vacated PELs: NICKEL: 1 mg/m3 TWA

Personal Protective Equipment

Eyes: 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: Wear appropriate gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to minimize contact with skin.

Respirators: 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.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: white to gray white
Odor: none reported
pH: Not available.
Vapor Pressure: 1 mm Hg @ 1810 C
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not applicable.
Boiling Point: 2730 deg C
Freezing/Melting Point:1455 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble in water.
Specific Gravity/Density:8.90
Molecular Formula: Ni
Molecular Weight:58.69

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, dust generation.
Incompatibilities with Other Materials: Acids, aluminum, ammonia, ammonium nitrate, bromine pentafluoride, ethylene + aluminum, dioxane, fluorine, hydrazine, hydrazoic acid, hydrogen, methanol, nitric acid, nitryl fluoride, organic solvents, oxidants, phosphorus, potassium perchlorate, selenium, sulfur and compounds.
Hazardous Decomposition Products: Toxic and highly flammable nickel carbonyl.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 7440-02-0: QR5950000; QR6126100; QR6555000; QR7120000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 7440-02-0:

- **ACGIH:** Not listed.
- **California:** carcinogen, initial date 10/1/89
- **NTP:** Suspect carcinogen
- **IARC:** Group 1 carcinogen (listed as Nickel compounds).

Epidemiology: Epidemiological studies have shown an increased incidence of cancers among nickel refinery workers.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Mutagenicity: No information available.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.
Environmental: No information reported.
Physical: No information available.
Other: None.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Not regulated as a hazardous material	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 7440-02-0 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 7440-02-0: 100 lb final RQ (no reporting of releases of this hazardous substance is require

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 7440-02-0: immediate, delayed, fire.

Section 313

This material contains NICKEL (CAS# 7440-02-0, 100.0%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 7440-02-0 (listed as Nickel compounds) is listed as a hazardous a ir pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

CAS# 7440-02-0 is listed as a Priority Pollutant under the Clean Water Act. CAS# 7440-02-0 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 7440-02-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains NICKEL, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN

Risk Phrases:

R 40 Limited evidence of a carcinogenic effect.

R 43 May cause sensitization by skin contact.

Safety Phrases:

S 22 Do not breathe dust.
S 36 Wear suitable protective clothing.

WGK (Water Danger/Protection)

CAS# 7440-02-0: No information available.

Canada - DSL/NDSL

CAS# 7440-02-0 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 7440-02-0 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 3/19/1998
Revision #5 Date: 10/28/2008

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 Fisher 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 Fisher has been advised of the possibility of such damages.

MATERIAL SAFETY DATA SHEET

A. D. MACKAY, Inc.
10 NORTH BROADWAY
P.O. BOX 'G'
RED HOOK, N.Y. 12571-0046
(914) 758-1033

SECTION I

FEBRUARY 2006 REVISED

CAS #: 7440-62-2

MATERIAL NAME:
VANADIUM (METAL, LUMP, POWDER, Etc.)

EMERGENCY TELEPHONE NO.
1-800-424-9300 (24 HOURS)

MATERIAL FAMILY:
PURE ELEMENT

FORMULA: V

UN I.D.#: NOT CLASSIFIED

TSCA:
THIS PRODUCT IS LISTED ON THE TOXIC SUBSTANCES CONTROL ACT (TSCA) INVENTORY.

SECTION II - HAZARDOUS INGREDIENTS

TYPICAL COMPOSITION	%	OSHA/PEL*	ACGIH/TLV*
VANADIUM	>99%	0.5 (CEILING), 0.1 (FUME)	0.5

*NONE FOR METAL. THESE VALUES REPRESENT V_2O_5, AS V (mg/m^3).

SECTION III - PHYSICAL DATA

BOILING POINT	MELTING POINT	SPECIFIC GRAVITY (H_2O=1)
3380°C	1890°C	5.96
VAPOR PRESSURE (mm Hg.)	**VAPOR DENSITY (AIR=1)**	**PERCENT VOLATILE BY VOLUME**
N/A	N/A	NONVOLATILE
SOLUBILITY IN WATER	**BULK DENSITY**	**EVAPORATION RATE**
INSOLUBLE	370 lb/ft^3	N/A

APPEARANCE AND ODOR
LIGHT GRAY OF BLACK LUSTROUS POWDER, OR SILVER GRAY METAL. NO ODOR.

AUTOIGNITION TEMPERATURE
POWDER CAN BE IGNITED AT 300°C

OTHER COMMENTS:
NOT ATTACKED BY HOT OR COLD HCl. BY COLD H_2SO_4. SOLUBLE IN HOT H_2SO_4, IN HYDROFLUORIC ACID, IN NITRIC ACID, IN AQUA REGIA. SLOWLY OXIDIZES IF EXPOSED TO AIR. FORMS V_2O_5 ABOVE 400°C. THE SOLID METAL WILL NOT BURN.

SECTION IV - FIRE AND EXPLOSION DATA

FLASH POINT:
N/A

FLAMMABLE LIMITS:
N/A

EXTINGUISHING MEDIA:
CLASS 'D' AGENT SUCH AS ANSUL'S MET-L-X DRY POWDER FOR METAL FIRES.

SPECIAL FIRE FIGHTING PROCEDURES:
WEAR NIOSH/MSHA APPROVED SELF-CONTAINED BREATHING APPARATUS FOR FIGHTING LARGE METAL FIRES. FIRE CAN BE CONTROLLED BY SMOTHERING WITH DRY TABLE SALT OR USING TYPE D FIRE EXTINGUISHER MATERIAL. DO NOT CONTACT METAL WITH WATER.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
DUST MAY BE HAZARDOUS WHEN EXPOSED TO HEAT OR FLAME. HOT OR BURNING METAL CAN PRODUCE TOXIC FUMES. USE SELF-CONTAINED BREATHING APPARATUS OPERATED IN POSITIVE PRESSURE MODE IF THE FIRE INVOLVES VANADIUM METAL OR OXIDE.

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE:
NONE FOR METAL. 0.5 mg/m^3 FOR V_2O_5, AS V.

Continued on Page 2

M A T E R I A L S A F E T Y D A T A S H E E T

SECTION V - HEALTH HAZARD DATA CONTINUED

TOXICITY DATA:
METALLIC VANADIUM IS CONSIDERED NON-TOXIC. HOWEVER, VANADIUM COMPOUNDS, NOTABLY THE PENTOXIDE AND METAVANDATE, ARE HIGHLY TOXIC. FINELY-DIVIDED VANADIUM IS REACTIVE ENOUGH TO CONVERT SLOWLY TO TOXIC FORMS, MAKING CONSIDERATION OF THEIR TOXIC EFFECTS NECESSARY. TOXICITY DATA IS FOR SOLUBLE COMPOUNDS. AS METAL: NON-TOXIC. AS V_2O_5: INHALATION-RAT LC_{Lo}: 70 mg/m^3/2HR. INHALATION-HUMAN TCLo: 1 mg/m^3/8HR. - ALLERGIC REACTION. ORAL - RAT LD_{50}: 10 mg/kg.

CARCINOGENICITY:
NTP? NO. **IARC MONOGRAPHS?** NO. **OSHA REGULATED?** NO.

ROUTES OF ENTRY:
INHALATION: YES. **INGESTION:** YES. **SKIN ABSORPTION:** NO. **SKIN/EYE CONTACT:** YES.

TARGET ORGANS:
AS SOLUBLE VANADIUM COMPOUNDS: LUNGS, LIVER, KIDNEY, BONE MARROW, ADRENALS.

EFFECTS OF OVEREXPOSURE: THE PENTOXIDE DUST HAS BEEN REPORTED TO BE A RESPIRATORY IRRITANT AND TO CAUSE SKIN PALLOR, GREENISH-BLACK TONGUE, CHEST PAIN COUGH, DYSPNEA, PALPITATION, AND LUNG CHANGES. WHEN INGESTED CAUSES GASTRO INTESTINAL DISTURBANCES. **ACUTE (AS SOLUBLE VANADIUM COMPOUNDS):** IRRITATION OF EYES, NOSE, THROAT AND RESPIRATORY TRACT, BRONCHITIS WITH WHEEZING AND CHEST PAIN. ALSO AFFECTS NERVOUS SYSTEM, CAN CAUSE HEMORRHAGE, PARALYSIS, CONVULSIONS AND RESPIRATORY DEPRESSION (IN SEVERE EXPOSURES). **CHRONIC (AS SOLUBLE VANADIUM COMPOUNDS):** CHRONIC BRONCHITIS, ALLERGIC SKIN REACTION, CHRONIC OBSTRUCTION PULMONARY DISEASE.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE:
NO DATA

EMERGENCY AND FIRST AID PROCEDURES:
INHALATION: AS METAL POWDER OR AS V_2O_5, REMOVE TO FRESH AIR, GIVE OXYGEN IF BREATHING IS DIFFICULT. PERFORM CPR AS NECESSARY. TREAT FOR SHOCK. SEEK IMMEDIATE MEDICAL ATTENTION. **EYE CONTACT:** AS METAL POWDER OR V_2O_5, FLUSH EYES IMMEDIATELY WITH WATER FOR AT LEAST 15 MINUTES. SEEK IMMEDIATE MEDICAL ATTENTION. **SKIN CONTACT:** REMOVE CONTAMINATED CLOTHING. WASH AFFECTED AREA THOROUGHLY WITH SOAP OR MILD DETERGENT AND WATER. SEEK IMMEDIATE MEDICAL ATTENTION. **INGESTION:** SEEK IMMEDIATE MEDICAL ATTENTION.

NOTES TO PHYSICIAN (INCLUDING ANTIDOTES): INHALATION OR INGESTION OF METALLIC VANADIUM (AS POWDER) POSES NO THREAT AS SUCH. THE MATERIAL COULD REACT WITH BODY FLUIDS, HOWEVER, TO PRODUCE TOXIC COMPOUNDS IN SITU. CALCIUM DISODIUM EDTA HAS BEEN SHOWN TO BE ANTIDOTAL IN ANIMAL STUDIES OF VANADIUM COMPOUNDS. ASCORBIC ACID WAS BENEFICIAL IN STUDIES OF VANADIUM IN HUMANS. OTHER TREATMENT SHOULD BE DIRECTED TO RELIEF OF SYMPTOMS, PRIMARILY RELATED TO THE IRRITATION OF MUCOUS MEMBRANES. INHALATION OF TOXIC LEVELS OF VANADIUM COMPOUNDS MAY CAUSE INCREASED SUSCEPTIBILITY TO RESPIRATORY INFECTION.

SECTION VI - REACTIVITY DATA

STABILITY			CONDITIONS TO AVOID:
	Unstable		
	Stable	XXX	HEAT, SPARKS AND OPEN FLAMES.

INCOMPATIBILITY (materials to avoid)
POWDER OXIDIZES SLOWLY IF EXPOSED TO AIR, FORMS V_2O_5 ABOVE 400°C. VANADIUM SHOULD BE KEPT AWAY FROM OXIDIZERS. VANADIUM WILL REACT VIOLENTLY WITH CHLORINE ABOVE 180°C, IS READILY DISSOLVED BY NITRIC ACID AND SLOWLY OXIDIZES IF THE SURFACE IS MOIST. POWDER EXPLODES ON CONTACT AT 0°C WITH LIQUID Cl_2 AND CAUSES INCANDESCENCE WITH BrF_3.

HAZARDOUS DECOMPOSITION PRODUCTS:
NONE KNOWN

HAZARDOUS POLYMERIZATION			CONDITIONS TO AVOID:
	MAY OCCUR		
	WON'T OCCUR	XXX	N/A

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M A T E R I A L S A F E T Y D A T A S H E E T

MATERIAL: VANADIUM CONTINUED A.D. MACKAY, Inc.

SECTION VII - SPILL OR LEAK PROCEDURE

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
USE NORMAL CLEAN-UP PROCEDURES WHICH MINIMIZE EXPOSURE IS APPLICABLE. DO NOT CAUSE DUSTS TO FORM. SEGREGATE MATERIAL, SWEEP UP OR VACUUM AND DISPOSE.

WASTE DISPOSAL METHOD:
CONSULT FEDERAL, STATE OR LOCAL AUTHORITIES FOR PROPER 'DISPOSAL' PROCEDURES

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specify type)
FOR OPERATIONS SUCH AS GRINDING OR POLISHING, WHICH WILL PRODUCE DUSTS OF METAL POWDER OR OXIDE ABOVE 0.5 mg/m^3: IN CONCENTRATIONS LESS THAN 25 mg/m^3, A HIGH EFFICIENCY PARTICULATE FILTER RESPIRATOR WITH A FULL FACEPIECE. IN CONCENTRATIONS LESS THAN 70 mg/m^3: A POWDERED AIR-PURIFYING RESPIRATOR WITH A FULL FACEPIECE AND A HIGH EFFICIENCY PARTICULATE FILTER. IN CONCENTRATIONS GREATER THAN 70 mg/m^3: SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE. USE ONLY NIOSH/MSHA APPROVED EQUIPMENT.

VENTILATION	**LOCAL EXHAUST** RECOMMENDED - FUME HOOD FOR DUSTS OR FUMES	SPECIAL N/A
	MECHANICAL (general) RECOMMENDED	**OTHER** N/A

PROTECTIVE GLOVES
MSHA/NIOSH APPROVED RUBBER GLOVES

EYE PROTECTION: MSHA/NIOSH APPROVED EYE GOGGLES/MASK

OTHER PROTECTIVE EQUIPMENT:
WORK UNIFORM, NON-FLAMMABLE, WITHOUT POCKETS AND CUFFS. NORMAL LABORATORY WEAR. EYEWASH STATION CAPABLE OF SUSTAINED FLUSHING.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:
STORE IN AN INERT ATMOSPHERE TO PREVENT OXIDIZATION, SUCH AS ARGON GAS. KEEP MATERIAL DRY. IF MACHINING CHIPS OR RESIDUES HAVE DEVELOPED A GREEN-BLACK OXIDE SURFACE FILM, THIS OXIDE SHOULD BE CAREFULLY REMOVED BY PICKLING BEFORE FURTHER HANDLING OR PROCESSING OF THE METAL. FINELY GROUND MATERIAL SHOULD BE KEPT FROM HEAT, SPARKS AND FLAMES.

OTHER PRECAUTIONS:
WASH THOROUGHLY AFTER USAGE. CHANGE FROM WORK UNIFORM TO STREET CLOTHING PRIOR TO LEAVING WORK AREAS. CLEANLINESS AND GOOD HOUSEKEEPING ARE IMPORTANT TO MINIMIZE OXIDE DUST LEVELS. EATING AND SMOKING SHOULD NOT BE PERMITTED IN AREAS WHERE VANADIUM DUSTS ARE PRESENT. WASH HANDS THOROUGHLY BEFORE EATING, SMOKING, OR USING TOILET FACILITIES.

REMEMBER -- SAFETY IS -- NO ACCIDENT

A NOTE CONCERNING HANDLING AND PRECAUTIONS OF SOME METALS & CHEMICALS, Etc.
Some of the metals and chemicals listed herein are research or experimental substances which may be **TOXIC**, as defined by various governmental regulations. In accordance with Environmental Protection Agency regulations, these materials should only be handled by, or under the direct supervision of a **"TECHNICALLY QUALIFIED INDIVIDUAL,"** as defined in 40 CFR, par.710.2(aa).

The above information is accurate to the best of our knowledge. However, since data, safety standards, and government regulations are subject to change and the conditions of handling and use or misuse are beyond our control **A. D. MACKAY, Inc. MAKES NO WARRANTY, EITHER EXPRESS OR IMPLIED, WITH RESPECT TO THE COMPLETENESS OR CONTINUING ACCURACY OF THE INFORMATION CONTAINED HEREIN AND DISCLAIMS ALL LIABILITY FOR RELIANCE THEREON.** User should satisfy himself that he has all current data relevant to his/her particular use.

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Material Safety Data Sheet

NFPA	HMIS	Personal Protective Equipment
0 / 0 / 1	Health Hazard 1 Fire Hazard 0 Reactivity 1	See Section 15.

Section 1. Chemical Product and Company Identification

Common Name/ Trade Name	Zinc Metal	**Catalog Number(s).**	YY053, Z1020, Z1033, Z1035, Z1040, Z1043
		CAS#	7440-66-6
Manufacturer	SPECTRUM LABORATORY PRODUCTS INC. 14422 S. SAN PEDRO STREET GARDENA, CA 90248	**RTECS**	ZG8600000
		TSCA	TSCA 8(b) inventory: Zinc Metal
Commercial Name(s)	Not available.	**CI#**	Not applicable.
Synonym	Zinc Metal Sheets; Zinc Metal Shot; Zinc Metal Strips; Zinc Foil	**IN CASE OF EMERGENCY CHEMTREC (24hr) 800-424-9300**	
Chemical Name	Zinc		
Chemical Family	Metal.	CALL (310) 516-8000	
Chemical Formula	Zn		
Supplier	SPECTRUM LABORATORY PRODUCTS INC. 14422 S. SAN PEDRO STREET GARDENA, CA 90248		

Section 2.Composition and Information on Ingredients

		Exposure Limits			
Name	**CAS #**	**TWA (mg/m^3)**	**STEL (mg/m^3)**	**CEIL (mg/m^3)**	**% by Weight**
1) Zinc Metal	7440-66-6				100

Toxicological Data on Ingredients

Zinc Metal
LD50: Not available.
LC50: Not available.

Section 3. Hazards Identification

Potential Acute Health Effects

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

Continued on Next Page

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	Non-flammable.
Auto-Ignition Temperature	Not applicable.
Flash Points	Not available.
Flammable Limits	Not available.
Products of Combustion	Not available.
Fire Hazards in Presence of Various Substances	Slightly flammable to flammable in presence of oxidizing materials, of acids, of alkalis, of moisture. Non-flammable in presence of shocks.
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. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.
Special Remarks on Fire Hazards	Zinc + NaOH causes ignition. Oxidation of zinc by potassium proceeds with incandescence. Residues from zinc dust /acetic acid reduction operations may ignite after long delay if discarded into waste bins with paper. Incandescent reaction when Zinc and Arsenic or Tellurium, or Selenium are combined. When hydrazine mononitrate is heated in contact with zinc, a flamming decomposition occurs at temperatures a little above its melting point. Contact with acids and alkali hydroxides (sodium hydroxide, postasium hydroxide, calcium hydroxide, etc.) results in evolution of hydrogen with sufficient heat of reaction to ignite the hydrogen gas. Zinc foil ignites if traces of moisture are present. It is water reactive and produces flammable gases on contact with water. It may ignite on contact with water or moist air.
Special Remarks on Explosion Hazards	Not available.

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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	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. 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, acids, alkalis, moisture.
Storage	Keep container tightly closed. Keep container in a cool, well-ventilated area. Keep from any possible contact with water. Do not allow water to get into container because of violent reaction.

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 (impervious).
Personal Protection in Case of a Large Spill	Splash goggles. Full suit. Boots. Gloves. 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. (Lustrous solid. Metal solid.)	**Odor**	Not available.
Molecular Weight	65.39 g/mole	**Taste**	Not available.
pH (1% soln/water)	Not applicable.	**Color**	Bluish-grey
Boiling Point	907°C (1664.6°F)		
Melting Point	419°C (786.2°F)		
Critical Temperature	Not available.		
Specific Gravity	Not available.		
Vapor Pressure	Not applicable.		
Vapor Density	Not available.		
Volatility	Not available.		
Odor Threshold	Not available.		
Water/Oil Dist. Coeff.	Not available.		
Ionicity (in Water)	Not available.		
Dispersion Properties	Not available.		
Solubility	Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol, acetone.		

Continued on Next Page

Section 10. Stability and Reactivity Data

Stability	The product is stable.
Instability Temperature	Not available.
Conditions of Instability	Excess heat, incompatible materials, moisture
Incompatibility with various substances	Reactive with oxidizing agents, acids, alkalis. Slightly reactive to reactive with moisture. The product may react violently with water to emit flammable but non toxic gases.
Corrosivity	Non-corrosive in presence of glass.
Special Remarks on Reactivity	Incompatible with acids, halogenated hydrocarbons, NH4NO3, barium oxide, Ba(NO3)2, Cadmium, CS2, chlorates, Cl2, CrO3, F2, Hydroxylamine, Pb(N3)2, MnCl2, HNO3, performic acid, KClO3, KNO3, N2O2, Selenium, NaClO3, Na2O2, Sulfur, Te, water, (NH4)2S, As2O3, CS2, CaCl2, chlorinated rubber, catalytic metals, halocarbons, o-nitroanisole, nitrobenzene, nonmetals, oxidants, paint primer base, pentacarbonoyliron, transition metal halides, seleninyl bromide, HCl, H2SO4, (Mg +Ba(NO3)2 +BaO2), (ethyl acetoacetate +tribromoneopentyl alcohol. Contact with Alkali Hydroxides(Sodium Hydroxide, Potassium Hydroxide, Calcium Hydroxide, etc) results in evolution of hydrogen. Ammonium nitrate + zinc + water causes a violent reaction with evolution of steam and zinc oxide. May react with water.
Special Remarks on Corrosivity	Not available.
Polymerization	Will not occur.

Section 11. Toxicological Information

Routes of Entry	Inhalation. Ingestion.
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. Non-hazardous in case of inhalation.
Special Remarks on Toxicity to Animals	Lowest Published Lethal Dose: LDL [Duck] - Route: Oral; Dose: 388 mg/kg
Special Remarks on Chronic Effects on Humans	Not available.
Special Remarks on other Toxic Effects on Humans	Acute Potential Health Effects: Skin: May cause skin irritation. Dermal exposure to zinc may produce leg pains, fatigue, anorexia and weight loss. Eyes: Zinc in the forms of Zinc Metal Sheets; Zinc Metal Shot; Zinc Metal Strips; Zinc Foil; Zinc Metal sticks; Zinc Metal, mossy are not expected to get into the eyes and cause eye irritation. Ingestion: May be harmul if swallowed. May cause digestive tract irritation with tightness in throat, nausea, vomiting, diarrhea, loss of appetite, malaise, abdominal pain. fever, and chills. May affect behavior/central nervous system and autonomic nervous system with ataxia, lethargy, staggering gait, mild derrangement in cerebellar function, lightheadness, dizzness, irritability, muscular stiffness, and pain. May also affect blood. Inhalation: Not an inhalation hazard in forms of Zinc Metal Sheets; Zinc Metal Shot; Zinc Metal Strips; Zinc Foil; Zinc Metal sticks; Zinc Metal, mossy when handled under normal conditions. Inhalation of zinc dust or fumes (if metal is smelted) may cause respiratory tract and mucous membrane irritation with cough and chest pain. It can also cause "metal fume fever", a flu-like condition characterized appearance of chills, headached fever, maliase, fatigue, sweating, extreme thirst, aches in the legs and chest, and difficulty in breathing. A sweet taste may also be be present in metal fume fever, as well as a dry throat, aches, nausea, and vomiting, and pale grey cyanosis. The toxicological properties of this substance have not been fully investisgated.

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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	Not available.
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.
DOT (Pictograms)	

Section 15. Other Regulatory Information and Pictograms

Federal and State Regulations	New York release reporting list: Zinc Metal Rhode Island RTK hazardous substances: Zinc Metal Pennsylvania RTK: Zinc Metal Florida: Zinc Metal Michigan critical material: Zinc Metal Massachusetts RTK: Zinc Metal New Jersey: Zinc Metal California Director's List of Hazardous Substances: Zinc Metal TSCA 8(b) inventory: Zinc Metal TSCA 12(b) one time export: Zinc Metal SARA 313 toxic chemical notification and release reporting: Zinc Metal CERCLA: Hazardous substances.: Zinc Metal: 1000 lbs. (453.6 kg)
California Proposition 65 Warnings	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. 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.
Other Regulations	EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances (EINECS No. 231-175-3). Canada: Listed on Canadian Domestic Substance List (DSL). China: Listed on National Inventory. Japan: Not listed on National Inventory (ENCS). Korea: Listed on National Inventory (KECI). Philippines: Listed on National Inventory (PICCS). Australia: Listed on AICS.
Other Classifications	**WHMIS (Canada)** Not Available

Continued on Next Page

DSCL (EEC)

R15- Contact with water liberates extremely flammable gases.
R17- Spontaneously flammable in air.

S7/8- Keep container tightly closed and dry.

HMIS (U.S.A.)

Health Hazard	1
Fire Hazard	0
Reactivity	1
Personal Protection	B

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

Health

Flammability

Reactivity

Specific hazard

WHMIS (Canada) (Pictograms)

DSCL (Europe) (Pictograms)

TDG (Canada) (Pictograms)

ADR (Europe) (Pictograms)

Protective Equipment

Gloves.

Lab coat.

Not applicable.

Safety glasses.

Continued on Next Page

Section 16. Other Information

MSDS Code	**Z5025**
References	Not available.
Other Special Considerations	Not available.

Validated by Sonia Owen on 6/25/2009.	**Verified by Sonia Owen.** **Printed 6/25/2009.**

CALL (310) 516-8000

Notice to Reader

All chemicals may pose unknown hazards and should be used with caution. This Material Safety Data Sheet (MSDS) applies only to the material as packaged. If this product is combined with other materials, deteriorates, or becomes contaminated, it may pose hazards not mentioned in this MSDS. It shall be the user's responsibility to develop proper methods of handling and personal protection based on the actual conditions of use. While this MSDS is based on technical data judged to be reliable, Spectrum Quality Products, Inc. assumes no responsibility for the completeness or accuracy of the information contained herein.

APPENDIX C
JOB SAFETY ANALYSIS (JSA) DOCUMENTS

To be provided with Remedial Investigation/Work Plan or as required by Site activities.