Supplemental Remedial Design Work Plan (RDWP)

Site:

"Former" Debbie Cleaners
3800-3808 Nostrand Avenue
Brooklyn, New York 11235
BCP Site # C224237

Prepared For:

New York State Department of Environmental Conservation
625 Broadway
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Attn: Mr. Daniel R. Nierenberg, P.G

On Behalf of:

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Certified By:

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JUNE 2025

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1.0 Certification

I Dean Devoe, certify that I am currently a NYS registered Professional Engineer as defined in 6 NYCRR Part 375, and that this Supplemental Remedial Design Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

I certify that the information and statements in this certification are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor pursuant to Section 210.45 of the Penal Law.

Dean Devoe	*Dean Devoe*	
NYS Professional Engineer	Signature	
072513	**6/24/2025**	
NYS Professional Engineer #	Date	Stamp

It is a violation of Article 145 of the New York State Education Law for any person to alter this document in any way without express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

2.0 Introduction

On behalf of Acadia 3780-3858 Nostrand Avenue LLC (the "Volunteer"), Dean Devoe (NYS Professional Engineer # 072513) in collaboration with CNS Environmental Corp. (CNS) (collectively the "Project Team") respectfully submit this Supplemental Remedial Design Work Plan (RDWP) to perform additional remedial activities outlined herein for the Brownfields Cleanup Program (BCP) Site # C224237 known as the "Former" Debbie Cleaners site located at 3800-3808 Nostrand Avenue in Brooklyn, NY ("Site"). See Figure 1: Site Location Map.

This RDWP is being submitted to comply with the 2019 Decision Document (DD) and the Remedial Action Objectives (RAOs) included in the DD, the 2019 Remedial Action Work Plan (RAWP) and the 2021 Remedial Design Document (RD) to address source material associated with end point samples collected from the "hot spot" excavation where the NYSDEC Protection of Groundwater Soil Cleanup Objectives (PGW SCOs) were exceeded; in accordance with the December 6, 2024 virtual conference meeting with NYSDEC.

This RDWP conforms to the Brownfield Cleanup Agreement (Site # C224237), the 2019 DD, the 2019 RAWP and the 2021 RD. This RDWP presents the details of additional remedial work required by the NYSDEC consisting of additional site excavation, off-site disposal and subsequent end-point sampling within the former hot spot, which will require the disassembly and reassembly of exterior portions of the active AS/SVE system.

3.0 Site Location and Description

The BCP Site is approximately 11,152 square foot of tenant spaces and driveway behind the tenant spaces; all of which is located within the northernmost building of the Nostrand Place shopping center property located from 3780 through 3860 Nostrand Avenue in Brooklyn, Kings County, New York. The Site is abutted to the north and south by other commercial tenant spaces; to the east by Nostrand Avenue with a retail shopping center beyond; and by residential homes approximately 36.5-feet to the west. The Site currently contains four (4) tenant spaces, a basement hallway and a rear driveway identified and occupied as follows:

Occupant	Address	Description
U.S. Army Career Center* and Building Utilities	3800 Nostrand Ave.	Northern-most tenant space
Vacant (Former Chase Bank)	3804 Nostrand Ave.	Former Debbie Cleaners space; situated to South of 3800 and North of 3806
Vacant (Former Academy of Dance and Creative Arts (ADACA))	3806 Nostrand Ave.	Situated to South of 3804 and North of 3808
Vacant (Former Love 2 Sleep)	3808 Nostrand Ave.	Southern-most tenant space
Basement Hallway	--	Runs along west side of abovementioned tenant spaces with access provided from each tenant space basement, as well as from an exterior staircase at rear driveway.
Rear Driveway	--	Situated at Street-grade to the west of the abovementioned tenant spaces

*US Army Career Center moved out of their temporary space at 3808 Nostrand Avenue, and back into its original space at 3800 Nostrand Avenue between April-June 2024.

4.0 Background

From approximately 1959 through 1985, the 3804 Nostrand Avenue tenant space most recently occupied by Chase Bank had been occupied by a dry cleaner (Debbie Cleaners), which appears to have led to the dry cleaning-related chlorinated Volatile Organic Compound (cVOC) contamination of groundwater and soil vapor, and a limited area of soil. The Site has been occupied by commercial tenants, and investigations within the "Former" Debbie Cleaners space were unable to be performed prior to the Remedial Investigation (RI).

The following previous environmental reports and work plans have been completed for the Site under the BCP:

- *Remedial Investigation Work Plan* prepared by CNS dated July 2017;
- *Draft Remedial Investigation Report* prepared by CNS dated March 2018;
- *Supplemental Remedial Investigation Work Plan* prepared by CNS dated June 2018;
- *Supplemental Remedial Investigation* prepared by CNS dated September 2018;
- *Remedial Action Work Plan and Alternatives Analysis Report* prepared by CNS dated July 2019;
- *Remedial Design Document* prepared by CNS dated July 2021;
- *Updated Baseline Indoor Air Evaluation* prepared by CNS dated December 2022;
- *Semi-Annual Sampling Report* prepared by CNS dated March 2024;
- *Semi-Annual Sampling Report* prepared by CNS dated August 2024; and
- *Semi-Annual Sampling Report* prepared by CNS dated January 2025;

Based upon the findings of investigations completed and historical dry-cleaning operations, the Contaminants of Concern (COCs) identified at the site consist of dry-cleaning related cVOCs within a

limited soil source area, groundwater and soil vapor including cis-1,2-Dichloroethene (c-DCE), Tetrachloroethene (PCE), and Trichloroethene (TCE). Based on the guidance applicable to this Site pertaining to the assessment of PFAS (*NYSDEC's Sampling, Analysis, and Assessment Of Per- And Polyfluoroalkyl Substances (PFAS) under NYSDEC's Part 375 Remedial Programs* [April 2023]), both Perfluorooctanoic acid (PFOA) and Perfluorooctanesulfonic Acid (PFOS) data collected from the Site indicate levels above the guidance values of 6.7 ppt and 2.7 ppt; however, the total concentration of PFAS (including PFOA and PFOS) did not exceed 500 ppt throughout the majority of the Site.

Based on the findings of the investigations and as evaluated within the Remedial Action Work Plan and Alternatives Analysis Report (RAWP) dated July 2019, a Soil Vapor Extraction (SVE) and Air Sparging (AS) System and excavation of the soil "hot spot" were the most feasible options for the Site. As part of the RAWP, an AS/SVE System Communications Test (Pilot Test) was completed in order to adequately design and evaluate the proposed remedial system and to determine the effective Radius of Influence (ROI) for the system design. Based on the pilot test activities, the ROI was confirmed to be approximately 25-feet.

In July 2019, the NYSDEC published the Decision Document (DD) for the site, which included the following elements of the remedy:

1. Remedial Design;
2. Excavation;
3. Backfill;
4. Cover System;
5. Air Sparge with Soil Vapor Extraction (AS/SVE);
6. Vapor Mitigation*;
7. Institutional Control (Environmental Easement); and
8. Site Management Plan.

*Vapor Mitigation includes a sub-slab depressurization system (SSDS) or other acceptable measure to mitigate the migration of vapors into the building from soil and/or groundwater. As documented within the 2019 RAWP and subsequent 2021 NYSDEC-approved RD (described below), in the event that COCs are adequately addressed by the AS/SVE system operation and accepted by the NYSDEC and NYSDOH, the installation of a SSDS shall not apply.

In July 2021, the Final-certified Remedial Design (RD) Document was prepared and subsequently approved by the NYSDEC, which accomplished the following:

- Presented the remedial excavation specifics for the excavation and disposal of contaminated soil and contaminant source areas;
- Presented the remediation system design specifics for the focused remediation of chlorinated volatile organic compounds (cVOCs) and for mitigation of soil vapor intrusion through a Combined Air Sparging/Soil Vapor Extraction (AS/SVE) system to be implemented at the Site; and
- Presented a general description of the Sub-slab Depressurization System (SSDS) to be implemented upon completion of the AS/SVE system, should residual vapor intrusion concerns remain.

To address the identified contamination and in accordance with the 2019 DD, the 2019 RAWP and the 2021 RD, the Project Team completed the excavation of the soil "hot spot" located approximately 5-feet west of the 3804 Nostrand Ave. rear exit door at street grade in September 2022; where Tetrachloroethene (PCE) was previously identified at 504 ppm at the depth of 4 feet bgs. The excavation area encompassed a 20-

foot x 14.5-foot foot area, to a depth of 5-feet bgs where a total of 58.56 tons of PCE Waste was excavated and disposed of as Hazardous at Clean Earth North Jersey located in Kearny, NJ. See Figure 2: Existing Remedy Components. Prior to backfilling and restoring the area, the Project Team installed the below-grade SVE and AS lines within the rear driveway, which were connected to former monitoring wells NW-2 and NW-5 (converted to Air Sparge wells) and a newly installed Soil Vapor Extraction well; to a control box outside of the basement entry point to the manifold. Post-excavation endpoint soil samples collected from the north sidewall, south sidewall, west sidewall and bottom did not identify any cVOC COC exceedances of the NYSDEC Commercial SCOs; however, cis-1,2-Dichloroethene (c-DCE) exceeded the NYSDEC PGW SCOs within the west sidewall and bottom sample, PCE exceeded the NYSDEC PGW SCOs within all four samples, and Trichloroethene (TCE) exceeded the NYSDEC PGS SCOs within the west sidewall sample. It should be noted that a sample was not attainable from the east sidewall due to the presence of the foundation wall. See Table 1: Prior Post-Excavation Endpoint Soil Sample Results Summary.

From May 2022 through January 2023, the Project Team installed the AS/SVE System at the Site, which consisted of Rotron DR858BB72W 10.0 HP Regenerative SVE Blower and Rietschle DLR 60 5 HP Air Sparge Compressor/Heat Exchanger connected by galvanized steel piping to a 230V Control Panel with a Knockout Tank and Transfer Pump; housed within an enclosed shed located at the west side of the Site building. See Figure 2: Existing Remedy Components. This AS/SVE System is connected to and operates eight (8) soil vapor extraction wells, seven (7) air sparging wells and thirteen (13) pressure differential/vapor monitoring points. A Sensaphone Sentinel Cellular remote environmental monitoring system was also installed as part of the AS/SVE System, which provides remote power and scheduling to the system, and information on system operating status, shut downs, alarms, etc. through remote telemetry.

On October 4, 2022, a grease fire originating at the abutting Chopstix Restaurant tenant space (3796 Nostrand Avenue) occurred, and as a result the basement was flooded with the most impacted spaces consisting of Chop Stix and the US Army tenant space (3800 Nostrand Avenue); and the roofs, which had left the spaces exposed to the elements. This event delayed the execution of remedial activities, including electrical wiring, piping installation, basement cleanouts, foundation slab repairs and sealing and the installation of the final elements of the AS/SVE system. In addition, access issues were encountered in the Former Chase Bank tenant space.

From December 2022 through January 2023, the Project Team completed basement cleanouts, slab cleaning and preparation, and foundation repairs within the majority of basement tenant spaces in compliance with the RAWP. Epoxy was applied to seal the floor during this time. During this time, access to the Former US Army/Building Utilities and Chopstix tenant spaces was limited due to post-fire renovation activities.

The system was started on January 10, 2023, and balanced and stabilized daily through January 25, 2023. The system was then inspected on a monthly basis through March 31, 2023; where three rounds of start-up sampling were completed. In addition, a baseline round of groundwater samples was collected during the first month of operations (January 2023). The complete details of the installation and start-up of the AS/SVE system will be documented within the Final Engineering Report (FER). This active AS/SVE system is intended to mitigate soil vapor intrusion into the building.

Since the installation of the AS/SVE system, three (3) Semi-Annual Sampling Events and one (1) Bi-Annual Sampling Event has been conducted in accordance with the approved Monitoring Schedule included within the 2021 RD. Based on data collected during these events, remediation of the cVOC COCs at the site is underway as substantiated by decreasing indoor air contaminant levels and decreasing levels of PCE within the groundwater, coupled with slightly increased levels of its breakdown product TCE. See Table

2: Remedial Action Progress Results Summary for Groundwater Contaminants of Concern and Table 3: Remedial Action Progress Results Summary for Indoor Air Contaminants of Concerns. Based upon the vacuum and pressure data collected from the SVE and AS wells, as well as pressure field extension testing data and indoor air sample analytical results, the AS/SVE system appears to be operating efficiently and effectively.

Notwithstanding, it was the Project Team's opinion that the low-level TCE and PCE identified within the indoor air during prior Semi-Annual Sampling Events was likely attributed to the inability to complete remaining slab sealing and epoxy activities, as well as damage to newly installed epoxy coatings caused by active post-fire renovation work, which has also affected vacuum, specifically within the 3790 Nostrand Avenue tenant space.

Based on the generally occupied nature of the site and the ongoing post-fire renovations, periodic site visits were conducted in between sampling events to assess its current state. During a late April 2024 site visit, CNS observed that a raw sewage spill occurred in the basement of the Site. Due to this occurrence, damage to the prior foundation sealing and epoxy efforts was observed in the hallway and portions of the Chase tenant space; and it was determined that a thorough cleaning and repairs were needed to foundation slab. While awaiting cleanup to be completed, CNS continued to complete periodic site visits where the AS/SVE system was found to be operating as intended. In early July 2024 prior to the sampling event, CNS observed accumulated/pooled water within the 3804, 3806 and 3808 Nostrand Avenue tenant spaces which appeared to be due to a pipe leak, which also caused damage to the previously completed epoxy efforts and required repairs. The majority of these repairs were not able to be completed until July 23, 2024 through August 26, 2024; although the repairs consisted of repairing/refilling all observed foundation cracks/penetrations within the 3800, 3806 and 3808 Nostrand Avenue basement spaces, as well as resealing of drains within the 3790 Nostrand Avenue basement tenant space. The reapplication of epoxy occurred in January 2025, with the hallway epoxy to be scheduled after a thorough cleaning has been completed.

5.0 Scope of Additional Remedial Actions

The proposed additional actions of the remedy are described in the following sections of this RDWP. The RDWP will be implemented in accordance with the NYSDEC-approved RAWP and the NYSDEC-approved RD Document which includes a Health and Safety Plan (HASP) and a Quality Assurance Project Plan (QAPP). See Figure 3: Supplemental Excavation Area and Sample Locations.

Based upon the COC end-point exceedances of the NYSDEC PGW SCOs, CNS is proposing the following activities within the former "hot spot" area located within the rear alleyway at street grade:

1. Removal of approximately 420 square feet of asphalt, concrete and RCA to access the underlying material;
2. Excavation and stockpiling of the top 4-feet of clean quarry sand (previously imported from the original excavation);
3. Isolate and disassemble the AS/SVE system components within the excavation area (AS/SVE piping, AS/SVE manhole);
4. Protect and/or remove/reinstall groundwater monitoring well TW-6;
5. Additional excavation of 3-feet of native subsurface material from the north side, south side and bottom. The west side will be excavated to the furthest extent of the property line as to not affect the abutting retaining wall between the Site and the western abutting residential properties. Newly excavated native subsurface material (anticipated to be approximately 40 cubic yards) will be placed in a segregated stockpile stockpiled and sampled in accordance with disposal facility

protocols prior to being transported for off-site disposal;
6. Collection of post-excavation endpoint soil samples;
7. Re-assembly of AS/SVE system components within the excavation area*;
8. Restoration of the excavation area to pre-remediation conditions*;
9. Pre- and Post-remedial system reactivation data collection (vacuum readings, pressure readings, depth to water measurements and PID readings) and system optimization data (as appropriate);

*The excavation area will not be backfilled until analytical results are received and reviewed by the Project Team and the NYSDEC.

Mobilization and Equipment Staging

Mobilization includes field personnel orientation, equipment mobilization, marking/staking sampling locations and utility mark-outs. Each field team member will attend an orientation meeting to become familiar with the general operation of the Site, health and safety requirements, and field procedures.

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations.

Soil Excavation, Screening and Stockpile Methods

As indicated above, based upon the COC end-point exceedances of the NYSDEC PGW SCOs, the Project Team is proposing the removal of approximately 420-square feet (SF) of asphalt, concrete and RCA to access the underlying material; excavation and stockpiling of the top 4-feet of clean quarry sand (previously imported from the original excavation); and an additional excavation of 3-feet of native subsurface material from the north side, south side and bottom within the former "hot spot" area located within the rear alleyway at street grade.

The west side of the former "hot spot" will be excavated to the furthest extent of the property line as to not affect the abutting retaining wall between the Site and the western abutting residential properties. Newly excavated native subsurface material (anticipated to be approximately 40 cubic yards) will be placed in a segregated stockpile stockpiled and sampled in accordance with disposal facility protocols prior to being transported for off-site disposal;

The excavation area will not be backfilled until analytical results are received and reviewed by the Project Team and the NYSDEC.

Visual, olfactory and PID soil screening and assessment will be performed during invasive work under the supervision of the project Professional Engineer and/or Qualified Environmental Professional and will be reported in the Final Engineering Report (FER).

Excavated soil will be stockpiled separately and will be segregated from clean soil and construction materials while awaiting proper characterization for off-site disposal. Stockpile(s) will be used only when necessary and will be removed as soon as practicable. While stockpiles are in place, they will be inspected daily, and before and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection. Excavated soils will be stockpiled on, at a minimum, double layers of 8-mil minimum sheeting, will be kept covered at all times with appropriately anchored plastic tarps, and will be routinely inspected. Broken or ripped tarps will be promptly replaced. All stockpile activities will be compliant with applicable laws and regulations. Straw bales or equivalent will surround soil stockpiles except for areas where access by equipment is required. Silt fencing and straw bales (or equivalent) will be used as needed near catch basins, surface waters and other discharge points.

Characterization of Excavated Soil

Soil/fill or other excavated media that is transported off-Site for disposal will be sampled in a manner required by the receiving facility, and in compliance with applicable laws and regulations.

Stormwater Pollution Prevention

Applicable laws and regulations pertaining to storm-water pollution prevention will be addressed during the remedial program. Erosion and sediment control measures (silt fences and barriers, and straw bale checks) will be installed around the perimeter of the remedial area and inspected daily and after every storm event to ensure that they are operating appropriately. Discharge locations will be inspected to determine whether erosion control measures are effective in preventing significant impacts to receptors. Results of inspections will be recorded in a logbook, maintained at the Site and available for inspection. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and straw bale check functional. Undercutting or erosion of the silt fence anchor will be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Materials Transport

Loaded vehicles leaving the Site will comply with all applicable materials transportation requirements (including appropriate covering, manifests, and placards) in accordance with applicable laws and regulations, including use of licensed haulers in accordance with 6 NYCRR Part 364. If loads contain wet material capable of causing leakage from trucks, truck liners will be used. Queuing of trucks will be performed on-Site, when possible, in order to minimize off Site disturbance. Off-Site queuing will be prohibited.

Outbound truck transport routes will take into account the following factors: (a) limiting transport through residential areas and past sensitive sites; (b) use of mapped truck routes; (c) minimizing off-Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport. To the extent possible, all trucks loaded with Site materials will travel from the Site using the most feasible truck routes. Trucks will be prohibited from stopping or idling in the neighborhood after leaving the project Site.

Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during site remediation and development.

Off-site Materials Disposal

Following receipt and review of waste characterization analytical results, a letter and/or application will be completed and submitted to each disposal facility identifying the Site location and a description of the material to be disposed of, accompanied by the waste characterization analytical results, requesting written acceptance of the material. Prior to off-site disposal, a formal acceptance letter will be obtained from the final disposal facility.

All impacted soil/fill or other waste excavated and removed from the Site will be managed as regulated material and will be disposed in accordance with applicable laws and regulations. A manifest system for off-Site transportation of exported materials will be employed and will be reported in the FER. Hazardous wastes derived from on-Site (if encountered) will be stored, transported, and disposed of in compliance with applicable laws and regulations.

The FER will include an itemized account of the destination of all material removed from the Site during this remedial action. Documentation associated with disposal of all material will include records and approvals for receipt of the material.

Dewatering

Due to the encountered groundwater levels in the areas surrounding the excavation area (+/- 15' bgs), dewatering will not be necessary.

Post-Excavation Confirmatory Sample Analysis

Removal actions under this remedy will be performed in conjunction with post-excavation confirmatory end-point sampling. After the initial excavation, confirmatory grab soil samples will be collected and submitted for laboratory analysis to verify that the PGW SCOs and Track 2 Commercial Use SCOs have been met. Additional soil will be removed if any post-excavation confirmatory sample analytical results for any of the cVOC COCs for the Site exceed the NYSDEC PGW SCOs.

A total of four (4) post-excavation confirmatory end-point samples will be collected and analyzed for full analysis:

- Volatile Organic Compounds by EPA Method 8260;
- Semi-volatile organic compounds + 1,4-Dioxane by EPA Method 8270;
- Pesticides/PCBs by EPA Method 8081/8082;
- Target Analyte List Metals by EPA Method 6010 and 7471; and
- NYSDEC PFAS Analyte List by EPA Method 1633

Contingency

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated to the NYSDEC.

Generally, this remedy has been designed to attain compliance with the PGW SCOs and Track 4 SCOs. Verification of post-excavation conditions will be conducted and analytical results reviewed to confirm compliance has been achieved. In the event post-excavation end-point sample results exceed the applicable criteria, the NYSDEC Project Manager will be contacted, and the excavation area may be extended to the extent feasible in order to achieve compliance; without comprising the integrity of building foundations and/or the abutting residential retaining wall.

Due to groundwater levels in the areas surrounding the excavation area (+/- 15' bgs), dewatering will not be necessary; however, in the event dewatering is required, dewatering will be completed in compliance with city, state, and federal laws and regulations. Extracted groundwater will either be containerized for off-site licensed or permitted disposal or will be treated under a permit from New York City Department of Environmental Protection (NYCDEP) to meet pretreatment requirements prior to discharge to the sewer system.

Quality Assurance/Quality Control Procedures

QA/QC procedures will be used to provide performance information with regard to accuracy, precision, sensitivity, representation, completeness, and comparability associated with the sampling and analysis for this investigation. Field QA/QC procedures will be used (1) to document that samples are representative of actual conditions at the Site and (2) identify possible cross-contamination from field activities or sample transit. Laboratory QA/QC procedures and analyses will be used to demonstrate whether analytical results have been biased either by interfering compounds in the sample matrix, or by laboratory techniques that may have introduced systematic or random errors to the analytical process. QA/QC samples (field and trip blanks, will be collected and analyzed at an ELAP-certified laboratory.

Survey

The limits of excavation and the location of final end-point samples will be surveyed by a New York State licensed surveyor after the completion of related construction activities in accordance with DER-10, Section 5.8(b)(8)(ii) and (iv). The survey will define the top elevation of residual contaminated soils and will constitute the written record of the upper surface of the 'Residuals Management Zone' in the SMP. This information will be provided on "As-Built" drawings provided within the FER and SMP.

Dismantling, Reinstallation and Reactivation of AS/SVE System

Prior to the dismantling of AS/SVE system components within the excavation area, pre-reactivation data shall be collected and will include vacuum, pressure, depth to water and PID readings data.

Prior to any excavation activities and throughout the duration of the work, the affected AS lines (AS-6 and AS-7) shall be isolated and shut-off at the AS manifold located within the AS/SVE system enclosure and the affected SVE line (EX-8) shall be isolated and shut-off at the isolation valve located in the basement hallway, then capped outside the foundation wall within the control box. The remaining interior AS/SVE components shall be adjusted and remain active. Once the affected AS/SVE lines are uncovered, the affected piping will be temporarily dismantled to perform the additional soil excavation and sampling efforts described herein

Following completion of excavation activities and confirmed post-excavation end-point soil sample compliance with applicable criteria, the affected AS/SVE system components shall be reinstalled to the specifications outlined within the NYSDEC-approved RD Document (2021), as follows:

- AS/SVE piping shall be installed below-grade to an approximate depth of 2.5-feet bgs and routed back through the foundation wall into the main manifold located in the basement;
- The SVE piping to the headline will consist of 2-inch diameter Schedule 40 PVC connected to the well (EX-8) with a Schedule 40 PVC reducing tee;
- The AS piping will consist of 1-inch diameter Schedule 40 PVC connected to each respective well (AS-6 and AS-7) connected to 1-inch diameter 200 Degree (min.) rated hosing to the main manifold;
- The 2' x 2' manhole will be reinstalled within the street-grade rear driveway in order to access the gate valve and vacuum gauge on the SVE well line.

Following reinstallation of the affected AS/SVE system components, all piping and connections will be inspected for evidence of damage, cracks or leaks, and if identified, shall be repaired or resealed as necessary.

The affected AS/SVE system components will then be brought back into service and post-reactivation data

will be obtained and used to balance and stabilize the system to pre-reactivation levels.

Import of Clean Fill/Backfill

All imported fill material used below and within the cover layer to meet the pre-excavation elevations and grades, will meet DER-10 backfill and cover soil quality objectives for the site.

Sources of backfill and/or cover soil to be imported to the Site will be evaluated by the Professional Engineer and will be uncontaminated, clean soil or sand that meets the allowable constituent levels for the use of the Site; or allowable material other than soil (ex. Virgin quarry gravel, rock, stone, RCA) permitted for use in accordance with DER-10.

The imported uncontaminated, clean material will be from an approved source/facility and will be evaluated by the Professional Engineer to ensure:

- That a segregated stockpile is properly maintained at the source and will not be comingled with any other material prior to importing and grading the clean soil material at the Site;
- That the material does not include any solid waste, including construction and demolition material;
- That screening for evidence of contamination by visual, olfactory and PID soil screening practices prior to testing at the source as well as upon importing to the Site for grading is completed; and
- That samples will be collected from the segregated stockpile at the source, and analyzed for the following parameters:
  - Volatile Organic Compounds (VOCs) via EPA Method 8260
  - Semi-Volatile Organic Compounds (SVOCs) via EPA Method 8270
  - Polychlorinated Biphenyls (PCBs) via EPA Method 8082
  - Pesticides via EPA Method 8081
  - Target Analyte List (TAL) Metals + Hexavalent Chromium & Cyanide via EPA Method 6010
  - NYSDEC PFAS Analyte List by EPA Method 1633

Recycled concrete aggregate (RCA), gravel, rock or stone will be imported from facilities permitted or registered by NYSDEC. Facilities will be identified in the FER. The PE and/or QEP will be responsible for ensuring that the facility is compliant with 6 NYCRR Part 360 registration and permitting requirements for the period of acquisition of the material. RCA, gravel, rock or stone meeting the requirements under DER-10 imported from compliant facilities will not require additional testing, unless required by NYSDEC under its terms for operation of the facility. RCA, gravel, rock or stone imported to the Site must be derived from recognizable and uncontaminated concrete. RCA, gravel, rock or stone material is not acceptable for and will not be used as cover material.

Prior to the proposed imported material being brought on Site, documentation of the source will be provided to the NYSDEC for approval, which will include the source location, sample analytical results and any state or local approvals as a fill source or brief history of where the source soil originated from.

Materials approved and imported to the Site will be subject to inspection, as follows:

- Trucks with imported material will be in compliance with applicable laws and regulations and will enter the Site at the designated location.
- The Professional Engineer will ensure that every truck load of imported material is inspected for evidence of contamination via visual, olfactory and PID screening of the material for evidence of contamination; and
- Fill material will be free of solid waste including pavement materials, debris, stumps, roots, and other organic matter, as well as ashes, oil, perishables or foreign matter.

All materials received for import to the Site will be approved by the Professional Engineer and will be in compliance with provisions of the RAWP. The FER will report the source of the fill, evidence that an inspection was performed on the source, analytical results, frequency of testing, a Site map indicating the locations where backfill or soil cover was placed and Bills of Lading.

Site Restoration

As stated above, all imported fill material used below and within the cover layer to meet the pre-excavation elevations and grades, will meet DER-10 backfill and cover soil quality objectives for the site. Prior to backfill material being imported, the Project Team will ascertain and review analytical results to determine the backfill materials meet NYSDEC requirements. The Site will be regraded after backfilling is completed and prepared for surficial restoration. Disturbed areas will be restored with concrete and/or asphalt to repair and restore the cover system.

Community Air Monitoring Program

Throughout the duration of these activities, air quality will be monitored at the perimeters of the work area with a Photo Ionization Detector (PID) and Real-time Particulate Monitoring (PM-10) equipment. Work will stop if levels or organic vapors and/or particulate levels exceed OSHA and/or NIOSH action levels, until particulate levels are reduced, and proper site controls are enacted in the remediation zone.

Continuous monitoring will be performed during all operations which have the potential for coming into contact with potentially contaminated materials. All data will be recorded.

Real-time monitoring will be completed in compliance with New York State Department of Health (NYSDOH) Generic CAMP, May 2010, Appendix 1A and 1B of NYSDEC DER-10. Particulate monitors will have datalogging capability and the SST will manually inspect the readings every 15-minutes and log accordingly.

A comprehensive Community Air Monitoring Program is included in Appendix A: Health and Safety Plan attached hereto.

6.0 Reporting

Daily reports will be completed for each day of field activities and provided to NYSDEC and NYSDOH, which shall include daily CAMP monitoring results. Laboratory analytical results will be provided to NYSDEC with the subsequent BCP Monthly Progress Report upon receipt of the results. Following implementation of the NYSDEC-approved RDWP, the findings and analytical results will be summarized within the Final Engineering Report (FER).

7.0 Schedule

The following schedule outlines the duration of each activity required to obtain a 2025 Certificate of Completion for the Site. Start date of these activities are highly contingent on the availability of contractors, disposal facility approvals, tenant operations, and NYSDEC/NYSDOH review of data prior to backfilling the excavation area to complete the supplemental remedy. The NYSDEC will be provided with a 5-business day notification prior to on-site work activities.

Task	Start Date	Duration
SRDWP Work Activities outlined herein	July 7, 2025	Est. 2 weeks
Basement Hallway Cleanout, Sealing & Epoxy Application	July 21, 2025	Est. 1 week
Updated SMP Submission	In Progress	Est. 4-8 weeks
Updated FER Submission	July 28, 2025	Est. 4-6 weeks
Certificate of Completion	--	By December 31, 2025

Figure 1: Site Location Map

Figure 1

Site Location Map

Figure 2: Existing Remedy Components

KEY:
- = AIR SPARGE (AS) WELL
- = AIR SPARGE (AS) PIPING
- = SOIL VAPOR EXTRACTION (SVE/EX) WELL
- = SOIL VAPOR EXTRACTION (SVE/EX) PIPING
- = SVE/EX RADIUS OF INFLUENCE (ROI)
- = VAPOR MONITORING POINT (VMP)
- = GROUNDWATER MONITORING WELL (SAMPLED 1x EVERY 2 YEARS)
- = GROUNDWATER MONITORING WELL (SAMPLED 1x EVERY 6 MONTHS)
- = INDOOR AIR SAMPLE LOCATION (SAMPLED 1x EVERY 2 YEARS)
- = INDOOR AIR SAMPLE LOCATION (SAMPLED 1x EVERY 6 MONTHS)

RESIDENTIAL HOME BACKYARDS
(DEPTH = ~ 36'6" WEST OF PROPERTY LINE)

SOIL "HOT SPOT" EXCAVATION AREA (5-FEET BGS)
20-FEET
14.5-FEET
STREET LEVEL
BASEMENT LEVEL
AS LINES FROM BASEMENT
TENANT DUMPSTERS
EXTERIOR AS/SVE MANHOLE
BASEMENT SVE HEADLINE
GREASE TRAP
BOLLARD
ASSIVE SYSTEM SHED AT STREET LEVEL
A.S. MANIFOLD
PARKING GARAGE ENTRANCE RAMP
SPRINKLER ROOM
FORMER SUMP (SEALED)
VENT AT TOP OF COLUMN
STOVE/VENT
FLOOR DRAIN
WASHER/DRYER
FREEZER
STORAGE
OFFICE/STORAGE
DUMB WAITER
MEZZANINE SHELF
UP
DN

TW-4, TW-5, TW-6, TW-10, TW-13, TW-15, NW-1, NW-3, NW-4, NW-7, NW-8
(FORMER NW-5), (FORMER NW-2)
AS-1, AS-2, AS-3, AS-4, AS-5, AS-6, AS-7
EX-1, EX-2, EX-3, EX-4, EX-5, EX-6, EX-7, EX-8
VMP-1 (SS-16), VMP-2, VMP-3 (SS-15), VMP-4, VMP-5, VMP-6 (SS-1), VMP-7 (SS-2), VMP-8 (SS-3), VMP-9 (SS-6), VMP-10 (SS-8), VMP-11 (SS-7), VMP-12, VMP-13 (SS-13)
9808S-IA, 3808C-IA, 3806-IA, 3804-IA, 3800-IA, 3790-IA, 3810-IA

15, 18, 24, 27, 30, 33, 34, 35, 49, 52, 58

3804	3810	3808	3806	3804	3800	3790
PARKING GARAGE 17,393 SQ. FT.	VANKA CAFE 1,954 SQ. FT.	VACANT (FORMER LOVE 2 SLEEP) 2,311 SQ. FT.	VACANT (FORMER ADACA) 1,467 SQ. FT.	VACANT (FORMER CHASE BANK) 2,717 SQ. FT.	US ARMY CENTER (GROUND FLOOR) BUILDING UTILITIES (BASEMENT) 723 SQ. FT.	VACANT (FORMER CHOPSTIX) 3,012 SQ. FT.

NOSTRAND AVENUE

DD	APVD BY:				APVD
CP	CHKD BY:				BY
JL	DWN BY:				DATE
				REVISION	

SITE NO. BCP C224237

"FORMER" DEBBIE CLEANERS
3800-3808 NOSTRAND AVENUE
BROOKLYN, NY 11235

FIGURE 2

EXISTING REMEDY COMPONENTS

STATE OF NEW YORK
DEAN DEVOE
072513
LICENSED PROFESSIONAL ENGINEER
Dean Devoe

CNS ENVIRONMENTAL
LEGAL ESTATE SERVICES COMPANY
208 NEWTOWN RD
PLAINVIEW, NY 11803
www.cnsenviro.com

DATE 01/26/2023
CNS JOB # D196
SCALE 1" = 20'0"

Figure 3: Supplemental Excavation Area and Sample Locations

KEY:

- = PROPOSED SUPPLEMENTAL EXCAVATION AREA
- = PROPOSED POST-EXCAVATION SOIL ENDPOINT SAMPLE LOCATION
- = SOIL "HOT SPOT" EXCAVATION AREA (SEPTEMBER 2022)
- = POST-EXCAVATION SOIL ENDPOINT SAMPLE LOCATION (SEPTEMBER 2022)
- = AIR SPARGE (AS) WELL
- = AIR SPARGE (AS) PIPING
- = SOIL VAPOR EXTRACTION (SVE/EX) WELL
- = SOIL VAPOR EXTRACTION (SVE/EX) PIPING
- = AS/SVE RADIUS OF INFLUENCE (ROI)
- = VAPOR MONITORING POINT (VMP)
- = GROUNDWATER MONITORING WELL (SAMPLED 1x EVERY 2 YEARS)
- = GROUNDWATER MONITORING WELL (SAMPLED 1x EVERY 6 MONTHS)
- = INDOOR AIR SAMPLE LOCATION (SAMPLED 1x EVERY 2 YEARS)
- = INDOOR AIR SAMPLE LOCATION (SAMPLED 1x EVERY 6 MONTHS)
- = ABANDONED GROUNDWATER MONITORING WELL
- = FORMER SOIL BORING LOCATION

RESIDENTIAL HOME BACKYARDS
(DEPTH = ~ 36'6" WEST OF PROPERTY LINE)

PROPOSED SUPPLEMENTAL EXTENDED SOIL "HOT SPOT" EXCAVATION AREA (8-FEET BGS)

SEPTEMBER 2022 SOIL "HOT SPOT" EXCAVATION AREA (5-FEET BGS)

STREET LEVEL

BASEMENT LEVEL

STREET LEVEL

NOSTRAND AVENUE

3804	3810	3808	3806	3804	3800	3790
PARKING GARAGE 17,393 SQ. FT.	VANKA CAFE 1,954 SQ. FT.	VACANT (FORMER LOVE 2 SLEEP) 2,311 SQ. FT.	VACANT (FORMER ADACA) 1,467 SQ. FT.	VACANT (FORMER CHASE BANK) 2,717 SQ. FT.	US ARMY CENTER (GROUND FLOOR) / BUILDING UTILITIES (BASEMENT) 723 SQ. FT.	VACANT (FORMER CHOPSTIX) 3,012 SQ. FT.

REVISION	DATE	BY	APVD

DWN BY: JL | CHKD BY: CP | APVD BY: DD

SITE NO. BCP C224237

"FORMER" DEBBIE CLEANERS
3800-3808 NOSTRAND AVENUE
BROOKLYN, NY 11235

FIGURE 3

SUPPLEMENTAL EXCAVATION AREA & SAMPLE LOCATIONS

STATE OF NEW YORK
DEAN DEVOE
072513
LICENSED PROFESSIONAL ENGINEER
Dean Devoe

CNS ENVIRONMENTAL
208 NEWTOWN RD
PLAINVIEW, NY 11803
www.cnsenviro.com

DATE 01/14/2025

CNS JOB # D196

SCALE 1" = 20'0"

Table 1: Prior Post-Excavation Endpoint Soil Sample Results Summary

Table 1: Prior Post-Excavation Endpoint Soil Sample Results Summary (September 2022)
BCP Site # C224237

Sample ID: Location: Depth(s) of Sample: Sampling Date: Medium:		EP-AOC1-SW-S1A South Wall 4' bgs 9/26/2022 Soil	EP-AOC1-WW-S2A West Wall 4' bgs 9/26/2022 Soil	EP-AOC1-NW-S3A North Wall 4' bgs 9/26/2022 Soil	EP-AOC1-BE-S4A Bottom 5' bgs 9/26/2022 Soil	Protection of Groundwater SCO	Commercial SCO
Volatile Organic Compounds							
1,1,1-Trichloroethane	ppm	ND	ND	ND	ND	0.68	500
1,1,2,2-Tetrachloroethane	ppm	ND	ND	ND	ND	N/A	N/A
1,1,2-Trichloroethane	ppm	ND	ND	ND	ND	N/A	N/A
1,1-Dichloroethane	ppm	ND	ND	ND	ND	0.27	240
1,1-Dichloroethene	ppm	ND	ND	ND	ND	0.33	500
1,1-Dichloropropene	ppm	ND	ND	ND	ND	N/A	N/A
1,2,3-Trichlorobenzene	ppm	ND	ND	ND	ND	N/A	N/A
1,2,3-Trichloropropane	ppm	ND	ND	ND	ND	N/A	N/A
1,2,4-Trichlorobenzene	ppm	ND	ND	ND	ND	N/A	N/A
1,2,4-Trimethylbenzene	ppm	ND	ND	ND	ND	3.6	190
1,2-Dibromo-3-chloropropane	ppm	ND	ND	ND	ND	N/A	N/A
1,2-Dibromoethane	ppm	ND	ND	ND	ND	N/A	N/A
1,2-Dichlorobenzene	ppm	ND	ND	ND	ND	1.1	500
1,2-Dichloroethane	ppm	ND	ND	ND	ND	0.02	30
1,2-Dichloropropane	ppm	ND	ND	ND	ND	N/A	N/A
1,3-Dichlorobenzene	ppm	ND	ND	ND	ND	2.4	280
1,3,5-Trimethylbenzene	ppm	ND	ND	ND	ND	8.4	190
1,4-Dichlorobenzene	ppm	ND	ND	ND	ND	1.8	130
1,4-Dioxane	ppm	ND	ND	ND	ND	0.1	130
2-Hexanone	ppm	ND	ND	ND	ND	N/A	N/A
4-Methyl-2-pentanone	ppm	ND	ND	ND	ND	N/A	N/A
Acetone	ppm	ND	ND	ND	ND	0.05	500
Benzene	ppm	ND	ND	ND	ND	0.06	44
Bromochloromethane	ppm	ND	ND	ND	ND	N/A	N/A
Bromodichloromethane	ppm	ND	ND	ND	ND	N/A	N/A
Bromoform	ppm	ND	ND	ND	ND	N/A	N/A
Bromomethane	ppm	ND	ND	ND	ND	N/A	N/A
Carbon Disulfide	ppm	ND	ND	ND	ND	N/A	N/A
Carbon tetrachloride	ppm	ND	ND	ND	ND	0.76	22
Chlorobenzene	ppm	ND	ND	ND	ND	1.1	500
Chloroethane	ppm	ND	ND	ND	ND	N/A	N/A
Chloroform	ppm	ND	ND	ND	ND	0.37	350
Chloromethane	ppm	ND	ND	ND	ND	N/A	N/A
cis-1,2-Dichloroethene	ppm	**0.006**	**0.26**	**0.029**	**0.3**	0.25	500
cis-1,3-Dichloropropene	ppm	ND	ND	ND	ND	N/A	N/A
Cyclohexane	ppm	ND	ND	ND	ND	N/A	N/A
Dibromochloromethane	ppm	ND	ND	ND	ND	N/A	N/A
Dichlorodifluoromethane	ppm	ND	ND	ND	ND	N/A	N/A
Ethylbenzene	ppm	ND	ND	ND	ND	1	390
Hexachlorobenzene	ppm	ND	ND	ND	ND	3.2	6
Isopropylbenzene	ppm	ND	ND	ND	ND	N/A	N/A
p-Isopropyltoluene	ppm	ND	ND	ND	ND	N/A	N/A
m&p-Xylene	ppm	ND	ND	ND	ND	1.6	500
Methyl ethyl ketone	ppm	ND	ND	ND	ND	0.12	500
Methyl t-butyl ether (MTBE)	ppm	ND	ND	ND	ND	0.93	500
Methylacetate	ppm	ND	ND	ND	ND	N/A	N/A
Methylcyclohexane	ppm	ND	ND	ND	ND	N/A	N/A
Methylene chloride	ppm	ND	ND	ND	ND	0.05	500
Naphthalene	ppm	ND	ND	ND	ND	12	500
n-Butylbenzene	ppm	ND	ND	ND	ND	12	500
n-Propylbenzene	ppm	ND	ND	ND	ND	3.9	500
o-Xylene	ppm	ND	ND	ND	ND	1.6	500
sec-Butylbenzene	ppm	ND	ND	ND	ND	11	500
Styrene	ppm	ND	ND	ND	ND	N/A	N/A
tert-Butylbenzene	ppm	ND	ND	ND	ND	5.9	500
Tetrachloroethene	ppm	**2.6**	**21**	**3.2**	**10**	1.3	150
Toluene	ppm	ND	ND	ND	ND	0.7	500
Total Xylenes	ppm	ND	ND	ND	ND	1.6	500
trans-1,2-Dichloroethene	ppm	ND	**0.0018**	**0.0015**	**0.0017**	0.19	500
trans-1,3-Dichloropropene	ppm	ND	ND	ND	ND	N/A	N/A
Trichloroethene	ppm	**0.008**	**0.58**	**0.23**	**0.45**	0.47	200
Trichlorofluoromethane	ppm	ND	ND	ND	ND	N/A	N/A
Trichlorotrifluoroethane	ppm	ND	ND	ND	ND	N/A	N/A
Vinyl chloride	ppm	ND	ND	ND	ND	0.02	13

NOTES
All results are presented in parts per million (ppm)
Results in **BOLD** were detected above the Laboratory's Minimum Detection Limit, but below all applicable regulatory guidance values
Results exceed the NYSDEC Protection of Groundwater SCOs
Results exceed the NYSDEC Commercial SCOs
N/A = No Regulatory Standard Available
Protection of Groundwater SCOs = 6 NYCRR Part 375, Table 375-6.8 (b) Restricted Use Soil Cleanup Objectives, Protection of Groundwater (12/2006)
Commercial SCOs = 6 NYCRR Part 375, Table 375-6.8 (b) Restricted Use Soil Cleanup Objectives, Commercial for the Protection of Public Health (12/2006)

Table 2: Remedial Action Progress Results Summary for Groundwater Contaminants of Concern

Table 2: Remedial Action Progress Results Summary for Groundwater Contaminants of Concern

BCP Site # C224237: "Former" Debbie Cleaners

Contaminant of Concern:			c-1,2-DCE (ppb)	PCE (ppb)	TCE (ppb)	VC (ppb)	PFOA (ppt)	PFOS (ppt)
NYSDEC GW Standard:			5 ppb	5 ppb	5 ppb	2 ppb	6.7 ppt	2.7 ppt
NW-1	Former ADACA (Grade Level Sidewalk) 3806 Nostrand Avenue	1/29/2025	13	130	14	ND	54.9	27.5
NW-3	Former ADACA (Basement) 3806 Nostrand Avenue	1/29/2025	13	18	4.1	0.29	34.2	26.9
NW-7	Former Love 2 Sleep (Basement, Northwest) 3808 Nostrand Avenue	1/29/2025	5	78	4.7	ND	23.6	4.48
NW-8	Former Love 2 Sleep (Basement, Northeast) 3808 Nostrand Avenue	1/29/2025	17	48	7.5	ND	47.9	36
TW-4	Rear Driveway (Grade Level) Rear of 3808 Nostrand Avenue	1/29/2025	11	65	8.5	ND	49.1	27.9
TW-5	Rear Driveway (Grade Level) Rear of 3808 Nostrand Avenue	1/29/2025	26	25	6.2	ND	56.3	6.74
TW-6	Rear Driveway (Grade Level) Rear of 3804 Nostrand Avenue	1/29/2025	58	23	18	0.76	39.7	33.1
TW-10	Chase Bank (Basement, West) 3804 Nostrand Avenue	1/29/2025	22	22	2.3	ND	31.6	29.2
TW-13	U.S. Army/Building Utilities (Basement, East) 3800 Nostrand Avenue	1/29/2025	0.64	2.2	0.32	ND	14	55.2
TW-15	Parking Garage (Basement, Center)	1/29/2025	28	140	16	1.6	43.8	19.6

Notes:

All results presented in parts per billion (ppb); with exception to PFOA and PFOS presented in parts per trillion (ppt)

ND = Not Detected

Results in Bold exceed the NYSDEC Groundwater Standard

AS/SVE System started on 1/10/2023; balanced/stablized through 1/25/2023; and has continously operated since 1//26/2023.

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Table 3: Remedial Action Progress Results Summary for Indoor Air Contaminants of Concern

Table 3: Remedial Action Progress Results Summary for Indoor Air Contaminants of Concern

BCP Site # C224237: "Former" Debbie Cleaners

Contaminant of Concern:			Carbon Tetrachloride (ug/m^3)	c-1,2-DCE (ug/m^3)	PCE (ug/m^3)	TCE (ug/m^3)
Air Guideline Value			--	--	**30**	**2**
Immediate Action Level			--	--	**300**	**20**
Minimum Matrix Value			**0.2**	**0.2**	**3**	**0.2**
3790-IA	**Chopstix Basement (Southeast) 3790 Nostrand Avenue**	**1/29/2025**	**0.51**	ND	ND	ND
3800-IA	**U.S. Army/Building Utilities Basement (South) 3800 Nostrand Avenue**	**1/29/2025**	**0.48**	ND	ND	ND
3804-IA	**Chase Bank Basement (Center) 3804 Nostrand Avenue**	**1/29/2025**	**0.43**	ND	ND	ND
3806-IA	**Former ADACA Basement (Center) 3806 Nostrand Avenue**	**1/29/2025**	**0.43**	ND	ND	ND
3808C-IA	**Former Love 2 Sleep Basement (Center) 3808 Nostrand Avenue**	**1/29/2025**	**0.5**	ND	ND	ND
3808S-IA	**Former Love 2 Sleep Basement (Southwest) 3808 Nostrand Avenue**	**1/29/2025**	**0.5**	ND	ND	ND
3810-IA	**Vanka Café Basement 3810 Nostrand Avenue**	**1/29/2025**	**0.45**	ND	0.25	ND

Notes:

All results presented in micrograms per cubic meter ($\mu_{g/m3}$)

ND = Not Detected

Results in Bold exceed the NYSDOH Minimum Matrix Value for Indoor Air

AS/SVE System started on 1/10/2023; balanced/stablized through 1/25/2023; and has continously operated since 1//26/2023.

*Carbon Tetrachloride identified at 0.43 ug/m3 in the Outdoor Air

Appendix A: Health & Safety Plan (including Community Air Monitoring Program)

Health and Safety Plan

Site:

"Former" Debbie Cleaners
3800-3808 Nostrand Avenue
Brooklyn, New York 11235
BCP Site # C224237

Prepared For:

New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233-7016
Attn: Mr. Daniel R. Nierenberg, P.G.
Project Manager

On Behalf of:

Acadia 3780-3858 Nostrand Avenue, LLC
411 Theodore Fremd Avenue, Suite 300
Rye, New York 10580

Prepared By:

Dean Devoe, NYS Professional Engineer # 072513
and CNS Environmental Corp.
208 Newtown Road
Plainview, NY 11803
CNS Job #: D196

MAY 2025

TABLE OF CONTENTS

1.0 Introduction

Dean Devoe (NYS Professional Engineer # 072513) in collaboration with by CNS Environmental Corp. (CNS) (collectively the "Project Team") were retained by Acadia 3780-3858 Nostrand Avenue, LLC (the Applicant) to prepare this *Health and Safety Plan* (HASP) for Brownfields Cleanup Program (BCP) Site # C224237 known as the "Former" Debbie Cleaners site located at 3800-3808 Nostrand Avenue in Brooklyn, NY ("Site").

The BCP Site is approximately 11,152 square foot of tenant spaces and driveway behind the tenant spaces; all of which is located within the northernmost building of the Nostrand Place shopping center property located from 3780 through 3860 Nostrand Avenue in Brooklyn, Kings County, New York. The Site is abutted to the north and south by other commercial tenant spaces; to the east by Nostrand Avenue with a retail shopping center beyond; and by residential homes approximately 36.5-feet to the west. The Site currently contains four (4) tenant spaces, a basement hallway and a rear driveway identified and occupied as follows:

Occupant	Address	Description
U.S. Army Career Center* and Building Utilities	3800 Nostrand Ave.	Northern-most tenant space
Vacant (Former Chase Bank)	3804 Nostrand Ave.	Former Debbie Cleaners space; situated to South of 3800 and North of 3806
Vacant (Former Academy of Dance and Creative Arts (ADACA))	3806 Nostrand Ave.	Situated to South of 3804 and North of 3808
Vacant (Former Love 2 Sleep)	3808 Nostrand Ave.	Southern-most tenant space
Basement Hallway	--	Runs along west side of abovementioned tenant spaces with access provided from each tenant space basement, as well as from an exterior staircase at rear driveway.
Rear Driveway	--	Situated at Street-grade to the west of the abovementioned tenant spaces

*US Army Career Center moved out of their temporary space at 3808 Nostrand Avenue, and back into its original space at 3800 Nostrand Avenue between April-June 2024.

From approximately 1959 through 1985, the tenant space currently most recently occupied by Chase Bank (3804 Nostrand Avenue) was occupied by a dry cleaner (Debbie Cleaners), which appears to have led to the dry cleaning-related chlorinated Volatile Organic Compound (cVOC) contamination of groundwater and soil vapor, and a limited area of soil.

Based upon the findings of prior investigations conducted under the BCP agreement, dry-cleaning related cVOCs are present above regulatory levels within the Site groundwater and soil vapor, and in a suspected source area in the Site soil.

As a result, CNS has developed the following HASP procedures for all field personnel to follow during all investigation, remediation and excavation activities. The CNS Site Safety Officer (SSO) will be responsible for informing all field technical personnel of the pertinent level of personal protection required and work rules to be observed. The SSO will also maintain a daily sign in sheet to document all on-site personnel and visitors. No smoking, eating, chewing of tobacco, or use of lip balm will be permitted on the subject site during any activity that disturbs the site's surficial soils. Under no circumstance will excavation activities commence prior to completion of utility mark-out activities.

The HASP requirements are based on currently available information and a preliminary analysis of associated potential hazards. This plan establishes the minimum protocols necessary for protecting all on-site field personnel. All field technical personnel will be equipped with personnel protection/safety equipment which, at a minimum, meets the requirements of this HASP.

1.1 Project Personnel

Professional Engineer/Site Safety Officer:	Mr. Dean Devoe	(516) 932-3228
Senior Project Manager (CNS Environmental):	Mr. Charles Powers	
Environmental Scientist/Site Safety Technician (CNS Environmental):	Mr. Shawn McAleese	
Facility Contact:	Mr. John Bucci	(914) 288-8100

1.1.1. Professional Engineer / Site Safety Officer

The Professional Engineer (PE) has overall responsibility for the implementation of all remedial actions on the Site; and will also act as the Site Safety Officer (SSO) who has overall responsibility for the implementation of this HASP. The SSO will maintain communications with the Senior Project Manager (SPM), provide monitoring and records of activities. The SSO is responsible for the enforcement of safety protocols and procedures of this project and will be responsible for the resolution of any day-to-day health and safety issues which arise during the conduct of site work. Health and safety-related issues will be determined by the SPM and the proper action plan (i.e. level of protection required) will be conveyed to the SSO for implementation.

1.1.2. Senior Project Manager

The Senior Project Manager (SPM) has overall responsibility for the health and safety of the HASP activities on the site. The SPM will approve any changes to this plan due to modification of procedures or newly proposed site activities and is responsible for the development of safety protocols and procedures. The Site Safety Officer (SSO) will report to the SPM and will notify the SPM of any health and safety deficiencies or problems requiring a specific action or level of protection required.

1.2 Applicable Health & Safety Standards

Since this site is not a hazardous waste site or treatment facility, as defined by 29 CFR 1910.120, the specific requirements of that training standard are not applicable. Personnel will be required to understand the potential hazard of the work and will be instructed in the proper methods for avoiding contamination, for mitigating any environmental damages, and on the use of necessary personnel protective equipment (PPE). Workers involved in tasks which require any soil disturbance where inhalation, skin contact, or ingestion are possible routes of exposure, must be properly trained and qualified to wear personal protective equipment noted in Sections 5.0 and 8.0, herein. Work at protection Level B and C will require the additional training and medical qualifications set forth in CFR 1910.120.

The remedial activity must conform with safety requirements of all applicable sections of OSHA regulations found in 29 CFR 1926, 29 CFR 1200 and the General Safety Standards. The Site Safety Technician (SST) will provide area monitoring to determine and to document potential exposure levels during various tasks, but it will be the responsibility of the contractor safety supervisor(s) to alert their workers of potential hazards, to maintain any necessary medical records and to immediately notify the SPM,

SSO and the owner of any unusual conditions, accidents, illnesses, near misses and property damage. Complete records of all accidents and illnesses will be required by the contractor. Serious accidents, first aid, spills, or any unusual hazards must be reported immediately upon occurrence.

2.0 Potential Chemical Exposure

Based on site-specific information acquired as part of investigation activities; potential environmental soil exposures maybe encountered. The Contaminants of Concern (COCs) identified at the site consist of dry-cleaning related cVOCs within a limited soil source area, groundwater and soil vapor including cis-1,2-Dichloroethene (c-DCE), Tetrachloroethene (PCE), and Trichloroethene (TCE); however, may also include low level Semi-Volatile Organic Compounds (SVOCs) and Metal contaminants associated with historic urban fill material commonly found within the New York City boroughs.

The most likely routes of exposure are breathing of vapors and/or particulate-laden air released during soil disturbing activities. Dermal contact is also a potential exposure pathway. The remaining sections of this HASP address procedures (including training, air monitoring, work practices, and emergency response) to reduce the potential exposure to these contaminants.

The potential adverse health effects from the broad classes of contaminants potentially present at the site are diverse and potentially severe. Although many of these contaminants are known or suspected to result in chronic illness from long duration exposures, due to the limited nature of the field activities, acute effects are both more likely to be of concern and noticeable.

- Typical symptoms of acute exposure, particularly to VOC's and SVOCs are irritated eyes, nose or upper respiratory tract, headache, nausea, drowsiness, dizziness and difficulty breathing.
- Long-term exposure to heavy metals, such as lead and mercury, can affect the central nervous system, kidneys, and immune system, particularly in young children. In adults, lead may decrease reaction time, cause weakness in fingers, wrists, or ankles, and possibly affect the memory.

This HASP addresses potential environmental hazards from the presence of potentially hazardous materials. It is not intended to address the normal hazards of construction work, which are covered by OSHA regulations and/or local and state construction codes or regulations.

2.1 General Hazard Assessment

The probability of worker exposure to an environmental hazard varies with the job task. The job tasks that involve contact with potentially contaminated soils are expected to have a greater potential for exposure than job tasks that do not come into contact with the soil. Site workers may be exposed to VOCs, SVOCs or Metals by inhalation, ingestion, and/or dermal contact. To protect potentially exposed personnel, zones may be established, dust control measures will be implemented, respirators and personal protective equipment may be worn, and initial personal air monitoring will be conducted.

2.2 Chemical Vapor Exposures

Chemical compounds have been detected in soil samples associated with this project. The main route of exposure for many compounds is inhalation, and secondary exposure may be absorbed through the skin. Exposure to airborne concentrations of various compounds will be controlled by monitoring and the use of personal protective equipment, if and when required noted in Sections 5.0 and 8.0, herein.

2.3 Category 1 Above-Grade Remedial Activities; Limited Soil Disturbance/Contact

It is anticipated that the following activities occurring above-grade that require minimal soil disturbance should not result in contact with potentially contaminated soil or require additional Health and Safety (H&S) considerations beyond good H&S practices already in place for this type of remediation project. These tasks may include Surveying, Surface Grading, Paving-Curb & Sidewalk Work.

These operations will be conducted within the remediation work zone and will be evaluated and monitored by the SSO. Access to the work zone is limited to project personnel, project support personnel, and authorized visitors. Initially, exclusion zones will not be established for these activities, but may be established if visual evidence of contamination is seen and/or instrument readings exceeding the action levels detailed in Section 5.0 are detected.

Surveying

This activity is generally conducted above grade and does not necessitate the disturbance of the soil. It is not anticipated that a potential exposure will exist. Initially, an exclusion zone will not be established for this activity.

Landscaping

This activity will involve final grading and placement of gravel. Because this activity is expected not to significantly disturb subsurface soils, an exclusion zone will not be initially established.

Surface Grading

This activity would be to level a surface as needed. Initially, an exclusion zone will not be established for this activity. Dust control may be included as required.

2.4 Category 2 Below-Grade Remedial Activities; Contact with Soil

It is anticipated that personnel working in the following activities have some reasonable potential to come into contact with potentially contaminated soil. These activities may include:

- Soil Excavation
- Soil Stockpiling
- Soil Vapor Extraction Point Installation

These activities may result in potential exposure to contaminated soil and may be conducted in an exclusion zone. This will be evaluated by the SPM and monitored by the SSO. Access to any exclusion zone will be limited to project personnel. All project personnel working in these areas must meet the training and medical requirements for working in an exclusion zone, when established, as defined in Section 4.0 of this HASP. Personnel protective clothing and equipment will be worn as defined in Section 5.0, or as determined by the SPM.

Routes of exposure may include inhalation and incidental ingestion or skin absorption. Operators of heavy equipment (i.e. bulldozers, backhoes) will have a lesser probability of being exposed to contaminated soils by dermal contact; however, there is the possibility of inhalation exposure or accidental ingestion. Exclusion zones may be established for these activities.

3.0 Medical Emergency

Medical emergencies can be described as situations which present a significant threat to the health of personnel involved in the implementation of the subsurface assessment activities. These can result from chemical exposure, heat stress, cold stress and poisonous insect bites. Medical emergencies must be dealt with immediately and proper care should be administered. This may be in the form of first aid and emergency hospitalization.

In the event of a medical emergency, assess whether or not the victim can be safely transported to medical facilities. If the victim cannot be moved without the risk of aggravating their condition, refer to Section 3.2 "Emergency Notification" and summon an ambulance and appropriate emergency response personnel.

3.1 Transporting Victims

If the victim can be safely transported without risk of additional injury, the nearest hospital is NYC Health + Hospitals/Coney Island.

The hospital is located at the northeast corner of Shore Parkway and Ocean Parkway. The most direct or emergency route from the subject site to the hospital is as follows:

1. Head south on Nostrand Ave toward Avenue Z (0.3 mi)
2. Turn right at the 2nd cross street onto Voorhies Avenue (0.8 mi)
3. Continue onto Shore Parkway (0.1 mi)
4. Slight left to stay on Shore Parkway (0.2 mi)
5. Slight left at E 11th Street (0.2 mi)
6. Slight left onto Shore Parkway (0.2 mi)
7. Turn right onto Ocean Parkway Service Road (364 ft)
8. Arrive at NYC Health + Hospitals/Coney Island, 2601 Ocean Parkway, Brooklyn, NY 11235.

Total mileage 1.8 miles; total travel time is nine (9) minutes.

See Appendix I: Mapped Hospital Directions.

3.2 Emergency Notification

The following is a list of telephone numbers for the nearest hospital and emergency response personnel:

NYC Health + Hospitals/Coney Island	1-718-616-3000
Fire Emergency	911
Ambulance/Rescue Squad	911
NYC Police Department 61st Precinct	911
NYSDEC Spill Hotline	1-800-457-7362
NYC Department of Health	1-212-442-9666
NYSDEC Region II Division of Hazardous Waste Remediation	1-718-482-4933
CNS Senior Project Manager (Charles Powers)	1-516-932-3228 (office)
	1-516-448-5004 (mobile)
Professional Engineer/ Site Safety Officer (Dean Devoe)	1-516-932-3228 (office)
	1-917-417-1524 (mobile)

4.0 Site/Zone Control

Three zones will be used to control access to remediation areas when potential contamination may be present and to prevent the accidental spread of contaminated materials. The three zones are identified as:

1) Remediation Work Zone (Cold Zone) - all activities take place without restrictions;
2) Contamination Reduction Zone (Warm Zone) – Decontamination of personnel takes place;
3) Exclusion Zone (Hot Zone) – Remediation and clean-up are performed.

In order to delineate areas of activity involving potentially contaminated soil from other site activities, the areas will be marked with orange fencing and posted with a notice regarding potential hazards, area restrictions, and access requirements. Caution tape may be used. The Exclusion Zone shall be posted or marked in such a way as to be visually distinct from the Remediation Zone fencing. The contractor shall ensure the zone fencing is maintained and completely reestablished at the end of each workday. The SPM will be responsible for establishing the Exclusion Zone.

4.1 Remediation Work Zone

The Remediation Work Zone is the entire project work area or remediation area. All non-hazardous materials project work activities will be conducted within the Remediation Work Zone. The remediation work zone is restricted to project personnel, project support personnel and visitors as defined in this document. Unauthorized personnel will be prohibited from entering the site.

Air and/or soil sampling methods may be used while any excavation takes place. Upgrading of zones and PPE will depend upon results of sampling.

All personnel (as noted above) entering the remediation work zone will be briefed by the SPM prior to their initial entry. All project personnel entering the remediation work zone must meet the training requirements as outlined in Section 5.0. The protective work clothing and equipment to be worn is defined in Section

5.0 or as required by the SPM. All project personnel and equipment exiting the construction work zone may need to be decontaminated before leaving the site, as determined by the SPM.

Activities defined as Category 1 in Section 2.3 will be performed within the remediation work zone. The SPM will monitor these activities.

4.2 Exclusion Zone

Exclusion zones will be established by the SPM, if the action levels listed in Section 5.0 are exceeded, if there are visible signs of contamination and/or if there are changes in operations or the knowledge of the site which would increase the probability of worker exposure. The Exclusion Zone is designated to prevent the accidental spread of hazardous substances from a contaminated area to a clean area. The limits and location of the Exclusion Zone may vary depending on soil disturbing activities. The SPM will determine the extent of the Exclusion Zone depending on potential hazards and site activities. Entry into the Exclusion Zone requires the use of PPE, as defined by the SPM.

4.3 Contamination Reduction Zone

This area is a buffer between the exclusion zone and the remediation work zone where personnel and equipment are decontaminated. It serves as a reduction zone between contaminated areas and clean areas. Activities to be conducted in this zone will require personnel protection as defined in Section 5.0. Decontamination will require removal of PPE, disposal or cleaning of PPE and cleaning of work equipment. Procedures for decontamination will be followed based on appropriate standards and company procedures. Equipment may be tailored to a decontamination pad for cleaning in which case the contamination reduction zone may be a remote site.

5.0 Personal Protection On-Site

Based on currently available information, Level D protection should be adequate for most of the work to be performed on-site. For the purpose of this Health and Safety Plan, Level D areas are defined as areas where gross ambient organic vapor levels (monitoring in real time) range from site background to 5 parts per million (ppm) over background or airborne substances are exceeded, personal protection will be upgraded to Level C. Background readings will be obtained each day within the work area prior to commencement of work and along the perimeter of the work site.

Work clothing meeting requirements of the Site Information, Regulations and Safety Program for Contractors will be worn by personnel conducting activities within the remediation work zone. For work involving disturbance of soils, the SPM may designate exclusion zones for these activities. He will also determine other appropriate levels of protection to either Level "C" or Level "B". Only trained and qualified workers will be permitted to work at level "C" or "B", and work in Level "B" will require a mandatory "buddy" system at all times.

For the purpose of this Health and Safety Plan, during implementation of remedial efforts, Level D personnel protection will be required. Level D is the standard work uniform to be worn at all times when excavating or working in exposed soil in trenches, excavation or dirt piles. The level of protection to be worn by field personnel will be defined and controlled by the SPM and/or SSO as follows:

ACTIVITY	LEVEL	PROTECTIVE EQUIPMENT
Encounter with unknown chemical hazard condition, some excavation/trench work, chemical spill control, emergency rescue operations, any high hazard conditions not involving fire or other unknown safety hazard.	B	-Full face piece supplied air respirator (SAR) or self-contained breathing apparatus (SCBA) -Chemical-resistant clothing -Inner Coverall clothing -Inner and outer chemical resistant gloves -Chemical resistant safety over boots-disposable -Hard hat -Hearing protection as needed
Soil excavation, UST related work, trench related work, and activities resulting in direct contact with contaminated soils as determined by the SPM or designee	C	-Full or half face piece air purifying respirator -Chemical-resistant clothing -Inner and outer chemical-resistant gloves -Chemical resistant safety overboots (disposable) -Hard hat -Hearing protection as needed -Safety glasses or goggles if half face piece respirator is used
Soil excavation and handling, trenching operations, pile driving sub-grading constructions, (underground) piping or wiring. For all work activities in the remediation zone, when there is no exceedance to contaminant action levels.	D	-Work Clothing or Coveralls, and/or outer polycoated Tyvek or equal chemical resistant as needed -Work Clothes, standard -Safety boots -Boot covers, chemical resistant, disposable, as needed -Chemical resistant gloves as needed (Nitral or equal w/interior disposable gloves) -Safety glasses or goggles -Hard hat -Hearing protection as needed -Dust Mask

During the course of excavation activities, all efforts will be made to minimize activities that will create dust. Dust suppression, including wetting down the work area, use of haul trucks equipped with tarps and gravel pads will likely be necessary.

5.1 Basic Equipment

Basic safety equipment will be kept on-site to monitor site conditions and respond to emergency situations. This equipment includes, but is not limited to the following:

- First Aid Kits
- Portable eyewash
- Type ABC fire extinguisher
- Photo Ionization Detector (HNU or equivalent)

5.2 Personnel Training

All personnel working on-site who have the potential for coming into contact with site soils during implementation of remedial efforts must have received the minimum Health and Safety training in accordance with OSHA 1910.120(E)(2).

Initial Training – All personnel shall have the mandated OSHA 10-Hour Construction Industry Safety and Health training. Initial hazard awareness training orientation and a site briefing will be provided on-site for all Project Personnel, Project Support Personnel, and Visitors by the SPM or designee prior to their initial

entry to the site. Training may also be provided on an as needed basis at the beginning of each project task to specifically address the activities, procedures, monitoring, and equipment for the site operations. It will include site and facility layout, hazards, and emergency services at the site, and will detail all provisions contained within the HASP.

Project Personnel Training - All Project Personnel designated to work in an exclusion zone, as outlined in Section 4.0, are required to have successfully completed the initial training requirement (40 hours) and refresher training requirements pursuant to OSHA 29 CFR 1910.120(e). Copies of each employee's certificate/card will be retained on file.

Supervisor Training - For any work in the exclusion zones, the direct on-site manager of the task work force shall be required to have successfully completed the supervisor training requirement pursuant to OSHA 29 CFR 1920.120(e).

Weekly Safety Training - Weekly Safety Training meetings will be conducted by the SPM or designee with crews working Levels B or C to discuss specific tasks being performed and relevant safety issues. Weekly Safety Training meetings will be held, and documented, by each contractor with all their employees.

6.0 Field Procedures

Work areas will be defined, respectively, as Level 'C' or 'D' to correspond with the required level of personal protection. Each work area will be cordoned off while work is taking place. Access to these areas will be provided only to those persons directly involved in the field operations and only if the appropriate level of personal protection is worn as outlined in Section 5.0.

All equipment and personnel will be subjected to decontamination procedures before leaving an area of restricted access. Separate work zones and decontamination zones will be predesignated in areas requiring Level C protection as outlined in Section 4.0.

Monitoring for this project is conducted (1) to manage worker safety during the project; (2) to minimize exposure outside of the construction exclusion zones, (3) to delineate zones and (4) to assist with determination of appropriate levels of personnel protective equipment. Site specific action level criteria have been established for all the instruments which may be used in making field health and safety determinations. Other information, such as the visible presence of contamination, is also used in making field health and safety decisions. Therefore, it is possible the SPM or his designee may establish exclusion zones and/or require personnel to wear PPE, even though atmospheric air contaminant concentrations are below established site-specific HASP action levels.

6.1 Air Monitoring (Particulates and VOCs)

Throughout the duration of remedial excavation activities, air quality will be monitored at the perimeters of the work site with a Photo Ionization Detector (PID) and Real-time Particulate Monitoring (PM-10) equipment. Work will stop if levels or organic vapors and/or particulate levels exceed OSHA and/or NIOSH action levels, until particulate levels are reduced, and proper site controls are enacted in the remediation zone.

Continuous monitoring will be performed by the SST during all operations which have the potential for coming into contact with potential contaminated materials. The owner, or their designees, will provide the proper required equipment, perform sampling, and record the results of this monitoring.

Real-time monitoring will be completed in compliance with New York State Department of Health (NYSDOH) Generic CAMP, May 2010, Appendix 1A of NYSDEC DER-10. Particulate monitors will have datalogging capability and the SST will manually inspect the readings every 15-minutes and log accordingly.

See Appendix A: Community Air Monitoring Plan.

6.2 Record Keeping

The on-site SSO will maintain a record of all individuals present at the work site, levels of worker protection and general conformance with this HASP. PID readings will be periodically recorded in addition to noting observed peak readings.

7.0 Decontamination

All equipment and personnel will be subjected to decontamination procedures before leaving an area of restricted access. Separate work zones and decontamination zones will be predesignated, if needed, as outlined in Section 4.0.

Field decontamination will be established at the exits from the exclusion zones to the remediation zones, by the SPM and will be under the control of the SPM or designee. Decontamination of equipment and personnel require all material in contact with a potential hazardous substance to be adequately cleaned. All disposable garments will follow procedures as outlined in the 29 CFR 1910.120 and the EPA/NIOSH Guidance Document 85-115. Decontamination will take place in the decontamination reduction zone. All equipment will be cleaned to both prevent the hazards from leaving the site and cross-contaminate the non-impacted areas.

7.1 Level D Areas

Before leaving Level D work areas, loose soil will be brushed from equipment and clothing. Equipment will be rinsed with potable water. Disposable coveralls, gloves, etc. will be placed in plastic bags and disposed of as household waste in available on-site receptacles. This will be performed by all project personnel exiting the construction zones before:

1. Rest breaks and meal periods
2. Leaving at the end of shift

7.2 Level B and C Areas (Exclusion Zone)

All Project Personnel exiting a construction exclusion zone to the Contamination Reduction Zone will be required to wash boots and gloves in a one tub station, then rinse in a second tub station.

All Project Personnel exiting an exclusion zone will be required to wash outer garments at Station 1, which is a tub station with soapy water; then proceed to clean up Station 2, a tub station with water for rinsing. A pump spray container (Hudson or like model) will be used to minimize contaminated water. From these stations the employee will proceed through the following eight (8) steps in the order listed. An exclusion zone will be required for all levels (D through B) of protection.

1. Remove outer boot covers
2. Remove disposable coveralls
3. Remove outer gloves
4. Vacuum or brush any dust off clothing or shoes
5. Remove respirator
6. Remove inner gloves
7. Wash face and hands prior to eating
8. Waste water is collected and returned to the soil in the exclusion zone

8.0 UST Closure Protocol

There is currently no evidence to suggest that there are any Underground Storage Tanks (USTs) located on the subject site, as a GPR Study performed as part of Remedial Investigation activities did not identify any metallic anomalies consistent with such. In the event any UST's are identified during execution of the remedial excavation, CNS will immediately notify the NYSDEC via telephone and E-mail. In addition, in the event a release of contaminants into the environment is identified, the NYSDEC Spills Hotline will be immediately contacted. Any UST identified during implementation of remedial efforts will be decommissioned as outlined within the state regulations.

During excavation, removal and cleaning of the USTs, the SST will field screen the ambient air with a PID for the presence of petroleum contamination. If a UST is encountered the SSO will classify the area as a Category 2 work area and implement and assess an Exclusion Zone as outlined in Subsection 2.4 and 4.2, herein. Level C PPE will be required for all personnel entering the UST Exclusion Zone and decontamination will be applicable as outlined in Section 5.0 and 7.0 subsection 7.2, herein.

Appendix A: Community Air Monitoring Plan (CAMP)

Community Air-Monitoring Plan

This Community Air-Monitoring Plan (CAMP) has been prepared to prevent the release of particulates and/or organic vapors for the excavation activities to be conducted for the property known as Brownfields Cleanup Program (BCP) Site # C224237 known as the "Former" Debbie Cleaners site located at 3800-3808 Nostrand Avenue in Brooklyn, NY ("Site"). This CAMP includes monitoring for airborne particulates and organic vapors during the ground-intrusive remedial activities; and is intended to provide a measure of protection for the downwind community (i.e., off-site sensitive receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of remedial work activities. See Figure A-1 at the end of this Appendix for tentative CAMP Monitoring Station Locations. It must be noted that CAMP monitoring station locations may need to be adjusted based on field observations and wind direction.

This CAMP follows the VOC Monitoring, Response Levels, and Actions included in DER-10, Appendix 1A – New York State Department of Health Generic CAMP and Appendix 1B – Fugitive Dust and Particulate Monitoring.

Potential Sensitive Receptors

- Residential properties located approximately 50-feet west of the Site
- Bright Start Day Care located approximately 150-feet northwest of the Site
- Sheepshead Playground approximately 650-feet to the south beyond Avenue Z
- Public Elementary School # 52 Sheepshead Bay located approximately 1,200-feet to the south beyond Avenue Z and the Sheepshead Playground
- Yeshiva of Kings Bay Universal Pre-K approximately 1,000-feet to the southwest
- Playground # 286 approximately 500-feet to the east
- Junior High School # 14 Shell Bank/YMCA After-School Program approximately 1,000-feet to the northeast
- Sheepshead/Nostrand Community Center Pre-School and CCNS The Bay Neighborhood Senior Center approximately 1,100-feet to the north

Particulate Monitoring, Response Levels and Actions

Particulate concentrations will be monitored continuously upwind and downwind of the remedial activities at temporary particulate monitoring stations located on the perimeter of the subject site. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level and will comply with the specifications outlined within Appendix 1B of DER-10. The equipment will be equipped with an audible alarm to indicate exceedance of the action level, defined as 150 micrograms per cubic meter (mcg/m^3) over a 15-minute average. In addition, fugitive dust migration will be visually assessed during all work activities.

If the downwind PM-10 particulate level is 100 mcg/m^3 greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed (e.g., water misting, smaller work areas, slower truck speeds). Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 opposite the walls of occupied structures, near to intake vents and/or above the upwind level, work will be stopped and a re-evaluation of activities and dust suppression techniques initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the PM-10 particulate concentration at the monitoring point to within 150 mcg/m3 of the upwind level and in preventing visible dust migration.

The following techniques demonstrated to be effective for controlling the generation and migration of dust shall be employed, as applicable:

(a) Applying water on haul roads;
(b) Wetting equipment and excavation faces;
(c) Spraying water on buckets during excavation and dumping;
(d) Hauling materials in properly tarped or watertight containers;
(e) Restricting vehicle speeds to 10 mph;
(f) Covering excavated areas and material after excavation activity ceases; and
(g) Reducing the excavation size and/or number of excavations

Weather conditions shall also be evaluated to ensure property fugitive dust control, and in extreme conditions which make dust control efforts ineffective; remedial actions may be suspended.

Organic Vapors

Organic vapor concentrations will be monitored continuously upwind and downwind of the remedial activities at temporary monitoring stations located on the perimeter of the work area. A Photo-Ionization Detector (PID) will be utilized to perform real-time monitoring.

Prior to the state of remedial excavation activities, background readings in occupied spaces around the work area will be collected and recorded. Any unusual background readings will be reported to the NYSDEC and NYSDOH.

If the ambient air concentration of VOCs exceeds 1 ppm above background (for a 15-minute sustained period) at the downwind temporary monitoring station(s), opposite the walls of occupied structures and/or next to intake vents, activities will be halted and monitoring continued. If the VOC level decreases below 1ppm above background, activities can resume. If the VOC levels are greater than 1ppm over background but less than 5ppm over background at the perimeter of the exclusion zone, activities can resume provided:

- The organic vapor level 200 ft. downwind of the perimeter of the work area or half the distance to a receptor (member of the general public), whichever is less, is below 1 ppm over background (VOCs).
- More frequent intervals of monitoring are conducted.

All air monitoring results will be documented and provided within daily reports to the NYSDEC/NYSDOH and within the FER.

Special Requirements

At the direction of the NYSDOH, consideration shall be made to the following Special Requirements which have been incorporated into the monitoring plan described above. It must be noted that due to the physical setting of the site in close proximity to a residential neighborhood, remedial work activities can not be completed during weekends or evenings.

Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures

- When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

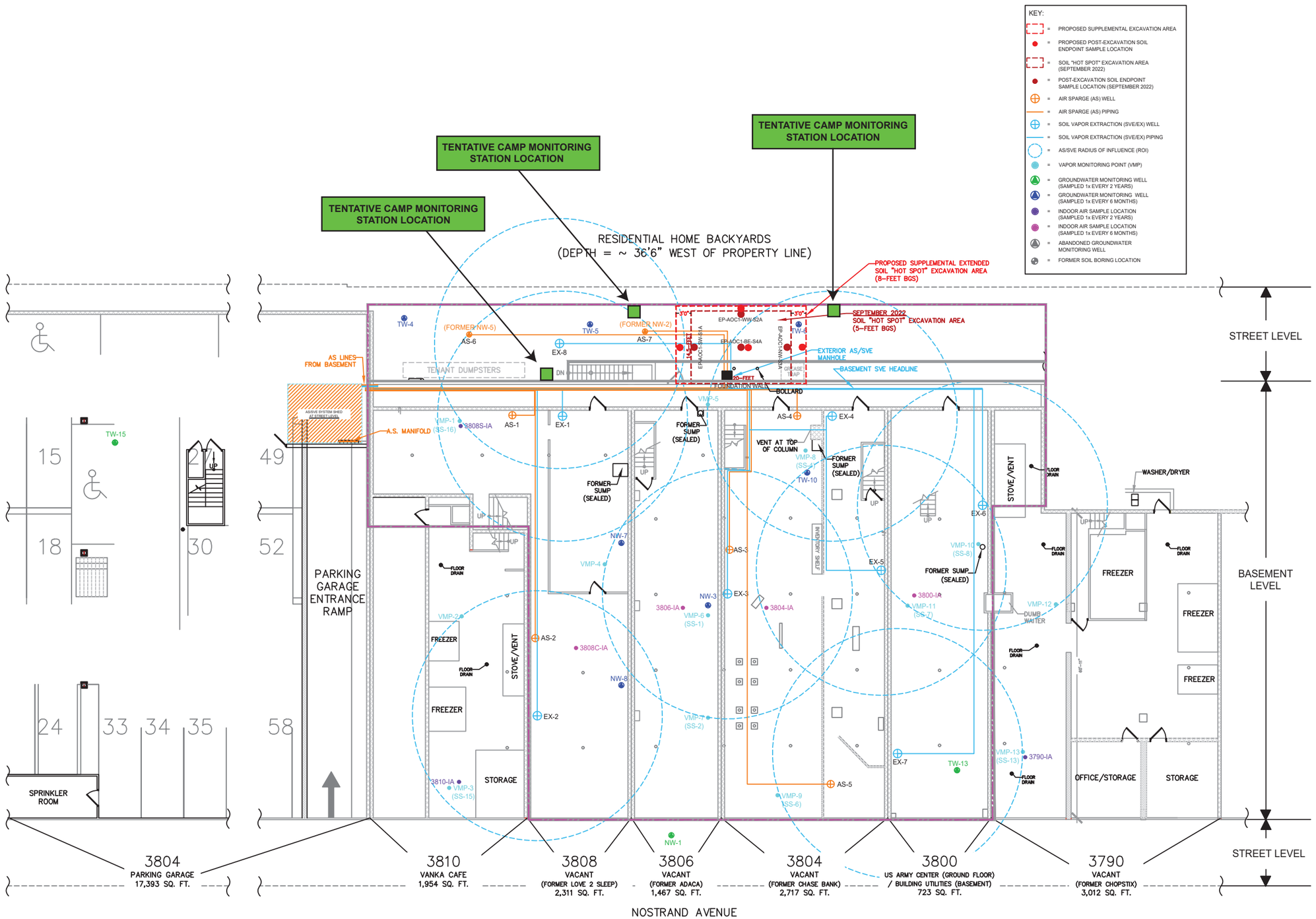
- If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring should occur within the occupied structure(s). Depending upon the nature of contamination, chemical-specific colorimetric tubes of sufficient sensitivity may be necessary for comparing the exposure point concentrations with appropriate pre-determined response levels (response actions should also be pre-determined). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.

- If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m3, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m3 or less at the monitoring point.

- Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each site.

Special Requirements for Indoor Work With Co-Located Residences or Facilities

- Unless a self-contained, negative-pressure enclosure with proper emission controls encompasses the work area, all individuals not directly involved with the planned work must be absent from the room in which the work will occur. Monitoring requirements shall be as stated above under "Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures" except that in this instance "nearby/occupied structures" would be adjacent occupied rooms. Additionally, the location of all exhaust vents in the room and their discharge points, as well as potential vapor pathways (openings, conduits, etc.) relative to adjoining rooms, should be understood and the monitoring locations established accordingly. In these situations, it is strongly recommended that exhaust fans or other engineering controls be used to create negative air pressure within the work area during remedial activities. Additionally, it is strongly recommended that the planned work be implemented during hours (e.g. weekends or evenings) when building occupancy is at a minimum.



DWN BY:	JL	CHKD BY:	CP	APVD BY:	DD

DATE	REVISION	BY	APVD

SITE NO. **BCP C224237**

"FORMER" DEBBIE CLEANERS
3800-3808 NOSTRAND AVENUE
BROOKLYN, NY 11235

FIGURE A-1

TENTATIVE CAMP STATION LOCATIONS

STATE OF NEW YORK · DEAN DEVOE · 072513 · LICENSED PROFESSIONAL ENGINEER

Dean Devoe

CNS ENVIRONMENTAL
208 NEWTOWN RD
PLAINVIEW, NY 11803
www.cnsenviro.com

DATE **03/14/2025**

CNS JOB # **D196**

SCALE **1" = 20'0"**

Appendix B: Respiratory Protection Program

CONTRACTOR
RESPIRATORY PROTECTION PROGRAM

SUBJECT: Respiratory Protection Program

REGULATORY STATUTE: OSHA - 29 CFR 1910.134

BASIS: About 32 million workers are potentially exposed to one or more chemical hazards on a daily basis. There are an estimated 575,000 existing chemical products, and hundreds of new ones being introduced annually. This poses a serious problem for exposed workers and their employer. The OSHA Respiratory Protection Standard establishes uniform requirements to make sure that the respiratory hazards of all U.S. workplaces are evaluated, and that engineering controls, and work practice controls are implemented, and where not feasible, a respiratory protection program instituted.

GENERAL: Contractor will ensure that respiratory hazards within our facility and on our work sites are evaluated, and that information concerning these hazards is transmitted to all employees. This standard practice instruction is intended to address comprehensively the issues of; evaluating the potential respiratory hazards, communicating information concerning these hazards, and establishing appropriate engineering, work practice, or respiratory protective measures for employees.

RESPONSIBILITY: The company Safety Officer is the Director of Health and Safety. He/she is solely responsible for all facets of this program and has full authority to make necessary decisions to ensure success of the program. The Safety Officer will develop written detailed instructions covering each of the basic elements in this program, and is the sole person authorized to amend these instructions. This company has expressly authorized the Safety Officer to halt any operation of the company where there is danger of serious personal injury. This policy includes respiratory hazards.

Contents of the Contractor Respiratory Protection Program

1. **Written Program.**
2. **Employer and Employee Responsibility.**
3. **Policy Statement**.
4. **Respiratory Selection Policy**.
5. **Use of Respirators**.
6. **Inspection, Maintenance, and Care of Respirators**.
7. **Training Program.**
8. **Respirator Decision Logic.**
9. **Respirator Fit Testing**.
10. **Respirator Inspection Record.**

Contractor Respiratory Protection Program

1.0 Written Program. Contractor will review and evaluate this standard practice instruction governing the selection and use of respirators on an annual basis, or when changes occur to 29 CFR 1910.134, that prompt revision of this document, or when facility operational changes occur that require a revision of this document. Effective implementation of this program requires support from all levels of management within this company. This written program will be communicated to all personnel that are affected by it. It encompasses the total workplace, regardless of number of workers employed or the number of work shifts. It is designed to establish clear goals, and objectives.

2.0 Employer and Employee Responsibility.

2.1 Employer's Responsibility.

2.1.1 Respirators shall be provided by this employer when they are necessary to protect employee health.

2.1.2 The respirator provided shall be suitable for the intended use.

2.1.3 The employer shall be responsible for establishing and maintaining a respiratory program whenever respirators are used. A program administrator shall be appointed to oversee the program. The program administrator for Contractor is the Director of Health and Safety.

2.2 Employee's Responsibility.

2.2.1 The employee shall use the respiratory protection in accordance with instructions and training received or contracted by Contractor.

2.2.2 The employee shall guard against damage to the respirator, and immediately replace suspect respirators.

2.2.3 The employee shall report any trouble with or malfunction of the respirator to his/her supervisor.

3.0 Policy Statement.

3.1 Engineering controls. To control and or minimize the threat of occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective of this program shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used.

3.2 Respirators. Respirators shall be provided by this employer when such equipment is necessary to protect the health of the employee. This employer shall:

3.2.1 Provide the respirators which are applicable and suitable for the purpose intended.

3.2.2 Be responsible for the establishment and maintenance of a written respiratory protective program which shall include the requirements outlined in 29 CFR 1910.134.

3.3 The employee shall use the provided respiratory protection in accordance with instructions and training received.

3.4 Respirators shall be selected on the basis of hazards to which the worker is exposed.

3.5 The user shall be instructed and trained in the proper use of respirators and their limitations.

3.6 Respirators shall be regularly cleaned and disinfected. Those used by more than one worker shall be thoroughly cleaned and disinfected after each use.

3.7 Respirators shall be stored in a convenient, clean, and sanitary location.

3.8 Respirators used routinely shall be inspected during cleaning. Worn or deteriorated parts shall be replaced. Respirators for emergency use such as self-contained devices shall be thoroughly inspected at least once a month and after each use.

3.9 Appropriate surveillance of work area conditions and degree of employee exposure or stress shall be maintained.

3.10 There shall be regular inspection and evaluation to determine the continued effectiveness of the program.

3.11 Employees will not be assigned to tasks requiring use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. A physician shall determine what health and physical conditions are pertinent. The respirator user's medical status will be reviewed on an annual basis or if it is suspected that the employee is no longer physically fit to wear a respirator.

3.12 NIOSH approved or accepted respirators shall be used when they are available. The respirator furnished shall provide adequate respiratory protection against the particular hazard for which it is designed.

4.0 Respiratory Selection Policy. Selection of respirators shall be made according to the specific hazard involved 29 CFR 1910.1000 and will be selected in accordance with the manufacturer's instructions or other related requirements (OSHA or ANSI standards, NIOSH, etc.).

4.1 Air quality. Compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration shall be of high purity.

4.1.1 Oxygen shall meet the requirements of the United States Pharmacopoeia for medical or breathing oxygen.

4.1.2 Breathing air shall meet at least the requirements of the specification for Grade D breathing air as described in Compressed Gas Association Commodity Specification G-7.1-1966.

4.1.3 Compressed oxygen shall not be used in supplied-air respirators or in open circuit self-contained breathing apparatus that have previously used compressed air. Oxygen must never be used with air line respirators. Breathing air may be supplied to respirators from cylinders or air compressors.

4.1.3.1 Cylinders shall be tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR Part 178).

4.2 Supplied Air. Compressors purchased by this company for supplying air shall be equipped with the necessary safety and standby devices. A breathing-air type compressor shall be used. The type compressor

used shall be constructed and situated so as to avoid entry of contaminated air into the system and suitable in-line air purifying sorbent beds and filters installed to further assure breathing air quality. A receiver of sufficient capacity to enable the respirator wearer to escape from a contaminated atmosphere in event of compressor failure, and alarms to indicate compressor failure and overheating shall be installed in the system. If an oil-lubricated compressor is used, it shall have a high-temperature or carbon monoxide alarm, or both. If only a high-temperature alarm is installed in the system, the air from the compressor shall be frequently tested for carbon monoxide to ensure that levels are below the exposure limit for carbon monoxide.

4.2.1 Air line couplings used shall be incompatible with outlets for other gas systems to prevent inadvertent servicing of air line respirators with non-respirable gases or oxygen.

4.2.2 Breathing gas containers shall be properly marked and stored in accordance with 29 CFR 1910.101.

5.0 Use of Respirators.

5.1 This document will specify standard procedures for respirator use. These will include all information and guidance necessary for their proper selection, use, and care. Possible emergency and routine uses of respirators will be where possible anticipated and planned for.

5.2 The correct respirator shall be specified for each job. The respirator type will be specified in the work procedures by the Project Manager who supervises the respiratory protective program in the field. The individual issuing them shall be adequately instructed to insure that the correct respirator is issued.

5.3 Dangerous atmospheres. Written procedures/checklists for specific routine tasks/jobs shall be prepared covering safe use of respirators in dangerous atmospheres that might be encountered in normal operations or in emergencies. Personnel shall be made familiar with these procedures and the available respirators.

5.3.1 In areas where the wearer, with failure of the respirator, could be overcome by a toxic or oxygen-deficient atmosphere, at least one additional person shall be present. Communications (visual, voice, or signal line) shall be maintained between both or all individuals present. Planning shall be such that one individual will be unaffected by any likely incident and have the proper rescue equipment to be able to assist the other(s) in case of emergency.

5.3.2 When a self-contained breathing apparatus or Type C full face supplied air with 5 minute escape bottles are used in atmospheres immediately dangerous to life or health (IDLH), standby personnel must be present with suitable rescue equipment.

5.3.3 Employees using air line respirators in atmospheres immediately hazardous to life or health (IDLH) shall be equipped with safety harnesses and safety lines for lifting or removing persons from hazardous atmospheres or other and equivalent provisions for the rescue of persons from hazardous atmospheres shall be used. A standby personnel with suitable self-contained breathing apparatus (SCBA) shall be at the nearest fresh air base for emergency rescue.

5.4 Respirator Training. For safe use of any respirator, it is essential that our employees be properly instructed in its selection, use, and maintenance. Both supervisors and workers shall be so instructed by a training provider who is classified as an OSHA competent person. Training shall provide employees the opportunity to handle the respirator, have it fitted properly, test its face-piece seal, wear it in normal air for a long familiarity period, and, finally, to wear it in a test atmosphere.

5.5 Fit instructions. Every respirator wearer shall receive fitting instructions including demonstrations and practice in how the respirator should be worn, how to adjust it, and how to determine if it fits properly. Respirators shall not be worn when conditions prevent a good face seal. Such conditions may be a growth of beard, sideburns, a skull cap that projects under the facepiece, or temple pieces on glasses. Also, the absence of one or both dentures can seriously affect the fit of a facepiece.

5.6 Fit Evaluation (wearer). Annual fit test evaluations will be conducted to determine the correct respirator size and model for the worker. The facepiece fit shall be checked by the wearer each time he/she puts on the respirator. This will be done by following the manufacturer's facepiece fitting instructions. This will be done in accordance with the manufacturer's facepiece fitting instructions. Qualitative fit testing can be performed for all negative pressure air purifying respirators with a protection factor of 10 or less and all positive pressure respirators.

5.7 Fit Evaluation (company). Annual fit test evaluations will be conducted on the workforce to determine the correct respirator size and model for the individual workers. Periodic checks of employees while wearing respirators will be accomplished by an OSHA competent person, CET or CIH to assure proper protection. This will be done in accordance with the manufacturer's facepiece fitting instructions. Respirator fit tests are conducted annually. Qualitative fit testing can be performed on all negative pressure air purifying respirators with a protection factor of 10 or less and all positive pressure respirators.

5.8 Hair / Apparel. If hair growth or apparel interferes with a satisfactory fit, then they shall be altered or removed so as to eliminate interference and allow a satisfactory fit.

5.9 Corrective vision requirements (full-face respirators). Full-face respirators having provisions for optical inserts will be reviewed for use this company. These inserts when used will be used according to the manufacturer's specification. When employees must wear optical inserts as part of the facepiece, the facepiece and lenses shall be fitted by qualified individuals to provide good vision, comfort, and a gas-tight seal. This company will provide corrective lenses for respirators based on optometry recommendations from an optometrist.

5.9.1 Conventional eye glasses. Conventional eye glasses will not be used with full-face respirators. A proper seal cannot be established if the temple bars of eye glasses extend through the sealing edge of the full facepiece.

5.9.2 Contact lenses. Contact lenses will not be used with full-face respirators. Wearing of contact lenses in contaminated atmospheres with a respirator shall not be allowed.

5.9.3 If corrective spectacles or goggles are required, they shall be worn so as not to affect the fit of the facepiece. Proper selection of equipment will minimize or avoid this problem.

6.0 Inspection, Maintenance, and Care of Respiratory Equipment. Equipment shall be properly maintained to retain its original state of effectiveness.

6.1 Respirator inspection shall include but is not limited to the following:

6.1.1 A check of the tightness of connections.

6.1.2 Condition of the facepiece, headbands, valves, connecting tube, and canisters.

6.1.3 Inspection of the Rubber or elastomer parts for pliability and signs of deterioration. Stretching and manipulating rubber or elastomer parts with a massaging action will keep them pliable and flexible and prevent them from taking a set during storage.

6.2 Specific procedures for disassembly, cleaning and maintenance of respirators used by this company will be done according the manufacturers written instructions.

6.3 Random inspections. Respiratory protection is no better than the respirator in use, even though it may be worn conscientiously. Frequent random inspections shall be conducted to assure that respirators are properly selected, used, cleaned, and maintained. The respirator manufacturer's inspection criteria will be used as the basis for the inspections. The following personnel are qualified to perform respirator inspections.

Qualified Inspectors	Duty Title
Charles Powers	Senior Project Manager
Dean Devoe	Site Safety Officer
_____	_____
_____	_____
_____	_____

Inspection records will be maintained in the Contractor's main office.

6.4 Emergency use respirators. All respirators shall be inspected routinely before and after each use. A respirator that is not routinely used but is kept ready for emergency use shall be inspected after each use and at least monthly to assure that it is in satisfactory working condition. The respirator manufacturer's inspection criteria will be used as the basis for the inspections. A record shall be kept of inspection dates and findings for respirators maintained for emergency use. Respirators maintained for emergency use shall be cleaned and disinfected after each use.

6.5 Routine use respirators. All routine use respirators shall be inspected routinely before and after each use. The respirator manufacturer's inspection criteria will be used as the basis for the inspection. Routinely used respirators shall be collected, cleaned, and disinfected as frequently as necessary to insure that proper protection is provided for the wearer.

6.6 SCBA inspections. Self-contained breathing apparatus (SCBA) shall be inspected monthly. Air and oxygen cylinders shall be fully charged according to the manufacturer's instructions. It shall be determined that the regulator and warning devices function properly.

6.7 Replacement or repairs. Replacement or repairs shall be done only by an OSHA competent person with parts designed for the respirator. No attempt shall be made to replace components or to make adjustment or repairs beyond the manufacturer's recommendations. Reducing or admission valves or regulators shall be returned to the manufacturer or to a trained technician for adjustment or repair.

6.8 Storage requirements. After inspection, cleaning, and necessary repair, respiratory protection equipment shall be carefully stored to protect against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators should be packed or stored so that the facepiece and exhalation valve will rest in a normal position and function will not be impaired by the elastomer setting in an abnormal position.

6.8.1 Emergency use respirators. Respirators placed at stations and work areas for emergency use should be quickly accessible at all times and will be stored in compartments built for the purpose. The compartments will be clearly marked. Instructions for proper storage of emergency respirators, such as gas masks and self-

contained breathing apparatus, are found in "use and care" instructions usually mounted inside the carrying case lid.

6.8.2 Routine use respirators. Routinely used respirators, such as dust respirators, may be placed in plastic bags. Respirators having removable cartridges with imbedded compounds that could evaporate into a sealed bag should be removed so as not to permeate into the rubber parts of the respirator. Respirators should not be stored in such places as lockers or tool boxes unless they are in carrying cases or cartons.

6.9 Identification of chemical cartridges. The primary means of identifying a chemical cartridge is by means of labels. The secondary means is by a color code. All cartridges purchased or used by this company will be properly labeled and or colored coded in accordance with 29 CFR 1910.134 before they are placed in service. The labels and colors will be properly maintained at all times until disposal. Cartridges having labels and colors not identifiable will be properly disposed of. To determine the type cartridge:

6.9.1 Determine the following from the cartridge:

6.9.1.1 Type of canister. Canister used for "X" contaminant or Type "Y" Gas Mask Canister.

6.9.1.2 "For respiratory protection in atmospheres containing not more than "X" percent by volume of "Y" (Name of atmospheric contaminant).

6.9.1.3 Radionuclides. Canisters having a special high efficiency filter for protection against radionuclides and other highly toxic particulates will have a label with a statement of the type and degree of protection afforded by the filter. The label will be affixed to the neck end of, or to the gray stripe which is around and near the top of, the canister. The degree of protection shall be marked as the percent of penetration of the canister by a 0.3 micron-diameter dioctyl phthalate (DOP) smoke at a flow rate of 85 liters per minute.

6.9.1.4 Oxygen warning. Employees must be fully aware of the label warning that states that cartridge respirators should be used only in atmospheres containing sufficient oxygen to support life (at least 19.5 percent by volume), since cartridges are only designed to neutralize or remove contaminants from the air.

6.9.1.5 Color coding. Each cartridge is painted a distinctive color or combination of colors indicated in Table I-1. All colors used are of such a color that they are clearly identifiable by the user and clearly distinguishable from one another. The color coating offers a high degree of resistance to chipping, scaling, peeling, blistering, fading, and the effects of the ordinary atmospheres to which they may be exposed under normal conditions of storage and use.

Table I-1 from 29 CFR 1910.134

Atmospheric contaminants	Colors assigned
Acid gases	White.
Hydrocyanic acid gas	White with 1/2 inch green stripe completely around the canister near the bottom.
Chlorine gas	White with 1/2 inch yellow stripe completely around the canister near the bottom.
Organic vapors	Black.
Ammonia gas	Green.
Acid gases and ammonia gas	Green with 1/2 inch white stripe completely around the canister near the bottom.
Carbon monoxide	Blue.
PCBs, Acid gases and organic vapors	Yellow.
Hydrocyanic acid gas and chloropicrin vapor	Yellow with 1/2 inch blue strip completely around the canister near the bottom.
Acid gases, organic vapors, and ammonia gases	Brown.
Asbestos, Lead dust, Radioactive materials excepting tritium and noble gases	Purple (Magenta).
Particulates (dusts, fumes, mists, fogs, or smokes) in combination with any of the gases or vapors	Canister color for contaminant as designated above, with 1/2 inch gray stripe completely around the canister near the top.
All of the above atmospheric contaminants	Red with 1/2 inch gray stripe completely around the canister near the top.
Note: Gray is not assigned as the main color for a canister designed to remove acids or vapors.	
Note: Orange is used as a complete body, or stripe color to represent gases not included in this table. The user will need to refer to the canister label to determine the degree of protection the canister will afford.	

7.0 Respiratory Protection Training Program. This company shall develop a standardized training format to meet the requirement for a respiratory protection training program. Fit testing of employees is an annual requirement.

7.1 Training shall be provided to each affected employee:

7.1.1 Before the employee is first assigned duties that require respiratory protection.

7.1.2 Before there is a change in assigned duties.

7.1.3 Whenever there is a change in operations that present a hazard for which an employee has not previously been trained.

7.1.4 Whenever this employer has reason to believe that there are deviations from established respiratory procedures required by this instruction or inadequacies in the employee's knowledge or use of these procedures.

7.2 The training shall establish employee proficiency in the duties required by this instruction and shall introduce new or revised procedures, as necessary, for compliance with this instruction or when future revisions occur.

7.3 This employer shall certify that the training required by this section has been accomplished. The certification shall contain each employee's name, the signatures or initials of the trainers, and the dates of training. The certification shall be available for inspection by employees and their authorized representatives.

8.0 Respirator Decision Logic.

8.1 Where a specific OSHA standard exits. Each task/job having the potential for respiratory hazards will be evaluated to determine worker protection requirement. The specific OSHA standard will be consulted to determine delineated respiratory requirements. The standards are listed in the "Z" tables to 29 CFR 1910.1000-1101.

8.2 Where a specific OSHA standard does not exit. The NIOSH respirator decision logic table from the "NIOSH guide to Industrial Respiratory Protection", Publication No. 87-116 (or subsequent versions) will be used. After all criteria have been identified and evaluated and after the requirements and restrictions of the respiratory protection program have been met, the class of respirators that should provide adequate respiratory protection will be determined.

9.0 Respirator Fit Testing. This employer shall ensure that the respirator issued to the employee exhibits the least possible facepiece leakage and that the respirator is fitted properly. For each employee wearing negative pressure respirators, this employer shall perform (or have performed) either quantitative or qualitative face fit tests at the time of initial fitting and annually thereafter. Qualitative fit tests may be used to fit test all negative pressure air purifying respirators with a protection factor of 10 or less and all positive pressure respirators. Quantitative fit testing is required for all negative pressure respirators with a protection factor of greater than 10.

9.1 Half-mask respirators. This employer shall perform (or have performed) qualitative fit test protocols in accordance with the specific standard listed in the "Z" tables to 29 CFR 1910.1000-1101. Where a specific OSHA standard protocol does not exit. The "NIOSH guide to Industrial Respiratory Protection", Publication No. 87-116 (or subsequent versions) will be used.

9.2 Minimum fit factor. Employees shall not be permitted to wear a half mask or full facepiece mask if a minimum fit factor of 100 or 1,000, respectively, cannot be obtained.

9.3 Hair. Fit testing shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface.

9.4 Respiratory difficulty during tests. If an employee exhibits difficulty in breathing during the tests, she or he shall be referred to a physician trained in respiratory diseases or pulmonary medicine to determine whether the test subject can wear a respirator while performing her or his duties.

9.5 Respirator use determination. The test subject shall be given the opportunity to wear the assigned respirator for one week. If the respirator does not provide a satisfactory fit during actual use, the test subject may request another fit test which shall be performed immediately.

9.6 Respirator fit factor card. A respirator fit factor card shall be issued to the test subject with the following information, as a minimum:

9.6.1 Name.

9.6.2 Date of fit test.

9.6.3 Protection factors obtained through each manufacturer, model and approval number of respirator tested.

9.6.4 Name and signature of the person that conducted the test.

9.7 Filter replacement. Filters used for qualitative or quantitative fit testing shall be replaced weekly, whenever increased breathing resistance is encountered, or when the test agent has altered the integrity of the filter media. Organic vapor cartridges/canisters shall be replaced daily or sooner if there is any indication of breakthrough by the test agent.

9.8 Quantitative fit test, Re-test requirements. Because the sealing of the respirator may be affected, quantitative fit testing shall be repeated immediately when the test subject has a:

9.8.1 Weight change of 20 pounds or more.

9.8.2 Significant facial scarring in the area of the facepiece seal.

9.8.3 Significant dental changes; i.e., multiple extractions without prosthesis, or acquiring dentures.

9.8.4 Reconstructive or cosmetic surgery.

9.8.5 Any other condition that may interfere with facepiece sealing.

9.9 Fit test Recordkeeping requirements. A summary of all test results shall be maintained for 3 years. The summary shall as minimum include:

9.9.1 Name of test subject.

9.9.2 Date of testing.

9.9.3 Name of the test conductor.

9.9.4 Fit factors obtained from every respirator tested (indicate manufacturer, model, size and approval number).

10.0 RESPIRATOR INSPECTION RECORD

1. OWNER (if individually issued): _____

2. TYPE: _____
3. NO. _____
4. DEFECTS FOUND:

A. Facepiece: _____

B. Inhalation Valve: _____

C. Exhalation Valve Assembly: _____

D. Headbands: _____

E. Cartridge Holder: _____

F. Cartridge/Canister: _____

G. Filter: _____

H. Harness Assembly: _____

I. Hose Assembly: _____

J. Speaking Diaphragm: _____

K. Gaskets: _____

L. Connection: _____

M. Other Defects: _____

6. COMMENTS: _____

_____

_____

7. INSPECTOR'S NAME/TITLE: _____

8. SIGNATURE: _____
9. DATE: _____

Appendix C: Hazardous Waste Operations and Emergency Response Program (HAZWOPER)

CONTRACTOR
Hazardous Waste Operations and Emergency Response Program (HAZWOPER)

REGULATORY STATUTE: OSHA - 29 CFR 1910.120

BASIS: Hazardous Waste is a serious safety and health problem that continues to endanger human and animal life and environmental quality. Unless hazardous waste is properly treated, stored, or disposed of properly, it will continue to do great harm to our environment. There are an estimated 575,000 existing chemical products, and hundreds of new ones being introduced annually. This poses a serious problem for exposed workers and their employer. The OSHA HAZWOPER Standard covers workers employed in cleanup operations at uncontrolled hazardous waste sites and at EPA-licensed waste treatment, storage, and disposal (TSD) facilities; as well as workers responding to emergencies involving hazardous materials.

GENERAL: Contractor will ensure that the hazards of all wastes on worksite clean-ups are evaluated, and that operational procedures are developed and information concerning their hazards is transmitted to all employees. This program is intended to address comprehensively the issues of; evaluating the potential hazards of wastes, communicating information concerning these hazards, and establishing appropriate operating procedures and protective measures for employees.

RESPONSIBILITY: The Contractor Safety Officer is solely responsible for all facets of this program and has full authority to make necessary decisions to ensure success of the program. The Safety Officer will develop written detailed instructions covering each of the basic elements in this program, and is the sole person authorized to amend these instructions. The Safety Officer has authority to halt any operation where there is danger of serious personal injury. This policy includes respiratory hazards.

Contents of the Contractor HAZWOPER Program

1. **Written Program.**
2. **Purpose.**
3. **Safety and Health Program.**
4. **Site Excavation.**
5. **Contractors and Sub-Contractors.**
6. **Program Availability.**
7. **Organizational Structure Part of a Site Program.**
8. **Comprehensive Workplan Part of a Site Program.**
9. **Site-Specific Safety and Health Plan.**
10. **Site Characterization and Analysis.**
11. **Training.**
12. **Medical Surveillance.**
13. **Engineering Controls, Work Practices, and PPE.**
14. **Definitions.**

Contractor HAZWOPER Program

1.0 Written Program. Contractor will review and evaluate this standard practice instruction on an annual basis, or when changes occur to 29 CFR 1910.120 that prompt revision of this document, or when facility or site operational changes occur that require a revision of this document. Effective implementation of this program requires support from all levels of management. This written program will be communicated to all personnel that are affected by it. It encompasses the total jobsite, regardless of number of workers employed or the number of work shifts. It is designed to establish clear goals, and objectives.

2.0 Purpose. This program will provide an operational framework for;

A. Clean-up 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 Site List (NPL), state priority site lists, sites recommended for the EPA NPL, and initial investigations of government identified sites which are conducted before the presence or absence of hazardous substances has been ascertained).

B. Corrective actions involving clean-up operations at sites covered by the Resource Conservation and Recovery Act of 1976 (RCRA) as amended (42 U.S.C. 6901 et seq.).

C. Voluntary clean-up operations at sites recognized by Federal, state, local or other governmental bodies as uncontrolled hazardous waste sites.

D. Emergency Response Operations for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard.

3.0 Safety and Health Program. Contractor shall develop and implement a written safety and health program for employees involved in hazardous waste operations. The program shall be designed to identify, evaluate, and control safety and health hazards, and provide for emergency response for hazardous waste operations. The written safety and health program shall incorporate as a minimum the following:

3.1 An organizational structure.

3.2 A comprehensive workplan.

3.3 A site-specific safety and health plan, which need not repeat standard practice instructions developed elsewhere.

3.4 A safety and health training program.

3.5 A medical surveillance program.

3.6 This employer's standard practice instructions for safety and health.

3.7 Any necessary interface between general program and site specific activities.

4.0 Site Excavation. Site excavations created during initial site preparation or during hazardous waste operations shall be shored or sloped as appropriate to prevent accidental collapse in accordance with Subpart P of 29 CFR Part 1926.

5.0 Contractors and sub-contractors. Should the Contractor retain contractor or sub-contractor services to aid in hazardous waste operations, Contractor shall inform those contractors, sub-contractors, or their representatives of the site emergency response procedures and any potential fire, explosion, health, safety or other hazards of the hazardous waste operation that have been identified by this employer, including those identified in this employer's information program.

6.0 Program Availability. The Contractor written safety and health program shall be made available to:

6.1 Contractor or subcontractor or their representative who will be involved with the hazardous waste operation.

6.2 All associated employees and their designated representatives.

6.3 OSHA personnel.

6.4 Authorized personnel of other Federal, state, or local agencies with regulatory authority over the site.

7.0 Organizational structure part of a site program.

7.1 The organizational structure part of the program for the jobsite clean-up shall establish the specific chain of command and specify the overall responsibilities of supervisors and employees. It shall include, at a minimum, the following elements:

7.1.1 Contractor shall supply a general supervisor will have responsibility and authority to direct all hazardous waste operations.

7.1.2 Joanne Mathews, as site safety and health supervisor will have the responsibility and authority to develop and implement the jobsite safety and health plan and verify compliance.

7.1.3 All other personnel needed for hazardous waste site operations and emergency response and their general functions and responsibilities.

7.1.4 The lines of authority, responsibility, and communication.

7.2 The organizational structure shall be reviewed and updated as necessary to reflect the current status of waste site operations.

8.0 Comprehensive workplan part of a site program. Contractor will develop a comprehensive workplan that shall address the tasks and objectives of the site operations and the logistics and resources required to reach those tasks and objectives. The workplan shall:

8.1 Address anticipated clean-up activities as well as normal operating procedures which need not repeat this employer's procedures available elsewhere.

8.2 Define work tasks and objectives and identify the methods for accomplishing those tasks and objectives.

8.3 Establish personnel requirements for implementing the plan.

8.4 The workplan shall provide for the implementation of the training required by worker involved in site activities.

8.5 The workplan shall provide for the implementation of the required informational programs required workers involved in site activities.

8.6 The workplan shall provide for the implementation of a medical surveillance program required workers involved in site activities.

9.0 Site-specific safety and health plan. Contractor will develop a site safety and health plan, which will be kept on site. The plan will address the safety and health hazards of each phase of site operation and include the requirements and procedures for employee protection. The site safety and health plan, as a minimum, shall address the following:

9.1 A safety and health risk or hazard analysis for each site task and operation found in the workplan.

9.2 Employee training assignments to assure compliance with the training section of this instruction.

9.3 Personal protective equipment to be used by employees for each of the site tasks and operations being conducted as required by the personal protective equipment program.

9.4 Medical surveillance requirements.

9.5 Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment to be used.

9.6 Site control measures.

9.7 Decontamination procedures.

9.8 Emergency response plan meeting the requirements for safe and effective responses to emergencies, including the necessary PPE and other equipment.

9.9 Confined space entry procedures.

9.10 Spill containment requirements.

9.11 Pre-Entry Briefing. The site specific safety and health plan will provide for pre-entry briefings to be held prior to initiating any site activity, and at such other times as necessary to ensure that employees are apprised of the site safety and health plan and that this plan is being followed. The information and data obtained from site characterization and analysis will be used to prepare and update the site safety and health plan.

9.12 Effectiveness of site safety and health plan. Inspections shall be conducted by the site safety and health supervisor or, in his/her absence, the safety officer who is knowledgeable in occupational safety and health, acting on behalf of Contractor as necessary to determine the effectiveness of the site safety and health plan. Any deficiencies in the effectiveness of the site safety and health plan shall be corrected by Contractor.

10.0 Site characterization and analysis. The site shall be evaluated in accordance with this standard practice instruction to identify specific site hazards and to determine the appropriate safety and health

control procedures needed to protect employees from the identified hazards. The following requirements apply:

10.1 Preliminary evaluation. A preliminary evaluation of a site's characteristics shall be performed prior to site entry in order to aid in the selection of appropriate employee protection methods prior to site entry. Immediately after initial site entry, a more detailed evaluation of the site's specific characteristics shall be performed in order to further identify existing site hazards and to further aid in the selection of the appropriate engineering controls and personal protective equipment for the tasks to be performed.

10.2 Hazard identification. All suspected conditions that may pose inhalation or skin absorption hazards that are immediately dangerous to life or health (IDLH), or other conditions that may cause death or serious harm, shall be identified during the preliminary survey and evaluated during the detailed survey. Examples of such hazards include, but are not limited to:

10.2.1 Confined space entry.

10.2.2 Explosive or flammable situations

10.2.3 Visible vapor clouds.

10.2.4 Areas where biological or environmental indicators such as dead animals or vegetation are located.

10.3 Required information. The following information to the extent available shall be obtained by CNS Management Corp. for the Owner of the site prior to allowing employees to enter a worksite:

10.3.1 Location and approximate size of the site.

10.3.2 Description of the response activity and/or the job task to be performed.

10.3.3 Duration of the planned employee activity.

10.3.4 Site topography and how accessible.

10.3.5 Safety / health hazards expected at the site.

10.3.6 Pathways for hazardous substance dispersion.

10.3.7 Present status and capabilities of emergency response teams that would provide assistance to hazardous waste clean-up site employees at the time of an emergency.

10.3.8 Hazardous substances and health hazards involved or expected at the site, and their chemical and physical properties.

10.4 Personal protective equipment. Personal protective equipment (PPE) shall be provided and used during initial site entry in accordance with the following requirements:

10.4.1 Based upon the results of the preliminary site evaluation, an ensemble of PPE shall be selected and used during initial site entry which will provide protection to a level of exposure below permissible exposure limits and published exposure levels for known or suspected hazardous substances and health hazards, and which will provide protection against other known and suspected hazards identified during the

preliminary site evaluation. If there is no permissible exposure limit or published exposure level, this employer may use other published studies and information as a guide to appropriate personal protective equipment.

10.4.2 If positive-pressure self-contained breathing apparatus is not used as part of the entry ensemble, and if respiratory protection is warranted by the potential hazards identified during the preliminary site evaluation, an escape self-contained breathing apparatus of at least five minute's duration shall be carried by employees during initial site entry.

10.4.3 If the preliminary site evaluation does not produce sufficient information to identify the hazards or suspected hazards of the site, an ensemble providing protection equivalent to Level B PPE shall be provided as minimum protection, and direct reading instruments shall be used as appropriate for identifying IDLH conditions.

10.4.4 Once the hazards of the site have been identified, the appropriate PPE shall be selected and used in accordance with the engineering controls, work practices, and PPE for employee protection section of this instruction.

10.5 Monitoring. The following monitoring shall be conducted during initial site entry when the site evaluation produces information that shows the potential for ionizing radiation or IDLH conditions, or when the site information is not sufficient reasonably to eliminate these possible conditions:

10.5.1 Monitoring with direct reading instruments for hazardous levels of ionizing radiation.

10.5.2 Monitoring the air with appropriate direct reading test equipment (i.e., combustible gas meters, detector tubes) for IDLH and other conditions that may cause death or serious harm (combustible or explosive atmospheres, oxygen deficiency, toxic substances).

10.5.3 Visually observing for signs of actual or potential IDLH or other dangerous conditions.

10.6 Air Monitoring Program. An ongoing air monitoring program will be implemented after site characterization has determined the site is safe for the start-up of operations.

10.7 Risk Identification. Once the presence and concentrations of specific hazardous substances and health hazards have been established, the risks associated with these substances shall be identified. Employees who will be working on the site shall be informed of any risks that have been identified. In situations covered by the Hazard Communication Standard, 29 CFR 1910.1200, training required by that standard will not be duplicated. Risks to be considered include, but are not limited to:

10.7.1 Exposures exceeding the permissible exposure limits and published exposure levels.

10.7.2 IDLH concentrations.

10.7.3 Potential skin absorption and irritation sources.

10.7.4 Potential eye irritation sources.

10.7.5 Explosion sensitivity and flammability ranges.

10.7.6 Oxygen deficiency.

10.8 Employee Notification. Any information concerning the chemical, physical, and toxicologic properties of each substance known or expected to be present on the jobsite that is available to Contractor and relevant to the duties an employee is expected to perform shall be made available to the affected employees prior to the commencement of their work activities.

10.9 Site Control. Appropriate site control procedures will be implemented to control employee exposure to hazardous substances before clean-up work begins.

10.10 Site Control Program. A site control program for protecting employees which is part of Contractor's site safety and health program will be developed during the planning stages of a hazardous waste clean-up operation and modified as necessary as new information becomes available.

10.11 Elements of the site control program. Where these requirements are covered elsewhere they will not be repeated with just cause. The site control program will, as a minimum, include:

10.11.1 A site map.

10.11.2 Site work zones.

10.11.3 The use of a "buddy system".

10.11.4 Site communications including alerting means for emergencies.

10.11.5 The standard practice instructions or safe work practices.

10.11.6 Identification of the nearest medical assistance.

11.0 Training. All employees working on site (such as but not limited to equipment operators, general laborers and others) exposed to hazardous substances, health hazards, or safety hazards and their supervisors and management responsible for the site shall receive training before they are permitted to engage in hazardous waste operations that could expose them to hazardous substances, safety, or health hazards, and they shall receive review training as specified in this paragraph. Employees shall not be permitted to participate in or supervise field activities until they have been trained to a level required by their job function and responsibility. Elements to be covered include the following:

11.1 Names of personnel and alternates responsible for site safety and health.

11.2 Safety, health and other hazards present on the site.

11.3 Use of personal protective equipment.

11.4 Work practices by which the employee can minimize risks from hazards.

11.5 Safe use of engineering controls and equipment on the site.

11.6 Medical surveillance requirements, including recognition of symptoms and signs which might indicate overexposure to hazards.

11.7 The contents of the site safety and health plan.

11.8 Initial training requirements for hazardous waste clean-up sites.

Routine site employees	40 hours initial
	24 hours field
	8 hours annual refresher
Routine site employees (Minimal exposure)	24 hours initial
	8 hours field
	8 hours annual refresher
Non-Routine site employees	24 hours initial
	8 hours field
	8 hours annual refresher
Supervisors/Managers of Routine site employees	40 hours initial
	24 hours field
	8 hours Hazwaste Management
	8 hours annual refresher
Supervisors/Managers of Routine site employees (minimal exposure) and Non-Routine site employees	24 hours initial
	8 hours field
	8 hours Hazwaste Management
	8 hours annual refresher

11.9 Initial training requirements for treatment, storage, and disposal sites.

RESERVED

11.10 Initial training requirements for emergency response staff.

Level 1 - First Responder (awareness level)	Sufficient training or proven experience in specific competencies, annual refresher
Level 2 - First Responder (operations level)	Level 1 competency and 8 hours initial or proven experience in specific competencies annual refresher
Level 3 - HAZMAT Technician	24 hours of level 2 and proven experience in specific competencies, annual refresher
Level 4 - HAZMAT Specialist	24 hours of level 3 and proven experience in specific competencies, annual refresher
Level 5 - On Scene Commander	24 hours of level 2 and additional competencies, annual refresher

Definitions

Level 1 - First Responder. Witnesses or discovers a release of hazardous materials and who are trained to notify the proper authorities.

Level 2 - First Responder. Responds to releases of hazardous substances in a defensive manner, without trying to stop the releases.

Level 3 - HAZMAT Technician. Responds aggressively to stop releases of hazardous substances.

Level 4 - HAZMAT Specialist. Responds with and in support of HAZMAT technicians, but who have specific knowledge of various hazardous substances.

Level 5 - On-Scene Commander. Assumes control of the incident scene beyond the first-responder awareness level.

11.11 Qualifications for Trainers. Trainers used by Contractor shall be qualified to instruct employees about the subject matter that is being presented in training. Such trainers shall have satisfactorily completed a training program for teaching the subjects they are expected to teach, or they shall have the academic credentials and instructional experience necessary for teaching the subjects. Instructors shall demonstrate competent instructional skills and knowledge of the applicable subject matter.

11.12 Training Certification. Employees and supervisors that have received and successfully completed the training and field experience shall be certified by their instructor or the head instructor and trained supervisor as having successfully completed the necessary training. A written certificate shall be given to each person so certified. Any person who has not been so certified or who does not meet the requirements for entering the site shall be prohibited from engaging in hazardous waste operations.

11.13 Emergency response. Employees who are engaged in responding to hazardous emergency situations at hazardous waste clean-up sites that may expose them to hazardous substances shall be trained in how to respond to such expected emergencies.

11.14 Refresher training. Employees, managers and supervisors will receive eight hours of refresher training annually (any critique of incidents that have occurred in the past year that can serve as training examples of related work, and other relevant topics).

11.15 Equivalent training. Equivalent training includes any academic training or the training that existing employees might have already received from actual hazardous waste site work experience. Employee's who can show by documentation or certification that their work experience and/or training has resulted in training equivalent to that training required for a 40 hour course will not be required attend formal training. However, certified employees or employees with equivalent training new to a site shall receive appropriate, site specific training before site entry and have appropriate supervised field experience at the new site.

12.0 Medical Surveillance. The employer when engaged in hazardous waste operations specified Section 2 of this standard practice instruction will institute a medical surveillance program in accordance with this section.

12.1 Employees covered. The medical surveillance program shall be instituted by Contractor for the following employees:

12.1.1 All employees who are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year.

12.1.2 All employees who wear a respirator for 30 days or more a year or as required by 29 CFR 1910.134.

12.1.3 All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.

12.1.4 Members of HAZMAT teams.

12.2 Frequency of medical examinations and consultations. Medical examinations and consultations shall be made available by this employer to each employee authorized on the following schedules:

12.2.1 Prior to assignment.

12.2.2 At least once every twelve months for each employee covered unless the attending physician believes a longer interval (not greater than biennially) is appropriate.

12.2.3 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 six months.

12.2.4 As soon as possible upon notification by an employee 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 permissible exposure limits or published exposure levels in an emergency situation.

12.2.5 At more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary.

12.3 For authorized employees who may have been injured, received a health impairment, developed signs or symptoms which may have resulted from exposure to hazardous substances resulting from an emergency incident, or exposed during an emergency incident to hazardous substances at concentrations above the permissible exposure limits or the published exposure levels without the necessary personal protective equipment being used:

12.3.1 As soon as possible following the emergency incident or development of signs or symptoms.

12.3.2 At additional times, if the examining physician determines that follow-up examinations or consultations are medically necessary.

12.4 Content of medical examinations and consultations.

12.4.1 Medical examinations will include a medical and work history (or updated history if one is in the employee's file) 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.

12.4.2 The content of medical examinations or consultations made available to employees will be determined by the attending physician. (The guidelines in the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities should be consulted).

12.5 Examination by a physician and costs. All medical examinations and procedures performed by or contracted through this employer will be performed by or under the supervision of a licensed physician, preferably one knowledgeable in occupational medicine, and shall be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

12.6 Information provided to the physician. Contractor will provide one copy of 29 CFR 1910.120 any appendices to the attending physician, and in addition the following for each employee:

12.6.1 A description of the employee's duties as they relate to the employee's exposures.

12.6.2 The employee's exposure levels or anticipated exposure levels.

12.6.3 A description of any personal protective equipment used or to be used.

12.6.4 Information from previous medical examinations of the employee which is not readily available to the examining physician.

12.6.5 Information required by 29 CFR 1910.134.

12.7 Physician's written opinion. Contractor shall obtain and furnish the employee with a copy of a written opinion from the attending physician containing the following:

12.7.1 The physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response, or from respirator use.

12.7.2 The physician's recommended limitations upon the employee's assigned work.

12.7.3 The results of the medical examination and tests if requested by the employee.

12.7.4 A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further examination or treatment.

12.7.5 The written opinion obtained by this employer shall not reveal specific findings or diagnoses unrelated to occupational exposures.

12.8 Recordkeeping. An accurate record of the medical surveillance shall be retained. This record shall be retained for the period specified and meet the criteria of 29 CFR 1910.20.
The record will include at least the following information:

12.8.1 The name and social security number of the employee.

12.8.2 Physician's written opinions, recommended limitations, and results of examinations and tests.

12.8.3 Any employee medical complaints related to exposure to hazardous substances.

12.8.4 A copy of the information provided to the examining physician by Contractor, with the exception of 29 CFR 1910.120 and any appendices.

13.0 Engineering controls, work practices, and personal protective equipment for employee protection. Contractor will ensure that engineering controls, work practices, personal protective equipment, or a combination of these will be implemented in accordance with 29 CFR 1910, Subparts G and Z. Engineering controls and work practices will be instituted to reduce and maintain employee exposure to or below the permissible exposure limits, except to the extent that such controls and practices are not feasible.

14.0 PCB Spill Response Procedures.

Personal protective equipment include Level C respiratory protection, poly coated tyvek suit, PVC gloves and boots, full face respirator or half face respirator and goggles, OVAG/HEPA respirator cartridges (acid gas/HEPA), and hardhat (if necessary).

Tests for PCBs utilized at the site will be Clor-n-Oil and or Clor-n-Soil field tests as approved by the client. These tests will be used to screen for PCBs in parts per million concentrations. The Clor-n-Oil screening kit can measure PCB contamination in oil and complies with EPA SW-846 Method 9079 for testing. The Clor-n-Soil screening kit can determine concentrations either above 50 ppm or below 50 ppm.

Rinse poly coated tyvek suits prior to disposal of suits as waste. This will prevent personnel from contaminating themselves with PCBs during removal of suits during decontamination procedures. All personal protective equipment is triple rinsed prior to disposal.

All PCB waste is drummed in DOT approved drums for transportation to an approved TSDF facility. Drums will be labeled as containing PCBs (Polychlorinated Biphenyls).

These PCB procedures will be included with the standard HAZWOPER procedures for spill responses that have the potential to contain PCBs.

Requirements for cleanup of spills of less than 500 ppm concentration are as follows. Solid surfaces must be double washed/rinsed except that all indoor, residential surfaces other than vault areas must be cleaned to 10 micrograms per 100 square centimeters (10 mg / 100 cm2) by standard commercial wipe tests. All soil within the spill area (visible traces of soil and a buffer of one lateral foot around visible traces) must be excavated, and the ground be restored to its original configuration by backfilling with clean soil (containing less than 1 ppm PCBs).

Requirements for cleanup of spills of greater than 500 ppm concentration are as follows. The contaminated area shall be cordoned off or otherwise delineated and restricted where visible traces plus a three foot buffer with caution signs to prevent exposure. Initiate cleanup of all visible traces of fluid on hard surfaces and initiate removal of all visible traces of the spill on soil, gravel, sand, etc. as per above.

Requirements for decontaminating spills in outdoor electrical substations are as follows. Contaminated solid surfaces both impervious and non-impervious shall be cleaned to a PCB concentration of 100 micrograms per 100 centimeters squared as measured by standard wipe tests. Soil contaminated by the spill will be cleaned either to 25 ppm PCBs by weight, or to 50 ppm PCBs by weight provided that a label or notice is visibly posted in the area warning future personnel accessing the area.

Requirements for decontaminating spills in other restricted access areas are as follows. High contact solid surfaces shall be cleaned to 10 mg per 100 cm2 as measured by standard wipe tests. Low contact, indoor, impervious solid surfaces will be decontaminated to 10 mg per 100 cm2. As an option, low contact, indoor, non-impervious surfaces will either be cleaned to 10 mg per 100 cm2, or to 100 mg per 100 cm2 and then encapsulated. Low contact, outdoor surfaces both impervious and non-impervious shall be cleaned to 100 ug per 100 cm2. Soil contaminated by the spill will be cleaned to 25 ppm PCBs by weight.

Requirements for decontaminating spills in non-restricted access areas are as follows. Easily replaceable household items shall be disposed of. Indoor solid surfaces and high contact outdoor solid surfaces shall be cleaned to 10 mg per 100 cm2. Indoor vault areas and low contact, outdoor, impervious solid surfaces

shall be cleaned to 10 mg per 100 cm2. As an option, low contact, outdoor, non-impervious solid surfaces shall be either cleaned to 10 mg per 100 cm2, or cleaned to 100 mg per 100 cm2 and then encapsulated. Soil contaminated by the spill will be decontaminated to 10 ppm PCBs by weight provided that the soil is excavated to a minimum of 10 inches. The excavated soil will be replaced with clean soil, containing less than 1 ppm PCBs, and the spill site will be restored to its original configuration.

15.0 Definitions.

- **Buddy system** means a system of organizing employees into work groups in such a manner that each employee of the work group is designated to be observed by at least one other employee in the work group. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency.

- **Clean-up operation** means an operation where hazardous substances are removed, contained, incinerated, neutralized, stabilized, cleared-up, or in any other manner processed or handled with the ultimate goal of making the site safer for people or the environment.

- **Decontamination** means the removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health affects.

- **Emergency response corresponding to emergencies** means a response effort by employees from outside the immediate release area or by other designated responders (i.e., mutual-aid groups, local fire departments, etc.) to an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance. Responses to incidental releases of hazardous substances where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area, or by maintenance personnel are not considered to be emergency responses within the scope of this standard. Responses to releases of hazardous substances where there is no potential safety or health hazard (i.e., fire, explosion, or chemical exposure) are not considered to be emergency responses.

- **Facility** means (A) any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, storage container, motor vehicle, rolling stock, or aircraft, or (B) any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; but does not include any consumer product in consumer use or any water-borne vessel.

- **Hazardous materials response (HAZMAT) team** means an organized group of employees, designated by this employer, who are expected to perform work to handle and control actual or potential leaks or spills of hazardous substances requiring possible close approach to the substance. The team members perform responses to releases or potential releases of hazardous substances for the purpose of control or stabilization of the incident. A HAZMAT team is not a fire brigade nor is a typical fire brigade a HAZMAT team. A HAZMAT team, however, may be a separate component of a fire brigade or fire department.

- **Hazardous substance** means any substance designated or listed under paragraphs (A) through (D) of this definition, exposure to which results or may result in adverse affects on the health or safety of employees:

a. Any substance defined under section 101(14) of CERCLA.

b. Any biological agent and other disease-causing agent which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any person, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations in such persons or their offspring.

c. Any substance listed by the U.S. Department of Transportation as hazardous materials under 49 CFR 172.101 and appendices.

d. Hazardous waste as herein defined.

- **Hazardous waste** means--

a. Waste or combination, as defined in 40 CFR 261.3.
b. Substances defined as hazardous wastes in 49 CFR 171.8.

- **Hazardous waste operation** means any operation conducted within the scope of 29 CFR 1910.120.

- **Hazardous waste site or Site** means any facility or location within the scope of 29 CFR 1910.120 at which hazardous waste operations take place.

- **Health hazard** means a chemical, mixture of chemicals or a pathogen for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, heptaotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes. It also includes stress due to temperature extremes. Further definition of the terms used above can be found in appendix A to 29 CFR 1910.1200.

- **IDLH or Immediately dangerous to life or health** means an atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere.

- **Oxygen deficiency** means that concentration of oxygen by volume below which atmosphere supplying respiratory protection must be provided. It exists in atmospheres where the percentage of oxygen by volume is less than 19.5 percent oxygen.

- **Permissible exposure limit** means the exposure, inhalation or dermal permissible exposure limit specified in 29 CFR part 1910, subparts G and Z.

- **Published exposure level** means the exposure limits published in "NIOSH Recommendations for Occupational Health Standards" dated 1986 incorporated by reference, or if none is specified, the exposure limits published in the standards specified by the American Conference of Governmental Industrial Hygienists in their publication "Threshold Limit Values and Biological Exposure Indices for 1987-88" dated 1987 incorporated by reference.

- **Post emergency response** means that portion of an emergency response performed after the immediate threat of a release has been stabilized or eliminated and clean-up of the site has begun. If post emergency response is performed by an employer's own employees who were part of the initial emergency response, it is considered to be part of the initial response and not post emergency response. However, if a group of an employer's own employees, separate from the group providing initial response, performs the clean-up operation, then the separate group of employees would be considered to be performing post-emergency response.

- **Qualified person** means a person with specific training, knowledge and experience in the area for which the person has the responsibility and the authority to control.

- **Site safety and health supervisor (or officer)** means the individual located on a hazardous waste site who is responsible to this employer and has the authority and knowledge necessary to implement the site safety and health plan and verify compliance with applicable safety and health requirements.

- **Small quantity generator** means a generator of hazardous wastes who in any calendar month generates no more than 1,000 kilograms (2,205 pounds) of hazardous waste in that month.

- **Uncontrolled hazardous waste site** means an area identified as an uncontrolled hazardous waste site by a governmental body, whether Federal, state, local or other where an accumulation of hazardous substances creates a threat to the health and safety of individuals or the environment or both. Some sites are found on public lands such as those created by former municipal, county or state landfills where illegal or poorly managed waste disposal has taken place. Other sites are found on private property, often belonging to generators or former generators of hazardous substance wastes. Examples of such sites include, but are not limited to, surface impoundments, landfills, dumps, and tank or drum farms. Normal operations at TSD sites are not covered by this definition.

Appendix D: Trenching and Excavation

CONTRACTOR
TRENCHING AND EXCAVATION SAFETY PLAN

REGULATORY STANDARD: 29 CFR 1926.650 - 653

BASIS: OSHA requires all employers to maintain a written program. The primary hazard to which employees may be exposed during excavation work is a cave-in, which occurs when the soil forming the side of the excavation can no longer resist the forces applied to it. This results from a reduction in the frictional and cohesive capacities of the soil to resist forces. Changing environmental conditions, such as freezing and thawing, or the addition or removal of water from the pores of the soil can reduce the ability of a soil to resist forces. The addition of superimposed loads from soil piles, or the placement of equipment or materials near the edge of the excavation also creates forces that can exceed the ability of the soil to resist.

GENERAL: Contractor will ensure that whenever an excavation operation is being undertaken, that work practices and proper conditions are met prior to beginning, during and at the conclusion of such excavation operations. It should not be assumed that every acceptable safety precaution is contained herein or that unusual circumstances may not require further or additional procedures, equipment and practices. Employees will cease operations if there is a question regarding a hazard or if such is suspected or discovered.

RESPONSIBILITY: The Safety Officer and Environmental Manager are responsible for all facets of this program and have full authority to make necessary decisions to ensure success of the program. The Safety Officer and Environmental Manager are authorized to amend these instructions and is authorized to halt any operation of the area where there is danger of serious personal injury.

Contents of the Contractor Trenching and Excavation Safety Program

Contractor Trenching and Excavation Safety Program

1. Written Program. Contractor will review and evaluate this standard practice instruction:

- On an annual basis
- When regulatory changes occur that prompt revision of this document
- When facility operational changes occur that require a revision of this document
- When there is an accident or close-call that relates to this topic

Effective implementation of this program requires support from all levels of management within this company. This written program will be communicated to all personnel that are affected by it. It encompasses the total workplace, regardless of the number of workers employed or the number of work shifts. It is designed to establish clear goals, and objectives.

2. General Requirements. Contractor will establish procedures for "trenching and excavation" undertaken by its employees, through the use of this document. Preventing future work-place injuries in our company is the principle purpose of this document. This document will provide a basis for ensuring that all procedures implemented, revised or modified meet our requirements for safety. This document will help identify hazards in our work-place and enable us to determine the best course of action to take to reduce or eliminate known hazards.

3. Surface Encumbrances and Underground Installations Safety Guidelines. All surface encumbrances that are located so as to create a hazard to employees will be removed or supported, as necessary, to safeguard employees. The estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, will be determined prior to opening an excavation. The following procedures are designed to provide employees of this company with a system for protection and safe conditions while working in a trenching or excavation environment. These guidelines are designed for use by employees at all levels within the work force.

3.1 Establish the locations of all underground and overhead utilities and services before beginning trenching or excavation operations.

3.1.1 Contact utility and service companies to include municipal owned and advise them prior to the start of all actual excavation. No exceptions.

3.1.2 The following local response times for utility companies in our area to locate and advise us on underground installations or surface encumbrances are as follows:

To be determined by the information collected by the contractor from New York City Dig Safe

3.1.3 Utility companies or owners will be contacted:

- Within established or customary local response times;
- Advised of the proposed work, and;
- Asked to establish the location of the utility underground installations prior to the start of actual excavation and provide advice concerning surface encumbrances.

3.1.4 When excavation operations approach the estimated location of underground installations, the exact location of the installations will be determined by safe and acceptable means (modern techniques and customary types of equipment) where this determination is unclear the owning utility will be contacted for assistance.

3.1.5 While any excavation is open, underground installations will be protected, supported or removed as necessary to safeguard employees.

4. Protection from Hazards Associated with Water Accumulation

4.1 Employees will 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. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline systems.

4.2 Inspect all excavations after any rainfall or other hazard producing occurrence to determine if any change to the soils capacity to resist the force has occurred. This will be done by a person that has the competence to do so.

4.2.1 Authorized to inspect (*Site Specific*):

1. Charles Powers, Senior Project Manager (Primary)

2. Michael Hauptmann, Site Safety Officer (Alternate)

4.2.2 Water should not be allowed to accumulate within the excavation. If such has occurred it will be removed utilizing proper pumping procedures and precautions.

4.3 Water will be controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations will be monitored by a competent person to ensure proper operation.

4.4 If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches or dikes, suitable means will 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 runoff from heavy rains will be inspected by a competent person

5. Protection from Superimposed Loads

5.1 Superimposed loads (crane, backhoe and other such equipment working close to the excavation edges) require extra sheet piling, shoring or other bracing be used to assure the ability of the soil to resist. The use of mobile equipment near the excavation requires proper vehicle barricades and/or stop blocks.

6. Access and Egress from Excavations

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

6.2 Means of egress from trench excavations (less than 20 ft deep). A stairway, ladder, ramp or other safe means of egress will be located in trench excavations that are 4 feet (1.22 m) or more in depth so as to require no more than 25 feet (7.62 m) of lateral travel for employees.

6.3. Means of egress from trench excavations (20 ft or greater in depth). Ladders will be equipped with ladder platforms at 20-foot intervals.

7. Trench Safety

7.1 Trenches more than five feet deep require shoring or will be laid back to its angle of repose (stabilized slope).

7.2 In hazardous soil conditions (loosely compacted or rocky) trenches under five foot need protection.

7.3 There shall be at any excavation site a competently trained person, who is capable of identifying existing and predictable hazards and who shall have the authority to take prompt corrective action to eliminate them on the site. This individual shall be able to identify soil classifications and protective systems (shoring, bracing and piling) to be used in accordance with OSHA Trenching Standards found in 29 CFR 1926.652.

7.4 Trenches more than five (5) feet deep require shoring or will be laid back to a stable slope. In hazardous soil, trenches under five (5) feet will also be protected.

7.5 Portable trench boxes or sliding trench boxes used in place of shoring and sloping shall be designed, constructed and maintained to provide protection at least equal to the required sheeting and shoring. Shields shall be designed by a registered professional engineer and will meet the standards found in 29 CFR 1926.652.

7.6 Shields shall be installed so as to restrict lateral or other hazardous movement. Trench boxes and shields shall extend to the bottom of the trench and no less than eighteen (18) inches above the vertical top of the trench or excavation face. Exceptions are found in 29 CFR 1926.652. Excavation to a level not greater that 2 feet (.61 m) below the bottom of a shield shall be permitted, but only if the shield is designed to resist the forces calculated for the full depth of the trench and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the shield. No employee shall be allowed within the shield, or trench box during the installation, removal or relocation. If at anytime trench boxes are stacked, means shall be provided to prevent separation.

8. Exposure to Vehicular Traffic

Employees exposed to public vehicular traffic will be provided with, and will wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material.

9. Exposure to Falling Loads

9.1 No employee will be permitted underneath loads handled by lifting or digging equipment.

9.2 Employees will be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials.

9.3 Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped, in accordance with §1926.601, to provide adequate protection for the operator during loading and unloading operations.

10. Warning Systems for Mobile Equipment

When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system will be utilized such as barricades, hand or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.

11. Hazardous Atmospheres

11.1 Testing and controls. Confined space entry procedures will be adhered to in accordance with the Contractor Permit Required Confined Space Entry Program. To prevent exposure to harmful levels of atmospheric contaminants and to assure acceptable atmospheric conditions, the following requirements apply:

11.1.1 Oxygen deficiency. Where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist, such as in excavations in landfill areas or excavations in areas where hazardous substances are stored nearby, the atmospheres in the excavation will be tested before employees enter excavations greater than 4 feet (1.22 m) in depth.

11.1.2 Flammable atmospheres. Adequate precaution will be taken such as providing ventilation, to prevent employee exposure to an atmosphere containing a concentration of a flammable gas in excess of 20 percent of the lower flammable limit of the gas.

11.1.3 Testing. When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing will be conducted as often as necessary to ensure that the atmosphere remains safe.

11.2 Emergency Rescue Equipment.

11.2.1 Availability. Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher, will be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. The equipment will be attended when in use.

11.2.2 Lifelines. Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, will wear a harness with a lifeline securely attached to it. The lifeline will be separate from any line used to handle materials, and will be individually attended at all times while the employee wearing the lifeline is in the excavation.

12. Personal Protective Equipment (PPE). The following procedures are designed to provide employees of this company with a checklist system or procedure to follow for the selection of proper PPE for operations under this program.

12.1 Checklist

(1) Hard hat

(2) Long sleeve garment
(3) Trouser
(4) Safety toes work boot
(5) Proper eye and face protection
(6) Work glove, rubber or neoprene when working with or in chemicals
(7) NIOSH approved respirator where or when the job hazard may require
(8) Hearing protection
(9) Rubber or neoprene boots when exposed to waste-water products (a sanitary washing facility will be provided for cleanup)

Note: The first line supervisor or senior supervisor on the site will be responsible for compliance for proper utilization of PPE.

13. Material Handling Equipment. All material handling equipment will be operated in accordance with established CNS Management Corp. written policies, manufacturer's procedures and applicable OSHA standards.

14. Stability of Adjacent Structures

14.1 Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning will be provided to ensure the stability of such structures for the protection of employees.

14.2 Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees will not be permitted except when:

14.2.1 A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; or

14.2.2 The excavation is in stable rock; or

14.2.3 A registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity: or

14.2.4 A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.

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

15. Protection of Employees from Loose Rock or Soil

15.1 Adequate protection will be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection will consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the face to stop and contain falling material; or other means that provide equivalent protection.

15.2 Employees will be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection will be provided by placing and keeping such materials or equipment at least 2 feet (.61 m) from the edge of excavations, or by the use of retaining devices that are

sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

16. Site Inspections

16.1 Daily inspections of excavations, the adjacent areas, and protective systems will be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. These inspections are only required when employee exposure can be reasonably anticipated. An inspection will be:

16.2 Conducted by the competent person prior to the start of work and as needed throughout the shift.

16.3 Inspections will also be made after every rainstorm or other hazard increasing occurrence.

16.4 Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees will be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

17. Fall Protection

17.1 Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails will be provided.

17.2 Adequate barrier physical protection will be provided at all remotely located excavations. All wells, pits, shafts, etc., will be barricaded or covered. Upon completion of exploration and other similar operations, temporary wells, pits, shafts, etc., will be backfilled.

18. Training Requirements

18.1 Initial Training.

18.1.1 Contractor shall provide training to ensure the purpose and function of the trenching and excavation program is understood by employees and the knowledge and skills required for safe trenching and excavation operations is acquired by all affected employees. The training shall include as a minimum, the following:

18.1.2 Training in the recognition of applicable hazards associated with trenching and excavation operations.

18.1.3 Each affected employee shall be instructed in the purpose and use of this standard practice instruction.

18.1.4 All other employees whose work operations are or may be in an area where trenching and excavation operation are conducted shall be instructed to an awareness level about the procedures, and prohibitions relating to work in such areas.

18.2 Refresher Training.

18.2.1 Retraining shall be provided for all authorized and affected employees whenever there is a change in their job assignments, a change in equipment or processes that present a new hazard, or when there is a change in these procedures. **Note**: Retraining (to include a procedural review) will also be provided whenever there is a "close-call" or these procedures fail.

18.2.2 Additional retraining shall also be conducted whenever a periodic inspection reveals, or whenever Contractor has reason to believe, that there are deviations from or inadequacies in the employee's knowledge or use of these procedures.

18.2.3 The retraining shall reestablish employee proficiency and introduce new or revised operational methods and procedures, as necessary.

18.3 Certification. Contractor shall certify that employee training has been accomplished and is being kept up to date. The certification shall contain each employee's name and dates of training.

19. Protection of Employees in Excavations

19.1 Each employee in an excavation will be protected from cave-ins by an adequately designed protective system except when:

19.1.1 Excavations are made entirely in stable rock; or

19.1.2 Excavations are less than 5 feet (1.52 m) in depth and examination of the ground by a competent person provides no indication of a potential cave-in.

19.2 Protective systems will 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.

20. Design of Sloping and Benching Systems

20.1 The slopes and configurations of sloping and benching systems will be properly selected and constructed as follows:

20.1.1 Option 1 - Allowable configurations and slopes. Excavations will be sloped at an angle not steeper than one and one-half horizontal to one vertical (34 degrees measured from the horizontal), unless the employer uses one of the other options listed below.

20.1.2 Option 2 - Determination of slopes and configurations is made using 29CFR §1926.652 Appendices A and B Maximum allowable slopes, and allowable configurations for sloping and benching systems.

20.1.3 Option 3 - Designs using other tabulated data. Designs of sloping or benching systems will be selected from and in accordance with tabulated data, such as approved tables and charts. The tabulated data will be in written form and will include:

- Identification of the parameters that affect the selection of a sloping or benching system drawn from such data;

- Identification of the limits of use of the data, to include the magnitude and configuration of slopes determined to be safe;

- Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.

Note: At least one copy of the tabulated data which identifies the registered professional engineer who approved the data, will be maintained at the jobsite during construction of the protective system. After that time the data may be stored off the jobsite, but a copy of the data will be made available to OSHA upon request.

20.1.4 Option 4 - Design by a registered professional engineer.

20.2 Sloping and benching systems not utilizing Option (1) or Option (2) or Option (3) will be approved by a registered professional engineer. Designs will be in written form and will include at least the following:

20.2.1 The magnitude of the slopes that were determined safe for the particular project;

20.2.2 The configurations that were determined to be safe for the particular project;

20.2.3 The identity of the registered professional engineer approving the design.

Note: At least one copy of the design will be maintained at the jobsite while the slope is being constructed. After that time the design need not be at the jobsite, but a copy will be made available to OSHA upon request.

21. Design of Support Systems, Shield Systems, and other Protective Systems

21.1 Designs of support systems, shield systems, and other protective systems will be selected and constructed in accordance with the following options:

21.1.1 Option 1 - Designs using Appendices A, C and D of 29CFR §1926.652. Designs for timber shoring in trenches will be determined in accordance with the conditions and requirements set forth in appendices A and C. Designs for aluminum hydraulic shoring will be in accordance with appendix D of 29CFR §1926.652, but if manufacturer's tabulated data cannot be utilized, designs will be in accordance with appendix D.

21.1.2 Option 2 - Designs using Manufacturer's Tabulated Data. Design of support systems, shield systems, or other protective systems that are drawn from manufacturer's tabulated data will be in accordance with all specifications, recommendations, and limitations issued or made by the manufacturer.

21.1.2.1 Deviation from the specifications, recommendations, and limitations issued or made by the manufacturer will only be allowed after the manufacturer issues specific written approval.

21.1.2.2 Manufacturer's specifications, recommendations, and limitations, and manufacturer's approval to deviate from the specifications, recommendations, and limitations will be in written form at the jobsite during construction of the protective system. After that time this data may be stored off the jobsite, but a copy will be made available to OSHA upon request.

21.1.3 Option 3 - Designs using other Tabulated Data. Designs of support systems, shield systems, or other protective systems will be selected from and be in accordance with tabulated data, such as tables and charts. The tabulated data will be in written form and include all of the following:

21.1.3.1 Identification of the parameters that affect the selection of a protective system drawn from such data;

21.1.3.2 Identification of the limits of use of the data;

21.1.3.3 Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.

Note: At least one copy of the tabulated data, which identifies the registered professional engineer who approved the data, will be maintained at the jobsite during construction of the protective system. After that time the data may be stored off the jobsite, but a copy of the data will be made available to the OSHA upon request.

21.1.4 Option 4 - Design by a Registered Professional Engineer. Support systems, shield systems, and other protective systems not utilizing Option 1, Option 2 or Option 3, above, will be approved by a registered professional engineer. Designs will be in written form and will include the following:

21.1.4.1 A plan indicating the sizes, types, and configurations of the materials to be used in the protective system; and

21.1.4.2 The identify of the registered professional engineer approving the design.

22. Materials and Equipment used for Protective Systems

22.1 Materials and equipment used for protective systems will be free from damage or defects that might impair their proper function.

22.2 Manufactured materials and equipment used for protective systems will be used and maintained in a manner that is consistent with the recommendations of the manufacturer, and in a manner that will prevent employee exposure to hazards.

22.3 When material or equipment that is used for protective systems is damaged, a competent person will examine the material or equipment and evaluate its suitability for continued use. If the competent person cannot assure the material or equipment is able to support the intended loads or is otherwise suitable for safe use, then the material or equipment will be removed from service, and will be evaluated and approved by a registered professional engineer before being returned to service.

23. Installation and Removal of Support Systems

23.1 General requirements.

23.1.1 Members of support systems will be securely connected together to prevent sliding, falling, kickouts, or other predictable failure.

23.1.2 Support systems will be installed and removed in a manner that protects employees from cave-ins, structural collapses, or from being struck by members of the support system.

23.1.3 Individual members of support systems will not be subjected to loads exceeding those which those members were designed to withstand.

23.1.4 Before temporary removal of individual members begins, additional precautions will be taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system.

23.1.5 Removal will begin at, and progress from, the bottom of the excavation. Members will be released slowly so as to note any indication of possible failure of the remaining members of the structure or possible cave-in of the sides of the excavation.

23.1.6 Backfilling will progress together with the removal of support systems from excavations.

23.2 Additional requirements for support systems for trench excavations.

23.2.1 Excavation of material to a level no greater than 2 feet (.61 m) below the bottom of the members of a support system will be permitted, but only if the system is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the support system.

23.2.2 Installation of a support system will be closely coordinated with the excavation of trenches.

24. Sloping and Benching Systems

24.1 Employees will not be permitted to work on the faces of sloped or benched excavations at levels above other employees except when employees at the lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.

25. Shield Systems

25.1 Shield systems will not be subjected to loads exceeding those which the system was designed to withstand.

25.2 Shields will be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of sudden lateral loads.

25.3 Employees will be protected from the hazard of cave-ins when entering or exiting the areas protected by shields.

25.4 Employees will not be allowed in shields when shields are being installed, removed, or moved vertically.

25.5 Excavations of earth material to a level not greater than 2 feet (.61 m) below the bottom of a shield will be permitted, but only if the shield is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the shield.

26. Applicable Definitions

Accepted Engineering Practices - means those requirements which are compatible with standards of practice required by a registered professional engineer.

Aluminum Hydraulic Shoring - means a pre-engineered shoring system comprised of aluminum hydraulic cylinders (crossbraces) used in conjunction with vertical rails (uprights) or horizontal rails (wales). Such system is designed specifically to support the sidewalls of an excavation and prevent cave-ins.

Bell-Bottom Pier Hole - means a type of shaft or footing excavation, the bottom of which is made larger than the cross section above to form a bell shape.

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

Cave-In - means the separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or other wise injure and immobilize a person.

Competent Person - means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Cross Braces - mean the horizontal members of a shoring system installed perpendicular to the sides of the excavation, the ends of which bear against either uprights or wales.

Excavation - means any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

Faces or Sides - means the vertical or inclined earth surfaces formed as a result of excavation work.

Failure - means the breakage, displacement, or permanent deformation of a structural member or connection so as to reduce its structural integrity and its supportive capabilities.

Hazardous Atmosphere - means an atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, may cause death, illness, or injury.

Kickout - means the accidental release or failure of a cross brace.

Protective System - means a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Ramp - means an inclined walking or working surface that is used to gain access to one point from another, and is constructed from earth or from structural materials such as steel or wood.

Registered Professional Engineer - means a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

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

Shield (Shield System) - means a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either pre-manufactured or job-built in accordance with 1926.652. Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

Shoring (Shoring System) - means a structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Sides. See "Faces."

Sloping (Sloping System) - means a method of protecting employees from cave-ins by excavating to form sides of an excavation 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.

Stable Rock - means natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.

Structural Ramp - means a ramp built of steel or wood, usually used for vehicle access. Ramps made of soil or rock are not considered structural ramps.

Support System - means a structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Tabulated Data - means tables and charts approved by a registered professional engineer and used to design and construct a protective system.

Trench (Trench Excavation) - means a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 m) or less (measured at the bottom of the excavation), the excavation is also considered to be a trench.

Trench Box. See "Shield."

Trench Shield. See "Shield."

Uprights - means the vertical members of a trench shoring system placed in contact with the earth and usually positioned so that individual members do not contact each other. Uprights placed so that individual members are closely spaced, in contact with or interconnected to each other, are often called "sheeting."

Wales - means horizontal members of a shoring system placed parallel to the excavation face whose sides bear against the vertical members of the shoring system or earth.

Appendix E: Confined Space Entry

CONTRACTOR
PERMIT-REQUIRED CONFINED SPACE SAFETY PLAN

1.0 POLICY

1.1 Contractor is committed to provide a safe and healthful work environment for our entire staff. Pursuit of this endeavor, the following written program is in place to first identify any Permit-Required Confined Space (PRCS) and to eliminate or control hazards associated with PRCS operations. Contractor may encounter PRCS during Emergency Response Procedures. This program is in accordance with the Occupational Safety and Health Administration's (OSHA) Permit-Required Confined Spaces Standard, Title 29, Code of the Federal Regulations 1910.146.

1.2 Confined Space / Limited Egress enclosure: Any space or enclosure that (1) has limited openings for entry and egress; (2) may have limited ventilation; (3) may contain or produce life threatening atmospheres due to oxygen deficiency, or the presence of toxic, flammable, and/or corrosive contaminants; (4) and which is not intended for continuous employee occupancy. Examples of such enclosures may include but are not limited to: storage tanks, ship compartments, process/reaction vessels, stacks, pits, basements, silos, vats, degreasers, boilers, ventilation and exhaust ducts, manholes, sewers, tunnels, underground utility vaults, pipelines, and any open topped space several feet or more in depth that is not subject to adequate ventilation.

1.3 The configuration of the space and the proposed operation to be conducted within that space will ultimately determine if a permit-required confined space exists.

1.4 Health and Safety Officer or Director of Field Operations are to be considered synonymous and hold equal authority. The Director of Field Operations is a Contractor title who has the authority in the field on all the work sites of Contractor.

1.5 Purging: Displacing gases, vapors, or other airborne contaminants from a permit-required confined space by ventilation or inert gas.

2.0 RESPONSIBILITIES

2.1 Overall Program Responsibility: The Supervisor of Health and Safety is responsible for the overall implementation and maintenance of any written program or any certification concerning the requirements of the Permit-Required Confined Space (PRCS) Standard at our company.

2.2 Permit-Required Confined Space Evaluation: The Director of Field Operations and/or Health & Safety Officer is responsible for evaluating the workplace in the field to determine if any permit-required confined spaces are encountered at the work site. The Director of Field Operations and Health & Safety Officer is responsible for determining if a PRCS program is required, or if the permit space can be reclassified as a non-permit space, or if alternative procedures can be used.

2.3 Training: The Supervisor of Health and Safety is responsible for ensuring that affected personnel are properly trained and that refresher training is given. Personnel who may be included are any authorized entrants, attendants, entry supervisors, on-site rescue team members, and employees who may potentially enter the space.

2.4 Initial Contacting for Rescue Services: The Project Manager and/or Site Supervisor will ensure that rescue and emergency services have been informed of any permit-required confined spaces at the work site and have been given access to the spaces if they are to be used as standby during the course of the project.

2.5 Equipment: The Director of Field Operations will ensure that all equipment needed for safe entry into any permit spaces and non-permit spaces is available and in proper working order.

3.0 PERMIT SPACE IDENTIFICATION

3.1 The Director of Field Operations will evaluate the workplace and determine;

- No Permit-Required Confined Space(s) exist at the worksite.
- Permit-Required Confined Space(s) have been determined to exist.

Confined Space: is a space which, (1) is large enough and so configured that an employee can bodily enter and perform assigned work; (2) has limited or restricted means for entry or exit (example: tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry/exit); (3) is not designed for continuous human occupancy.

Permit Space: is a confined space which has one or more for the following characteristics (1) contains or has a potential to contain a hazardous atmosphere; (2) contains a material that has the potential for engulfing an entrant; (3) has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; (4) contains any other recognized serious safety or health hazard (i.e. electrical, mechanical, etc.).

See Confined Space and Permit-Required Confined Space Recognition Form.

3.2 The location(s) and hazard(s) posed by these permit spaces for the project are listed below;

LOCATION: HAZARD:

_____

_____

_____

The Entry Supervisor must sign and approve PRCS entry permits prior to any entry personnel entering the confined space.

4.0 PREVENTION OF UNAUTHORIZED ENTRY

4.1 If permit spaces are identified at a worksite, The Director of Health and Safety and/or Director of Field Operations will inform exposed or potentially exposed employees of their existence and hazards. The method(s) that will be used will be:

Posting of danger signs at each permit space reading "DANGER - Permit-Required Confined Space - Do Not Enter."

All workers on the job site will be drilled on the work procedures to be used on the project. Contractor will have a project meeting with all employees on the job site prior to commencement of work procedures.

4.2 If it is determined by the Director of Field Operations that permit required confined spaces exist at the work site, the following precautions will be taken during the course of the work.

X Will not be entered by unauthorized employees.

The following measures will be taken to prevent unauthorized employees from entering the space(s).

The work site will be isolated with caution tape and caution fencing to prevent entrance by unauthorized employees. The Site Supervisor will also have the responsibility for the site that unauthorized personnel are excluded from the work site. The work area will be sealed to prevent access during non-working hours.

X The PRCS will be entered only by authorized trained employees of our company.

5.0 PERMIT-REQUIRED CONFINED SPACE (PRCS)

5.1 Safe entry procedures will be developed for each permit space at the work site. These procedures specify the proper methods and equipment necessary to conduct the entry operation in a safe manner. A Permit Space Entry Procedure Worksheet will be completed for the permit space by the Director of Field Operations.

See the Permit-Required Confined Space (PRCS) Program Worksheet.

5.2 Entry Permit System: Entry into a PRCS enclosure shall be by permit only. The permit serves as written approval and authorization for an entry of a specific space for a specific task. The permit certifies that existing and potential hazards have been evaluated by the on-site Entry Supervisor (and/or on-site Health and Safety Officer) and identifies the protective measures specified to ensure worker safety. The entry permit when completed will serve as a final safety briefing outline before entry and will be reviewed by the Health and Safety Officer with the entry team and standby personnel. The entry permit will identify:

- The location of the Permit-Required Confined Space (PRCS) and a description of the entry task.
- Known and potential hazards that may be encountered in the PRCS.
- Isolation checklist
- blanking and/or disconnecting of all lines
- electrical lockout and tagout (both)

- mechanical isolation and tagout (both)
- mechanical ventilation (volumes)
- Safety and protective equipment required
- level of protection
- type of protective equipment
- safety harness and/or lifelines
- extraction devices
- tools and electrical equipment approvals (including lighting and communication devices)
- Pre-entry atmospheric monitoring
- oxygen level
- combustible gas/vapor level
- toxic substances level
- Provisions for continuous atmospheric monitoring
- equipment
- evaluation criteria
- Identification of entry team
- Personnel to make entry
- Personnel on stand-by
- Emergency procedures and first-aid equipment location
- Training required
- PRCS entry
- PRCS rescue
- Respirator use

5.3 Testing and Monitoring

5.3.1 Absolutely no permit-required confined space entry without the use of appropriate supplied-air respirators and dermal protection is to be initiated until appropriate initial testing has been conducted to assure the atmosphere in the PRCS is safe. Monitoring shall be conducted for oxygen content, combustible gases/vapors, toxic contaminants and any other tests specified by the on-site Health and Safety Officer. Monitoring of the PRCS shall be done on a continuous basis while personnel are in the PRCS enclosure.

Entry into a PRCS shall not be permitted without the use of appropriate supplied-air respirators and dermal protection under the following conditions:

(1). Oxygen concentration less than 19.5% (148mm Hg*) or greater than 23.5% (178 mm Hg*).

* based on atmospheric pressure of 760mm Hg (sea level).

(2). Flammability measures greater than 10% of the lower explosive limits (LEL).

(3). Contaminant level measurements indicating an IDLH atmosphere present in the PRCS.

(4). Emergency rescue conditions with additional standby team available.

Whenever any of the *not entry* conditions occur, the volumes of mechanical ventilation supplied to the space shall be increased and maintained at the increased levels. Entry or re-entry will be permitted when: (1) oxygen levels are measured greater than 19.5% and less than 23.5%; (2) LEL measurements fall below 10%; and (3) an IDHL atmospheric condition no longer exists.

Regardless of the level of respiratory protection, no entry for *Hot Work* will be allowed when tests indicate the concentration of flammable gases exceeds 10% of the LEL.

Initial atmospheric samples shall be drawn while outside the PRCS at least at the following locations:

(1). Outside the entry point(s)

(2). Immediately inside the entry point(s)

(3). At least every four feet in depth of the PRCS to the surface of the floor or any remaining residues.

All initial monitoring results will be recorded on the entry permit.

5.4 Work Practices: As part of the entry procedure, the on-site Health and Safety Officer shall review the entry permit with all members of the entry team and standby team personnel as indicated in Section 8.1 and shall be present during the operation. The Health and Safety Officer and Entry Supervisor will maintain communications and have ready access to emergency and support services and facilities.

5.4.1 Purging and Ventilation: All PRCS enclosures shall be subject to purging and continuous ventilation after initial atmospheric testing bur prior to any actual entry. the only exception to this requirement is where entry is made solely to obtain samples of materials remaining in the PRCS *and* initial atmospheric testing indicates:

(1). No oxygen deficiency or enrichment.

(2). LEL measurements are less than 10%

(3). Contaminant levels are less than 10% of the established IDHL of the airborne contaminant present.

(4). Organic vapor measurements coincide with the appropriate level of personal protective equipment employed for confined spaces.

(5). Special conditions exist such that the above criteria do not apply and specific authorization is obtained from the Director of Health and Safety of the Company.

5.4.2 Isolation / Lockout and Tagging

Except for such PRCS as manholes, sewers, and tunnels, where complete isolation is not physically possible, all PRCS shall be completely isolated from all other systems by such means as double block and bleed, blanking or physical disconnection of all lines into the PRCS. All lines that have been subject to the isolation actions shall be tagged to identify the reason for blocking, blanking and/or disconnection. The *Tag* shall contain the following statement:

THIS EQUIPMENT HAS BEEN
REMOVED FROM SERVICE DUE
TO CONFINED SPACE WORK
AT _____
DO NOT OPERATE

The PRCS shall be electrically isolated to prevent accidental activation of moving parts in the PRCS or other electrical equipment serving the PRCS. Electrical isolation shall be accomplished by lockout of circuit breakers and/or power disconnects in the open (OFF) position by key-type padlock. The Entry Supervisor for the entry team entering the PRCS shall have placed a lock on the circuit breaker/disconnect and shall maintain possession of the only key to the lock. Any circuit breaker/disconnect that is locked out, shall also be tagged to identify the reason for the lock out.

Mechanical isolation of moving parts shall be deactivated by disconnecting linkages, or removal of chain or belt drives. Other moving mechanical parts shall be blocked in such a manner as to preclude accidental rotation. Any mechanical isolation shall be tagged to identify the reason for the isolation.

5.4.3 Cleaning

Initial cleaning of any PRCS shall be done from the outside if at all feasible. If initial atmospheric testing shows a flammable atmosphere at or above the lower explosive limit (LEL) in the PRCS enclosure, it shall be inert gas purged prior to starting ventilation.

The cleaning process itself may create an additional potential for hazard in the PRCS. Examples of such conditions include:

(1). Excessive heat stress in the PRCS if it is steam cleaned and not allowed to cool down.

(2). Build up of toxic materials if a chemical neutralization is used and ventilation is not maintained or adequate.

3). Potential for fire and explosion in the PRCS where the auto ignition temperature of the stored product in the PRCS is 120% or less of the steam pressure and/or the steam hose nozzle is not bonded to the PRCS during steam cleaning operations.

5.4.4 Equipment, Instruments and Tools

All tools and other equipment, including monitoring instruments, for use in the PRCS shall be inspected for compliance with the following requirements.

(1). Tools and equipment will be kept cleaned in good state of repair.

(2). All electrical equipment including portable tools, lighting, and power cords shall meet approvals in accordance with OSHA regulations found in 29 CFR 1910 Subpart S, including provisions for ground fault interruption protection and visual inspection of equipment for defects or damage.

(3). Lighting used in the PRCS shall be explosion proof design equipped with necessary guards and bearing Underwriters Laboratories or other appropriate approval listings.

(4). Air activated tools used where flammable liquids are present shall be bonded to the PRCS.

(5). Compressed gas cylinders, except those that are part of Self Contained Breathing Apparatus (SCBA) or resuscitation equipment, shall never be permitted inside a PRCS. Cylinders used to supply compressed gases to the PRCS shall be turned off at the valve when not in actual use, and the supply lines removed from the PRCS.

(6). Ladders, scaffolding and staging shall be adequately designed and secured and in conformance with OSHA regulations found in 29 CFR 1910 Subpart D.

(7). Any equipment or instrumentation subject to use in PRCS where flammable atmospheres may occur shall be listed as explosive proof or intrinsically safe by a recognized testing laboratory.

5.4.5 Recordkeeping: Copies of the entry permit will be maintained as an employee exposure record as required under 29 CFR 1910.20.

6.0 ALTERNATIVE PROCEDURES

6.1 The OSHA regulations allow permit spaces which have, as their only hazard, an actual or potential hazardous atmosphere to use alternative procedures for entry. These alternative procedures as discussed in Section 1 do not require the implementation of a full PRCS program.

7.0 RECLASSIFYING PERMIT SPACE TO NON-PERMIT SPACE

Reserved

8.0 PERSONNEL, DUTIES, and TRAINING for FULL PERMIT-REQUIRED CONFINED SPACE ENTRY OPERATIONS

8.1 Entry into a PRCS where a full PRCS program is mandated will require a specially trained and equipped team. Each team will consist of an:

- *authorized entrant*
- *attendant*
- *entry supervisor*
- *rescue personnel* - will be supplied by others.

8.2 Each member of the team will receive initial and annual refresher training. The training will be specific for the duties of each team member and include the procedures and practices necessary to protect them from the dangers of the permit space.

8.3 The training program will include the duties of each team member as listed below:

Authorized Entrants
- Know the hazards associated with the permit space and their effects.
- Entry and egress procedures
- Properly use the equipment required for entry.

- Maintain a continuous means of communication with the attendant.
- Alert the attendant in the event of an emergency.
- Evacuate the space if an emergency occurs.

Attendants
- Know the hazards associated with the permit space and their effects.
- Entry and egress procedures
- Maintain an accurate account of the authorized entrants.
- Remain at their assigned station until relieved by another attendant or until the permit space entry is complete.
- Monitor conditions in and around the permit space.
- Summon rescue and applicable medical services in the event of an emergency.
- Perform non-entry rescue procedures.
- Perform appropriate measures to prevent unauthorized personnel from entering the permit space.

Entry Supervisors
- Know the hazards associated with the permit space and their effects.
- Verify the safeguards required by the permit space have been implemented.
- Verify that rescue services are available and that the means for summoning them are operable.
- Cancel the written permit and terminate the permit space entry when required.
- Remove personnel who are not authorized to enter the permit space during entry operations.
- Periodically, determine that the entry operation is being performed in a manner consistent with the requirements of the permit space entry procedures and that acceptable entry conditions are maintained.

Rescue Personnel
- See Rescue and Emergency Services attachment.

8.4 Permit-Required Confined Space (PRCS) Program Training

If a full permit-required confined space program is required, training is needed on the following topics.

a. Types of confined space hazards.
b. Components of the written PRCS program.
c. Components of the entry permit system.
d. Components of the hot work permit.
e. The need for prompt guarding of the entrance opening.
f. Atmospheric testing equipment including its use, calibration, and maintenance.
g. Atmospheric testing protocol:
    * oxygen, combustibles, toxics
    * pre-entry, frequent or continuous testing
    * check all levels of the space
h. Methods for the control or elimination of any atmospheric hazards:
    * Inerting
    * Draining and rinsing
    * Purging and cleaning
    * Continuous forced air ventilation
i. Procedures the employees must follow if they detect a hazard.
j. The evaluation process to be used for re-entry if hazards are detected.
k. Train employees on the use of entry equipment (ladders, communication devices, etc.).

l. Personnel protective equipment required:
   * full body harness
   * respiratory protection
   * chemical protective clothing
   * eye and face protection

m. Personnel and their responsibilities:
   * authorized entrant
   * attendant
   * entry supervisor
   * rescue team

n. On-site or Off-site rescue
   * Rescue Plan
   * practice rescues
   * basic first-aid and cardiopulmonary resuscitation certification.
   * full body harness with retrieval line attached to mechanical retrieval device

o. Procedures for annual review of canceled permits.

p. Any other information necessary to ensure employee safety during a permit space entry operation.

q. Documentation of the training.

8.4.1 The following is a list of employees who have been equipped and trained to serve as authorized entrants.

Authorized Entrants:	**Trainer:**	**Date of Training:**

8.4.2 The following is a list of employees who have been equipped and trained to serve as attendants.

Attendant:	**Trainer:**	**Date of Training:**

8.4.3 The following is a list of employees who have been trained to serve as entry supervisors.

Entry Supervisor:	**Trainer:**	**Date of Training:**

9.0 HOST EMPLOYER'S RESPONSIBILITIES WITH CONTRACTORS

9.1 When contractors are involved in permit space entry work at the work site, they will inform Contractor of the following information and coordinate any entry operations:

- The location of the permit spaces at their facility and that entry into these spaces is only allowed through a permit space program or alternative procedures or space reclassification.
- Owner's rationale for listing the space as a permit space such as any identified hazards and their experiences with the particular space.
- Precautions that they have implemented to protect employees working in or near the space.
- Owner's Health and Safety Officer or Representative (or equivalent) will debrief Contractor personnel at the completion of the entry operation, or during if a need arises, and if any hazards were confronted or created during their work.

10.0 CONTRACTOR'S RESPONSIBILITIES WITH HOST EMPLOYERS

10.1 When Contractor is hired to perform work in a PRCS, the Director of Field Operations and/or Director of Health and Safety will obtain the following information from the Owner or Owner's Representative (the host employer) and ensure the following tasks are performed.

* Obtain any information on the hazards of the permit space and information from pervious entry operations from the host employer.
* Determine if the host employer's workers will be working in of near the space.
* If the host employer will have employees working in or near the space during our entry operation, the Director of Field Operations will coordinate entry operations with the host employer's representative.
* Will inform the host employer of the permit space program that will be utilized.
* Hold a debriefing conference at the completion of the entry operation of during the entry operation (if needed) to inform the host employer of any hazards confronted or created.

11.0 RESCUE AND EMERGENCY SERVICES

11.1 The precautions and procedures outlined in our written PRCS program are designed to ensure that our employees are safe while working in permit spaces. Under no circumstances do we expect our employees to enter a permit space where hazards have not been eliminated or effectively controlled.

Additionally, we recognize that unexpected situations might arise that prevent entrants from self-rescue. Contractor does not maintain their own emergency rescue team. In response, the following rescue and emergency action plan has been developed and will be strictly enforced:

Contractor has decided to utilize (this will be determined prior to the project commencement);

_____ On-site rescue services which include:
_____ non-entry rescue procedures
_____ entry rescue procedures
_____ Off-site entry rescue services

11.2 Contractor requires that each member of the local rescue service is appropriately trained. Refer to Rescue and Emergency Services appendix for rescue plan and training requirements.

11.3 Contractor requires that each member of the rescue service is appropriately trained in basic first-aid and cardiopulmonary resuscitation (CPR) training and hold current certification.

11.4 Emergency Rescue Teams should practice rescue techniques at least annually from the actual or similarly configured space(s). Simulated rescue operations must include dummies, mannequins, or actual persons from the actual or representative permit spaces. Actual rescues during the 12-month period may also substitute for a practice rescue.

11.5 The Director of Health and Safety will make arrangements with **FDNY** for off-site rescue and emergency services on on-going planned PRCS work sites

The Director of Health and Safety will inform **FDNY** of the hazards they may encounter if they are summoned during on-going planned PRCS work sites. The Director of Health and Safety has also provided access to the rescue service so they can evaluate the permit spaces to develop appropriate rescue plans and practice rescue operations. If rescue and emergency services are needed, the following procedures will go into effect.

Name of Rescue Service:	FDNY
Telephone Number:	911
Location:	2165 Gerritsen Ave, Brooklyn, NY 11229
Distance from Site:	1.4 miles
Approximate Response Time:	Unknown
Name of Emergency Medical Service:	NYC Health + Hospitals/Coney Island
Telephone Number:	1-718-616-3000
Location:	2601 Ocean Parkway, Brooklyn, NY 11235
Distance from Site:	1.8 miles
Approximate Response Time:	Unknown
<u>Alternate Hospital:</u>	
New York Community Hospital, 2525 Kings Hwy, Brooklyn, NY 11229 (2.1 miles/11 minutes)	

12.0 TRAINING

12.1 Training must be given to each employee who has access or potential access to a permit space. The amount and type of training needed will depend on the individual's duty assignment. For example, some employees may only be required to know the existence, location, and danger posed by a permit space. Others would need considerably more training if they are members of a PRCS team. Still others would need training as it pertains to the type of entry procedures used (i.e. alternative procedures or reclassifying to non-permit space procedures). The overall intent of this training is to give employees the understanding, knowledge, and skills necessary for the safe performance of their assigned duties in relation to the permit spaces of concern.

12.2 Four basic categories have been set up to train employees based on duties and potential exposure.

12.2.1 Awareness Training: Awareness training for employees potentially exposed to permit spaces can be satisfied by providing them with the specific information contained in sections 3 and 4 of this program.

12.2.2 Training required for using alternative procedures

Reserved

12.2.3 Training required for using the reclassifying permit space procedures.

Reserved

12.2.4 Training required for using full Permit-Required Confined Space Procedures. (See Section 8.4)

13.0 PERMIT-REQUIRED CONFINED SPACE PROGRAM REVIEW

13.1 Within one year of any entry operation, the Supervisor of Health and Safety will conduct a review of the program using the canceled entry permits to identify any deficiencies in our program. A review will be conducted sooner if there is reason to believe that the program does not adequately protect our employees. Any corrective measures will be documented by a revision of the program. Employees will be trained on any changes. Additionally, employees who note any discrepancies with this program can contact the Supervisor of Health and Safety. If no permit entry operations are conducted during the year, no review is needed.

14.0 MEDICAL SURVEILLANCE

14.1 Contractor personnel are required to have annual physicals in accordance with OSHA 29 CFR 1910.120(f). Physicals are performed by a physician of the employee's choice and payment is fully covered by Contractor. The physician reports the employee's ability to perform his/her work and wear an air purifying respirator to Contractor. All employees receive a copy of the results of their medical exam upon completion by the physician. Contractor also maintains a copy of employee medicals on file. All employee medical records are kept on file in the Contractor's main office. An employee may obtain a copy his medical file by requesting it through the company's Supervisor of Health and Safety. Contractor maintains copies of employee files for 30 years after the date of termination of employment.

14.2 All employees receive an initial medical examination prior to beginning work with the company. Employees receive an initial medical examination even if they have received a prior medical examination within one year in conjunction with a previous employer. The contents of the initial medical examination consist of;

- Medical and work history questionnaire
- Completion of the respiratory disease standardized questionnaire (Periodic)
- Complete physical examination, concentrating on respiratory, cardiovascular, and digestive systems
- Routine urinalysis
- Chest x-ray read by a Type B Reader
- Pulmonary Function Test FVC, FEV1
- Electrocardiogram
- Additional tests deemed necessary by the examining physician

14.3 All employees receive annual medical examination in order to determine if the employee can maintain his/her job tasks. The cost of annual medical examinations are covered by Contractor and their contents consist of;

- Medical and work history questionnaire
- Completion of the respiratory disease standardized questionnaire (Periodic)
- Complete physical examination, concentrating on respiratory, cardiovascular, and digestive systems
- Chest x-ray read by a Type B Reader
- Pulmonary Function Test FVC, FEV1
- Additional tests deemed necessary by the examining physician

14.4 Employees may receive medical examinations if desired from one of the participating medical physicians that Contractor uses or one of the employee's own choice.

14.5 Contractor provides its employees with semi-annual respirator fit tests as required by OSHA at no charge to the employee. A copy of Contractor Respiratory Protection Program is located in Appendix F of the Health & Safety Manual.

14.6 Contractor collects worker exposure data as per OSHA 29 CFR 1910.120 regulations. Contractor maintains copies of workers personal exposure samples on file in the Contractor's main office.

Appendix F: Miscellaneous Tasks

Miscellaneous Task Standard Operating Procedures and Safety Measures

1.0 Site Inspection

2.0 Drum Handling

3.0 Opening Drums and Overpacks

4.0 Drum Staging and Overpacking

5.0 Compatibility Testing and Composting of Samples

6.0 Working Around Heavy Equipment

7.0 Corrosive Liquid Transfer

8.0 Flammable / Combustible Liquid Transfer

9.0 Lab Packing and Lab Inventory

10.0 Soil Excavation

11.0 Drum Sampling

12.0 Use of a High Pressure Water Cleaner

13.0 Drum Excavation

14.0 Soil Sampling

15.0 High Pressure Washer During Vat Cleaning

16.0 Compressed Gas Cylinders

17.0 Empty Drum Crushing

TASK SAFETY AND HEALTH RISK ANALYSIS

This Hazard Assessment identifies the general hazards associated with specific site operations and presents an analysis of documented or potential chemical hazards that exist at the site. Every effort must be made to reduce or eliminate these hazards. Those which cannot be eliminated must be guarded against by use of engineering controls and/or personal protective equipment.

ACTIVITY SPECIFIC HAZARDS and SOPs

1.0 Hazards and SOPs Associated with Site Inspection

Hazards

1. Slip / trip / fall hazards from debris and holes, trenches in floor.
2. Injury from unstable overhead and falling building materials/debris.
3. Gas release hazards.
4. Direct skin contact and/or inhalation of contaminants.
5. Biological hazards.

SOPs

1. Be sure that all areas of entry have or are provided with adequate lighting.
2. All personnel should wear hard hats at all times when inside buildings and hot zones.
3. Be sure that all manholes/floor drains are covered and marked.
4. Be sure that stairways are structurally sound.
5. Be sure that all rooms are checked for loose or unstable overhead structures/debris.
6. Minimize slip. trip. fall hazards by keeping work areas clean and being aware or unstable or loose footing.
7. Air monitoring is to be conducted prior to inspection.
8. Be aware of and avoid potential biological hazards.

2.0 Hazards and SOPs Associated with Drum Handling

Hazards

1. Injury from slip/trip/fall due to unstable ground conditions.
2. Cuts or abrasions from sharp or jagged metal during drum handling.
3. Potential for crushed fingers and toes, strained muscles, and back injury from moving heavy objects.
4. Operation of heavy equipment (e.g. backhoe with drum grappler).
5. Direct skin contact and/or inhalation of contaminants.

SOPs

1. Personnel are to be aware of footing as well as heavy equipment operating in the area.
2. Personnel should wear leather gloves and steel-toed boots.
3. Moving and opening drums is to be in accordance with 29 CFR 1910.120(j)
4. Level B or C respiratory protection should be used with handling drums.
5. All heavy equipment to have backup alarms and ground spotters to assist operators. Eye to Eye contact with the operator is to be made before approaching moving equipment.

3.0 Hazardous and SOPs Associated with Opening Drums and Overpacks Hazards

Hazards

1. The presence of air-reactive chemicals.
2. The presence of water-reactive chemicals, particularly when it is raining.
3. Direct skin contact, ingestion, and inhalation of contaminants.
4. Opening drums of unknown waste.
5. Splashing wastes.
6. Cuts from sharp metal edges.
7. Air lines tangles among the drums.

8. Slip/trip/fall.
9. Pinch points.
10. Bulging or visually unstable drums.

SOPs

1. Open drums and overpacks in Level B respiratory protection.
2. Be alert for bulging drums and chemical reactions.
3. Avoid allowing rain to enter drums.
4. Regular, periodic air monitoring is to be performed with the rad meter, monitox units, HNU and CGI to ensure a safe environment.
5. Keep fire extinguishers in the area.
6. Keep absorbent materials immediately available.
7. If a drum is bulging or difficult to open , use remote opening techniques.
8. Level B will be used when opening unknown drums, and when handling drums that are in poor physical condition.

4.0 Hazards and SOPs Associated with Drum Staging and Overpacking

Hazards

1. Direct skin contact and inhalation, ingestion threat from hazardous materials.
2. Poor physical condition of drums. Rusty metal and holes indicate a high potential or spills and splashes during drum handling.
3. Routine heavy equipment hazards.
4. Physical hazards associated with drum handling operations - potential for crushed fingers and toes, strained muscles, and back injury from moving/lifting heavy objects.
5. Operation of heavy equipment (e.g. backhoe with drum grappler).

SOPs

1. Use of level B or Level C personal protective equipment. Chemical resistant coveralls, gloves, splash shields, hard hats, and steel-toed boots should be used when handling drums, and in the vicinity of open drums.
2. Keep absorbents and emergency spill materials immediately available in the exclusion zone.
3. Use of safe work practices to prevent physical injury.
4. Drums will be staged on a polyethylene-lined containment pad.

5.0 Hazards and SOPs Associated with Compatibility Testing And Composting of Samples

Hazards

1. Inhalation of hazardous fumes.
2, Mixing incomplete materials.
3. Splashing or spilling samples.

SOPs

1. Personnel not involved with compatibility testing procedures should not be in the area.
2. Personnel will wear safety glasses, gloves, and acid shields
3. Containers should be clearly marked.
4. Chemicals should be added slowly an in small amounts with constant observation.
5. Personnel should evacuate the area in the event of uncontrolled chemical reactions.
6. All compatibility tests will be performed by an on-site chemist.

6.0 Hazards and SOPs Associated with Working Around Heavy Equipment

Hazards

1. Equipment movements.
2. Overhead and Underground utility lines.
3. Unstable slopes and open pits.

SOPs

1. All equipment must have operational backup alarms.
2. Personnel must make eye-to-eye contact with the operator before approaching operating equipment.
3. Operators must be aware of personnel in the area and use proper hand signals when communicating.
4. Operators must use caution when handling containers of hazardous materials.
5. Operators must wear hard hats if the machine does not have an enclosed cab or cage cover.
6. Operators must wear hard hats when going to and from their machines.
7. Ground spotters are to assist heavy machine operators.

7.0 Hazards and SOPs Associated with Corrosive Liquid Transfer

Hazards

1. Direct skin contact with corrosive materials.
2. Potential for spills or leaks during transfer operations.
3. Potential for chemical reaction from mixing incompatible liquids or from contact with transfer equipment.
4. Potential splashing of corrosive liquids during transfer operations.
5. Slip/trip/fall around transfer hoses and equipment.

SOPs

1. Wear protective corrosive resistant clothing (e.g. acid suits, splash shields). Be sure gloves and boots are taped to protective clothing. Take precautions to ensure that no skin surfaces are exposed.
2. Wear appropriate level of respiratory protection.
3. Keep absorbents and spill containment materials nearby in the event of a spill or leak.
4. Monitors transfers continuously for changes in conditions (e.g. reactivity, pressure buildup, fire). Personnel monitoring the pumping and receiving vessel must have clear and continuous communication. If necessary, install a remote shutoff on the transfer pump.
5. Make sure the transfer equipment (e.g. hoses, fittings, pumps and receiving vessels) are compatible with the corrosive material and that they are clean.
6. Be aware of the locations of emergency showers and eyewashes, which should be placed nearby during operations.
7. Have an emergency escape route and contingency plan.
8. Be sure that all drums are characterized and adequately and appropriately marked to avoid mixing incompatible materials.
9. Make transfer with caution, remembering that corrosives may react violently, even explosively, with a wide variety of chemicals.
10. Provide adequate ventilation to area of transfer activities.

8.0 Hazards and SOPs Associated with Flammable / Combustible Liquid Transfer

Hazards

1. Direct skin contact, inhalation, ingestion.
2. Potential for fire or explosion during transfer.
3. Potential for spills during transfer.
4. Potential for chemical reaction during transfer.
5. Slip/trip/fall around transfer hoses and equipment.

SOPs

1. Use chemical resistant coveralls such as Saranex or butyl rubber when working with flammable / combustible liquids or when in the vicinity of open liquids.
2. Use Level B respiratory protection when opening tanks, when monitoring intake vacuum hoses when ambient organic concentrations exceed 5 ppm or while engaged in other high hazard / contact activities.
3. Level C may be sufficient for non-intrusive perimeter activities if ambient concentrations are less than 5 ppm.
4. Keep fire extinguishers in readily accessible locations.
5. Ground or bond the tank and tanker truck prior to beginning transfer operations.
6. Clear the area of all open flames or other ignition sources, and all flammable and combustible materials.
7. Use spark-proof tools and equipment.
8. Keep absorbents and spills containment equipment nearby in the event of a spill or leak.
9. Conduct air monitoring for organics, flammable/explosive vapors and oxygen as appropriate. Air monitoring equipment can be left in the work area unattended and programmed to sound an alarm if dangerous levels are encountered.
10. Have an emergency escape route planned and a contingency plan in case of an accident.
11. Be sure that all tanks are characterized and appropriately marked to avoid bulking of incompatible tanks.
12. Conduct the transfer with extreme caution, remembering that striking surfaces may cause sparks.

9.0 Hazards and SOPs Associated with Lab Packing and Lab Inventory

Hazards

1. Possible skin contact with leaking bottles.
2. Mixing of incompatible materials.
3. Presence of shock sensitive materials.
4. Sudden release of dangerous vapors.

SOPs

1. Wear appropriate personal protective equipment, Level B (e.g. splash shields, acid suits, hard hats, chemical resistant gloves).
2. Clearly mark containers.
3. Non-essential personnel must be restricted from area.
4. Have appropriate fire fighting equipment present.
5. Review information files for possible chemical data.
6. Carefully follow lab packing guidelines specifically for the acceptable disposal facility.
7. Have sorbent materials on hand to quickly clean up any spills.

10.0 Hazards and SOPs Associated with Soil Excavation

Hazards
1. Movement of heavy equipment during soil excavation.
2. Direct skin contact with contaminated soil.
3. Damaging drums while excavating which could release unknown contaminants.
4. Inhalation of contaminated dusts.
5. Loose footing and slip/trip/fall hazards.

SOPs
1. Personnel are to be aware of working locations of heavy equipment.
2. All equipment must have operational back-up alarms.
3. Personnel should make eye-to-eye contact with the operator before approaching heavy equipment.
4. Personnel should wear appropriate respiratory equipment.

11.0 Hazards and SOPs Associated with Drum Sampling

Hazards
1. Direct skin contact, ingestion and inhalation of contaminants.
2. Potential for chemical splash and mixing of incompatible materials, air or water reaction.
3. Poor physical condition of drums.
4. Slip/trip/fall hazards associated with slick surfaces or high or elevated work areas.

SOPs:
1. Use chemical resistant coveralls such as Saranex or butyl rubber during sampling.
2. Use Level B respiratory protection for opening tanks or unknown materials, for sampling solvent tanks, or when ambient organic concentrations exceed 5ppm.
3. Use Level C respiratory protection for re-sampling materials and ambient organic concentrations are less than 5ppm.
4. Keep fire extinguishers immediately available.
5. Keep absorbent materials immediately available.
6. Use of a new drum thief to sample each drum or container.
7. Frequent air monitoring will be performed to ensure the quality of the ambient air.
8. If a drum is bulging or difficult to open, use remote opening techniques.

12.0 Hazards and SOPs Associated with the use of High Pressure Water Cleaner

Hazards
1. Body parts being injured/severed due to high pressure (3,000 psi) water stream.
2. Slip / trip / fall associated with water overspray and hose.
3. Control of high pressure nozzle.
4. Exposure to contaminants.

SOPs
1. Level C will be worn along with splash suit and shield.
2. No Hands, feet arms, or legs will be within three feet of high pressure nozzle.
3. Splash shields and rain protection should be worn over minimum level of protection.
4. Skin and ear protection may be required.
5. Operators are to be aware of other personnel or equipment in the area.

6. No personnel are to hold material being cleaned.

13.0 Hazards and SOPs Associated with Drum Excavation

Hazards

1. Drums may contain unknown hazardous substances.
2. Moving of drums may disturb otherwise intact hazardous materials.
3. Containers may be pressurized and subject to violent release of contents.

SOPs

1. Containers (other than empty containers) should be moved only by remote mechanical devices.
2. Where applicable polyethylene sheeting shall be place in such a manner as to contain any spilled material.
3. Containers should not be handled by personnel until the contents and condition of the containers are recognized as safe to handle. (Level B protection applies)
4. Use PID or HNU and Radmeter for initial hazard identification of containers.

14.0 Hazards and SOPs Associated with Soil Sampling

Hazards

1. Contact with or inhalation of contaminants, potentially in high concentrations in sampling media.
2. Back strain and muscle fatigue due to lifting, shoveling and auguring techniques.
3. Contact with or inhalation of decontamination solutions.

SOPs

1. Proper awareness of chemical contaminants and review of suspected contaminates should be completed.
2. Proper lifting (pre-lift weight assessment, use of legs, multiple personnel) techniques will prevent back strain. Use slowly easy motions when shoveling, auguring, digging to decrease muscle strain.
3. Material Safety Data sheets for all decon solutions should be included with each site health and safety plan.

15.0 Hazards and SOPs Associated with use of as High Pressure Washer During Vat Cleaning

Hazards

1. Body parts being injured/severed due to high pressure water stream.
2. Slip/trip/fall associated with water overspray and hose.
3. Control of high pressure nozzle.
4. Vat handling to facilitate cleaning.
5. Exposure to contaminants.

SOPs

1. No hands, feet, arms or legs will be within three feet of high pressure nozzle.
2. Splash shields and rain protection should be worn over minimum level of protection.
3. Operators are to be constantly aware of other personnel/equipment in the area.
4. Personnel will not hold or be near vats while cleaning with high pressure washer is ongoing. If necessary, vats will be maneuvered with heavy equipment.

16.0 Hazards and SOPs Associated with Compressed Gas Cylinders

Hazards

1. Sudden release of dangerous gases from unknown cylinders.
2. Slip / trip / fall from hidden or obstructed cylinders.
3. Possible sudden explosion from ruptured valves.

SOPs

1. To the extent possible, initial activities on site will involve locating and clearly marking the location of all unknown cylinders on site.
2. Equipment operators will be assisted by ground spotters when segregating drums and debris and during soil excavation activities.
3. When a damaged or corroded cylinder is found, it should not be moved or handled and extreme caution should be excised in staying clear of the valve stem.
4. All identified cylinders will be examined and evaluated by an experienced and qualified person prior to moving any cylinders.
5. If a cylinder leaks or ruptures, all personnel will evacuate the area.

17.0 Hazards and SOPs Associated with Empty Drum Crushing

Hazards

1. General hazards associated with heavy equipment operations.
2. Slip / trip / fall hazards.
3. Physical contact from splashing of any residual material that remains in drums.
4. Physical contact from flying metal pieces.

SOPs

1. Wear hard hats, face shields, safety goggles, and steel toed work boots at all times.
2. All personnel not necessary for the operation of equipment should stay clear of drum crushing activities.
3. Equipment operators are to be constantly aware of all other personnel/equipment in the area during operation.

Appendix G: Heat / Cold Stress Protocols

CONTRACTOR
HEAT / COLD STRESS PROTOCOLS FOR WORK

1.0 Heart rate (HR) should be monitored by the radial pulse for 30 seconds as soon as possible in the resting period.

1.1 If at the beginning of the rest period a worker's radial pulse is measured and his heart rate exceeds 100 beats per beats per minute, the worker's next work period should be reduced by 33%. Therefore, if the original work period was one hour, the following work cycle should be reduced to 40 minutes.

2.0 Heat stroke is a true medical emergency. First aid should be directed toward immediate measures to cool the body quickly, as well as seeing that the victim receives medical attention as soon as possible.

2.1 Prior to medical treatment, remove as much clothing as possible and proceed to cool the victim's body, taking care not to overchill the victim once his temperature falls below 102 ^{o}F. One of the following cooling measures should be taken:

a. sponge the bare skin with cool water;
b. apply cold packs continuously;
c. wrap the victim in a sheet soaked with water; or
d. immerse the victim in a tub of cold water, while closely monitoring the victim's level of consciousness.

3.0 Prior to site activity, the field team leader may make arrangements for heat stress monitoring (i.e., monitoring heart rate, body temperature and body water loss) during actual site work if conditions warrant these measures. In addition, he would want to ensure that the team members have been acclimatized to the particular environmental conditions and that personnel are aware of the signs and symptoms of heat sickness and have been adequately trained in first aid procedures. As field team leader, one could also make sure there is sufficient personnel on-site, so as to rotate work assignments. Schedule work during hours of reduced temperatures, and ensure work during hours of reduced temperatures, and ensure personnel do not consume alcoholic or caffeinated beverages but rather drink moderate levels of an electrolyte solution and eat well prior to commencing site work.

4.0 The worker could be experiencing a condition of heat rash. Allow workers to rest and relieve the itching associated with heat rash rather than return to work too soon. Itching workers may not follow stringent decontamination procedure or scratch where it itches on-site and risk cross contamination.

5.0 The sense of thirst is not an adequate regulator of water replacement during heat exposure. Therefore, as a general rule, the amount of water administrated should replace the amount of water lost, and it should be administered at regular intervals throughout the day. For every 1/2 pound of water loss, 8 ounces of water should be ingested. Water should be replaced by drinking 2-4 ounce servings during every rest period. A recommended alternative to water is an electrolyte drink split 50/50 with water.

6.0 Although there is no specific test given during a baseline physical that would identify a person's intolerance to heat, there are physical factors and personal habits which may indicate possible intolerance to heat, such as, whether or not an individual smokes, one's dietary habit, body weight, as well as predisposed physical conditions such as high blood pressure, heavier conditions, diabetes, or one's medication, that may influence an individual's ability to tolerate excessive heat.

7.0 Heat cramps are caused by profuse perspiration with inadequate fluid intake and salt replacement. Heat cramps most often afflict people in good physical condition who overwork in conditions of high temperature and humidity. Heat cramps usually come on suddenly during vigorous activity. Untreated, heat cramps may progress directly to heat exhaustion or heat strokes. First aid treatment: remove victim to a cool place and give sips of slated water (1 teaspoon of salt to 1 quart of water), 4 ounces every 15 minutes over a period of one hour. A commercial preparation, e.g., Gatorade may be used if split 50/50 with water.

7.1 The salted water or solution should mitigate the cramps. Manual pressure should not be applied to the cramped muscles.

TABLE C-1

Required Frequency of Heat Stress Monitoring for Workers in Impermeable Clothing

Adjusted Temperature ºF	Work time allowed before monitoring break (minutes)
90 or above	15
87.5-90	30
82.5-87.5	60
77.5-82.5	90
72.5-77.5	120

(1) Adapted from Eastern Research Group and National Institute for Occupational Safety and Health, Occupational Safety and Health Manual for Super Activities. September 26, 1984, pp. 8-75

(2) Calculate the adjusted air temperature (Ta adj.) by using this equation:

Ta adj. F = Ta F + (13 x % sunshine)

Measure air temperature (Ta) with a standard thermometer, with the bulb shielded from radiant heat. Then estimate percent sunshine (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows).

TABLE C-2

Heat Stress Indicator	When to Measure	If Exceeds	Action
heart rate	beginning of rest period	110 beats per minute	shorten next work period by 33%
oral temperature	beginning of rest period	99 ºF (After thermometer is under tongue for 3 minutes) 110.6 ºF	shorten next work period by 33% prohibit work in impermeable clothing
body weight	1. Before workday begins (a.m.) 2. After workday ends (p.m.)		increase fluid intake

8.0 SYMPTOMS OF HEAT STRESS

8.1 Heat Rash results from continuous exposure to heat or humid air.

8.2 Heat Cramps are caused by heavy sweating with inadequate fluid intake. Symptoms include:

* Muscle spasms.
* Pains in the hands, feet and abdomen.

8.3 Heat Exhaustion occurs when body organs attempt to keep the body cool. Symptoms include:

* pale, cool, moist skin.
* heavy sweating
* dizziness

8.4 Heat Stroke is the most serious form of heat stress. Immediate action must be taken to cool the body before serious injury and death occur. Symptoms include:

* red, hot, dry skin.
* lack of perspiration.
* nausea
* dizziness and confusion
* strong, rapid pulse.
* coma

(Reproduced from Occupational Safety and Health Guidance Manual for Superfund Activities, p. 8-79)

9.0 COLD STRESS (Hypothermia)

Cold stress is a function of cold, wetness and wind. A worker's susceptibility to cold stress can vary according to his / her physical fitness, degree of acclimatization to cold weather, age, and diet.

Prevention: Institute the following steps to prevent overexposure of workers to cold:

9.1 Maintain body core temperature at 96.8 ^{o}F or above by encouraging workers to drink warm liquids during breaks (preferably not coffee) and wear several layers of clothing. Wool is recommended since it can keep the body warm even when the wool is wet.

9.2 Avoid frostbite by adequately covering hands, feet, and other extremities. Clothing such as insulated gloves or mittens, earmuffs, and hat liners should be worn. To prevent contact frostbite (from touching metal and cold surfaces below 20 ^{o}F), workers should wear anti-contact gloves. Tool handles and control bars should be covered with insulating materials.

9.3 Adjust work schedules if necessary, providing adequate rest periods. When feasible, rotate personnel and perform work during the warmer hours of the day.

9.4 Provide a heated enclosure for workers close to their work area. Workers should remove their outer layer(s) of clothing while in the shelter to allow for sweat evaporation.

9.5 In the event that wind barriers are constructed around an intrusive operation (such as drilling), the enclosure must be properly vented to prevent the build-up of toxic or explosive gasses or vapors. Care must be taken to keep any heat source away from flammable substances.

9.6 Using a wind chill such as the one in Table-3, obtain the equivalent chill temperature (ECT) based on actual wind speed and temperature. Refer to the ECT when setting up work warm-up schedules, planning appropriate clothing, etc. Workers should use warming shelters at regular intervals at or below an ECT of 20 °F. For exposed skin, continuous exposure should not be permitted at or below an ECT of -25 °F.

9.7 Workers who become immersed in water or whole clothing becomes wet (from perspiration, rain, etc.) must immediately be provided a change of dry clothing whenever the air temperature is 25.6 °F or below.

9.8 Maintain an optimal level of worker fitness by encouraging regular exercise, proper diet, etc. If possible, acclimatize workers to site conditions for several days before work begins.

10.0 MONITORING

Personnel should be aware of the symptoms of cold stress. If the following symptoms of systemic hypothermia are noticed in any worker, he/she should immediately go to the warm shelter:

* Heavy, uncontrollable shivering
* Excessive fatigue or drowsiness
* Loss of coordination
* Difficulty in speaking, and
* Frostbite (see below)

Frostbite is the generic term for local injury resulting from cold. The stages of frostbite and their symptoms are as follows:

a. Frostbite or incipient frostbite is the sudden blanching or whitening of the skin.
b. Superficial frostbite is the waxy or white skin which is firm to the touch (tissue underneath is still resilient)
c. Deep frostbite is the tissues are cold, pale and solid

Appendix H: Accident Report Form

CONTRACTOR ACCIDENT REPORT

INJURED PERSON:_____REPORT DATE:_____

SOCIAL SECURITY NO.:_____

DOCTOR / HOSPITAL NAME:_____

_____

_____

HOME ADDRESS:_____

OCCUPATION:_____AGE:_____SEX:_____

ADDRESS ACCIDENT OCCURRED: TIME OF ACCIDENT_____AM PM

_____

_____

_____

DATE STOPPED WORK BECAUSE OF THIS INJURY:_____

NATURE OF INJURY & PART(S) OF BODY AFFECTED:_____

_____

_____

_____

DID YOU PROVIDE MEDICAL CARE? IF YES, WHEN ? _____

_____

HAS EMPLOYEE RETURNED TO WORK YES NO

IF YES, DATE:_____

WHAT WAS EMPLOYEE DOING WHEN INJURED ?
(PLEASE BE SPECIFIC. IDENTIFY TOOLS, EQUIPMENT OR MATERIAL THE EMPLOYEE WAS USING)

_____

_____

_____

_____

HOW DID THE ACCIDENT OR EXPOSURE OCCUR ?
(PLEASE DESCRIBE FULLY THE EVENTS THAT RESULTED IN INJURY. TELL WHAT HAPPENED AND HOW IT HAPPENED.)
PLEASE USE SEPARATE SHEET IF NECESSARY

_____

_____

_____

_____

_____

_____

OBJECT OR SUBSTANCE THAT DIRECTLY INJURED EMPLOYEE:_____

_____

_____

_____

_____

DATE SUPERVISOR FIRST KNEW OF INJURY:_____

SUPERVISOR SIGNATURE:_____

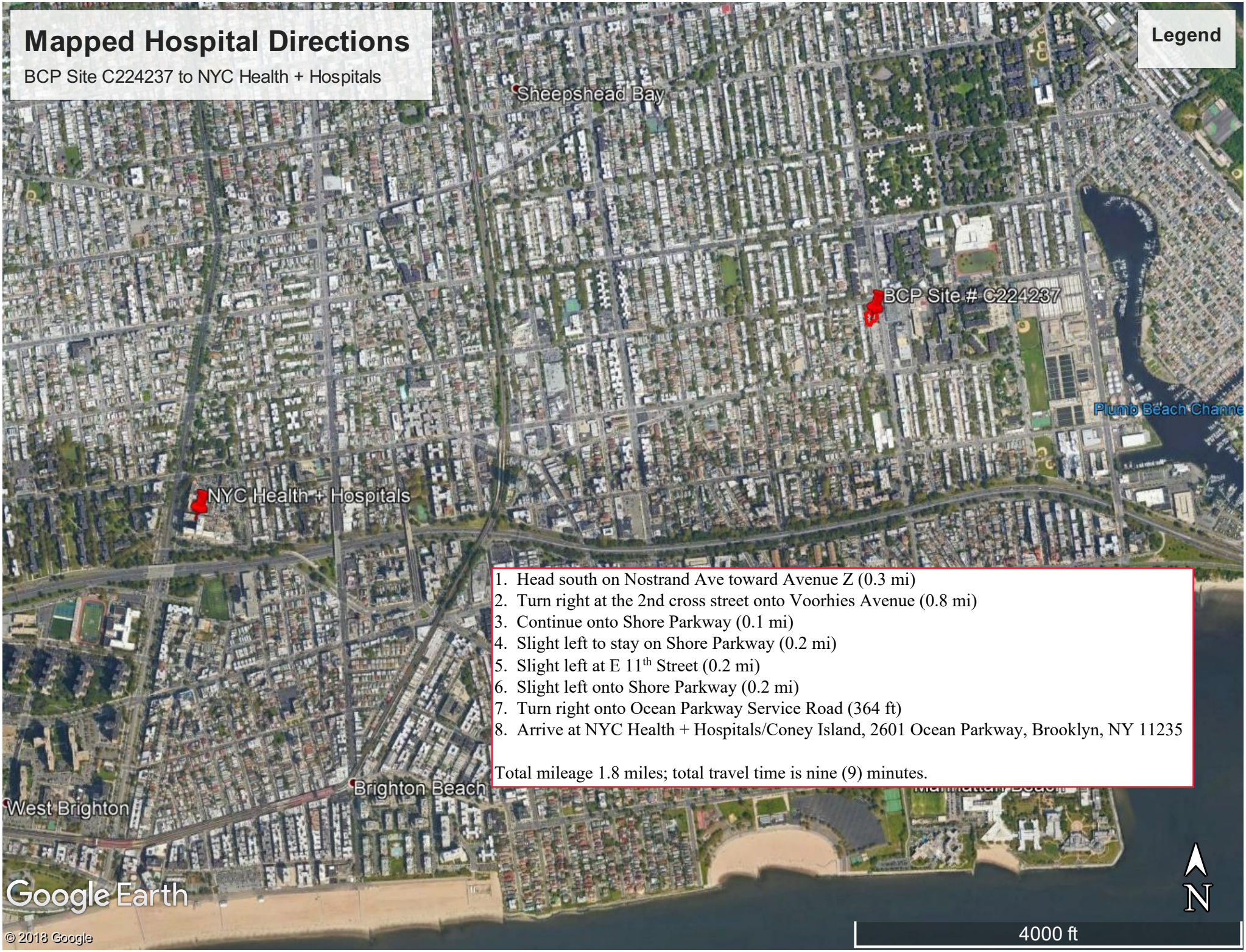
TITLE:_____

ACC-95

Appendix I: Mapped Hospital Directions

Mapped Hospital Directions

BCP Site C224237 to NYC Health + Hospitals



1. Head south on Nostrand Ave toward Avenue Z (0.3 mi)
2. Turn right at the 2nd cross street onto Voorhies Avenue (0.8 mi)
3. Continue onto Shore Parkway (0.1 mi)
4. Slight left to stay on Shore Parkway (0.2 mi)
5. Slight left at E 11th Street (0.2 mi)
6. Slight left onto Shore Parkway (0.2 mi)
7. Turn right onto Ocean Parkway Service Road (364 ft)
8. Arrive at NYC Health + Hospitals/Coney Island, 2601 Ocean Parkway, Brooklyn, NY 11235

Total mileage 1.8 miles; total travel time is nine (9) minutes.

Appendix J: Data Sheets for Contaminants of Concern

ATSDR Agency for Toxic Substances & Disease Registry

Gasoline, Automotive: ToxFAQs™

ToxFAQs™ for Automotive Gasoline

(Gasolina de Automóvil)

September 1996
CAS# 8006-61-9

This fact sheet answers the most frequently asked health questions about automotive gasoline. For more information, you may call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to automotive gasoline most likely occurs from breathing its vapor at a service station while filling a car's fuel tank. At high levels, automotive gasoline is irritating to the lungs when breathed in and irritating to the lining of the stomach when swallowed. Exposure to high levels may also cause harmful effects to the nervous system. Automotive gasoline has been found in at least 23 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

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What is automotive gasoline?

The gasoline discussed in this fact sheet is automotive used as a fuel for engines in cars. Gasoline is a colorless, pale brown, or pink liquid, and is very flammable.

Gasoline is a manufactured mixture that does not exist naturally in the environment. Gasoline is produced from petroleum in the refining process.

Typically, gasoline contains more than 150 chemicals, including small amounts of benzene, toluene, automotive gasolineylene, and sometimes lead. How the gasoline is made determines which chemicals are present in the gasoline mixture and how much of each is present. The actual composition varies with the source of the crude petroleum, the manufacturer, and the time of year.

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What happens to automotive gasoline when it enters the environment?

- Small amounts of the chemicals present in gasoline evaporate into the air when you fill the gas tank in your car or when gasoline is accidentally spilled onto surfaces and soils or into surface waters.
- Other chemicals in gasoline dissolve in water after spills to surface waters or underground storage tank leaks into the groundwater.
- In surface releases, most chemicals in gasoline will probably evaporate; others may dissolve and be carried away by water; a few will probably stick to soil.
- The chemicals that evaporate are broken down by sunlight and other chemicals in the air.
- The chemicals that dissolve in water also break down quickly by natural processes.

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How might I be exposed to automotive gasoline?

- Breathing vapors at a service station when filling the car's fuel tank is the most likely way to be exposed.
- Working at a service station.
- Using equipment that runs on gasoline, such as a lawn mower.
- Drinking contaminated water.
- Being close to a spot where gasoline has spilled or leaked into the soil.

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How can automotive gasoline affect my health?
Many of the harmful effects seen after exposure to gasoline are due to the individual chemicals in the gasoline mixture, such as benzene and lead. Inhaling or swallowing large amounts of gasoline can cause death.

Inhaling high concentrations of gasoline is irritating to the lungs when breathed in and irritating to the lining of the stomach when swallowed. Gasoline is also a skin irritant. Breathing in high levels of gasoline for short periods or swallowing large amounts of gasoline may also cause harmful effects on the nervous system.

Serious nervous system effects include coma and the inability to breathe, while less serious effects include dizziness and headaches.

There is not enough information available to determine if gasoline causes birth defects or affects reproduction.
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How likely is automotive gasoline to cause cancer?
The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified automotive gasoline for carcinogenicity. Automotive gasoline is currently undergoing review by the EPA for cancer classification.

Some laboratory animals that breathed high concentrations of unleaded gasoline vapors continuously for 2 years developed liver and kidney tumors. However, there is no evidence that exposure to gasoline causes cancer in humans.
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Is there a medical test to show whether I've been exposed to automotive gasoline?
Laboratory tests are available that can measure elevated blood or urine levels of lead (as an indication of exposure to leaded gasoline only), benzene, or other substances that may result from exposure to gasoline or other sources. These methods are sensitive enough to measure background levels and levels where health effects may occur. These tests aren't available in most doctors' offices, but can be done at special laboratories that have the right equipment.
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Has the federal government made recommendations to protect human health?
The EPA has established many regulations to control air pollution. These are designed to protect the public from the possible harmful health effects of gasoline.

The American Conference of Governmental Industrial Hygienists (ACGIH) set a maximum level of 890 milligrams of gasoline per cubic meter of air (890 mg/mÂ³) for an 8-hour workday, 40-hour workweek.
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Glossary
Carcinogenicity: Ability to cause cancer.

CAS: Chemical Abstracts Service.

Crude petroleum: Petroleum that has not been processed.

Dissolve: To disappear gradually.

Evaporate: To change into a vapor or a gas.

Irritant: A substance that causes an abnormal reaction.

Mixture: A combination of two or more components.

Refining process: The process by which petroleum is purified to form gasoline.

Tumor: An abnormal mass of tissue.

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References

Agency for Toxic Substances and Disease Registry (ATSDR). 1996. Managing Hazardous Materials Incidents. Volume III – Medical Management Guidelines for Acute Chemical Exposures: Automotive Gasoline. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological Profile for automotive gasoline. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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Where can I get more information?

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

For more information, contact:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop F-32
Atlanta, GA 30333
Phone: 1-888-42-ATSDR (1-888-422-8737)
FAX: (770)-488-4178
Email: ATSDRIC@cdc.gov

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Fuel Oils / Kerosene: ToxFAQs™

ToxFAQs™ for Fuel Oils

(Aceites Combustibles)

September 1996
CAS# 8008-20-6, 70892-10-3, 68476-30-2, 68476-34-6, 68476-31-3

This fact sheet answers the most frequently asked health questions about fuel oils. For more information, you may call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Fuel oils are liquid mixtures produced from petroleum, and their use mostly involves burning them as fuels. Drinking or breathing fuel oils may cause nausea or nervous system effects. However, exposure under normal use conditions is not likely to be harmful. Fuel oils have been found in at least 26 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

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What are fuel oils?

Fuel oils are a variety of yellowish to light brown liquid mixtures that come from crude petroleum. Some chemicals found in fuel oils may evaporate easily, while others may more easily dissolve in water.

Fuel oils are produced by different petroleum refining processes, depending on their intended uses. Fuel oils may be used as fuel for engines, lamps, heaters, furnaces, and stoves, or as solvents.

Some commonly found fuel oils include kerosene, diesel fuel, jet fuel, range oil, and home heating oil. These fuel oils differ from one another by their hydrocarbon compositions, boiling point ranges, chemical additives, and uses.

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What happens to fuel oils when they enter the environment?

- Some chemicals found in fuel oils may evaporate into the air from open containers or contaminated soil or water.
- Some chemicals found in fuel oils may dissolve in water after spills to surface waters or leaks from underground storage tanks.
- Some chemicals found in fuel oils may stick to particles in water, which will eventually cause them to settle to the bottom sediment.
- Some of the chemicals found in fuel oils may be broken down slowly in air, water, and soil by sunlight or small organisms.
- Some of the chemicals found in fuel oils may build up significantly in plants and animals.

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How might I be exposed to fuel oils?

- Using a home kerosene heater or stove, or using fuel oils at work.
- Breathing air in home or building basements that has been contaminated with fuel oil vapors entering from the soil.
- Drinking or swimming in water that has been contaminated with fuel oils from a spill or a leaking underground storage tank.
- Touching soil contaminated with fuel oils.
- Using fuel oils to wash paint or grease from skin or equipment.

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How can fuel oils affect my health?

Little information is available about the health effects that may be caused by fuel oils. People who use kerosene stoves for cooking do not seem to have any health problems related to their exposure.

Breathing some fuel oils for short periods may cause nausea, eye irritation, increased blood pressure, headache, light-headedness, loss of appetite, poor coordination, and difficulty concentrating. Breathing diesel fuel vapors for long periods may cause kidney damage and lower your blood's ability to clot.

Drinking small amounts of kerosene may cause vomiting, diarrhea, coughing, stomach swelling and cramps, drowsiness, restlessness, painful breathing, irritability, and unconsciousness. Drinking large amounts of kerosene may cause convulsions, coma, or death. Skin contact with kerosene for short periods may cause itchy, red, sore, or peeling skin.

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How likely are fuel oils to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that some fuel oils (heavy) may possibly cause cancer in humans, but for other fuel oils (light) there is not enough information to make a determination. IARC has also determined that occupational exposures to fuel oils during petroleum refining are probably carcinogenic in humans.

Some studies with mice have suggested that repeated contact with fuel oils may cause liver or skin cancer. However, other mouse studies have found this not to be the case. No studies are available in other animals or in people on the carcinogenic effects of fuel oils.

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Is there a medical test to show whether I've been exposed to fuel oils?

There is no medical test that shows if you have been exposed to fuel oils. Tests are available to determine if some of the chemicals commonly found in fuel oils are in your blood. However, the presence of these chemicals in blood may not necessarily mean that you have been exposed to fuel oils.

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Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) and the Air Force Office of Safety and Health (AFOSH) have set a permissible exposure level (PEL) of 400 parts of petroleum distillates per million parts of air (400 ppm) for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that average workplace air levels not exceed 350 milligrams of petroleum distillates per cubic meter of air (350 mg/mÂ³) for a 40-hour workweek.

The Department of Transportation (DOT) lists fuel oils as hazardous materials and, therefore, regulates their transportation.

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Glossary

Carcinogenic: Able to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or a gas.

Hydrocarbon: Any compound made up of hydrogen and carbon.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.
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References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological Profile for fuel oils. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.
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Where can I get more information?

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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FAX: (770)-488-4178
Email: ATSDRIC@cdc.gov
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- Content source: Agency for Toxic Substance and Disease Registry

Volatile Organic Compounds (VOCs) in Commonly Used Products

People spend most of their time indoors – at home, school and work. This makes the quality of the indoor air you breathe important. This fact sheet focuses on certain kinds of chemicals called *volatile organic compounds* or *VOCs* that are found in many products that we commonly use. It is designed to help you think about what VOCs may be present in your indoor air and steps you can take to reduce them.

What are VOCs?

VOCs are chemicals that easily enter the air as gases from some solids or liquids. They are ingredients in many commonly used products and are in the air of just about every indoor setting. The table to the right shows some examples of products that contain VOCs.

How do VOCs get into indoor air?

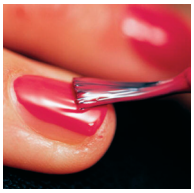
Products containing VOCs can release these chemicals when they are used and when they are stored. Many times you'll notice an odor when using these products. Product labels often list VOC ingredients and recommend that they should be used in well ventilated areas. *Ventilation* means bringing in fresh, outdoor air to mix with indoor air.

When you use a product containing VOCs indoors, the levels of these chemicals in the air increase, then decrease over time after you stop using them. The amount of time the chemical stays in the air depends on how quickly fresh air enters the room and the amount of the chemical used. Levels of VOCs will decrease faster if you open windows or doors, or use exhaust fans.

Building materials and furnishings, such as new carpets or furniture, slowly release VOCs over time. It may be necessary to ventilate areas with new carpeting or furniture for longer time periods because VOC levels can build up again after the windows are closed. If possible, unroll new carpets or store furniture outside your home (in a shed or detached garage) to minimize odors before bringing them in the home. If that's not possible, open windows, close doors and try to stay out of rooms until odors are reduced.

If VOC containing products are used outdoors near your home, you may want to close windows and nearby vents to prevent chemicals from coming inside.

Products used at home or work can release VOCs into the air when used and stored.



Examples of Household Products	Possible VOC Ingredients
Fuel containers or devices using gasoline, kerosene, fuel oil and products with petroleum distillates: paint thinner, oil-based stains and paint, aerosol or liquid insect pest products, mineral spirits, furniture polishes	BTEX (benzene, toluene, ethylbenzene, xylene), hexane, cyclohexane, 1,2,4-trimethylbenzene
Personal care products: nail polish, nail polish remover, colognes, perfumes, rubbing alcohol, hair spray	Acetone, ethyl alcohol, isopropyl alcohol, methacrylates (methyl or ethyl), ethyl acetate
Dry cleaned clothes, spot removers, fabric/ leather cleaners	Tetrachloroethene (perchloroethene (PERC), trichloroethene (TCE))
Citrus (orange) oil or pine oil cleaners, solvents and some odor masking products	d-limonene (citrus odor), a-pinene (pine odor), isoprene
PVC cement and primer, various adhesives, contact cement, model cement	Tetrahydrofuran, cyclohexane, methyl ethyl ketone (MEK), toluene, acetone, hexane, 1,1,1-trichloroethane, methyl-iso-butyl ketone (MIBK)
Paint stripper, adhesive (glue) removers	Methylene chloride, toluene, older products may contain carbon tetrachloride
Degreasers, aerosol penetrating oils, brake cleaner, carburetor cleaner, commercial solvents, electronics cleaners, spray lubricants	Methylene chloride, PERC, TCE, toluene, xylenes, methyl ethyl ketone, 1,1,1-trichloroethane
Moth balls, moth flakes, deodorizers, air fresheners	1,4-dichlorobenzene, naphthalene
Refrigerant from air conditioners, freezers, refrigerators, dehumidifiers	Freons (trichlorofluoromethane, dichlorodifluoromethane)
Aerosol spray products for some paints, cosmetics, automotive products, leather treatments, pesticides	Heptane, butane, pentane
Upholstered furniture, carpets, plywood, pressed wood products	Formaldehyde

VOCs can also get into indoor air from contaminated soils and groundwater under buildings. The chemicals enter buildings through cracks and openings in basements or slabs. When nearby soil or groundwater is contaminated, you might be asked for permission to investigate indoor air at your property. More information can be found at *www.nyhealth.gov/environmental/indoors/vapor_intrusion/*.

Should I be surprised if VOCs are in the air I breathe?

No. Because they are commonly used, some VOCs are almost always found in indoor air. The New York State Department of Health (DOH) and other agencies have studied typical levels of VOCs that may be present in indoor and outdoor air. Sometimes these levels are called "*background levels*".

The term "background levels" can be confusing because they can vary depending on where an air sample was collected and whether VOCs were used or stored. For example, a study of VOCs in urban areas might find higher levels than another study in rural areas. Some studies look at office environments, others examine residences. Please keep in mind study findings may or may not make sense for your setting.

More information about levels of VOCs collected by DOH is available in Appendix C of the guidance for evaluating vapor intrusion at *www.nyhealth.gov/environmental/investigations/soil_gas/svi_guidance.*

How can VOCs affect human health?

Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure*. No matter how dangerous a substance or activity is, it cannot harm you without exposure.

Whether or not a person will have health effects after breathing in VOCs depends on:

1. The *toxicity* of the chemical (the amount of harm that can be caused by contact with the chemical).
2. How much of the chemical is in the air.
3. How long and how often the air is breathed.

Differences in age, health condition, gender and exposure to other chemicals also can affect whether or not a person will have health effects.

Short-term exposure to high levels of some VOCs can cause headaches, dizziness, light-headedness, drowsiness, nausea, and eye and respiratory irritation. These effects usually go away after the exposure stops. In laboratory animals, long-term exposure to high levels of some VOCs has caused cancer and affected the liver, kidney and nervous system. In general, we recommend minimizing exposure to chemicals, if possible.

How can I reduce the levels of VOCs indoors?

- Find out if products used or stored in your home contain VOCs. Information about the chemicals in many household products are listed on the front of this fact sheet and a larger list is on the National Institute of Health's website at *hpd.nlm.nih.gov/products.htm*.
- If you must store products containing VOCs, do so in tightly sealed, original containers in a secure and well-ventilated area. If possible store products in places where people do not spend much time, such as a garage or outdoor shed. Better yet, buy these products in amounts that are used quickly.
- Dispose of unneeded products containing VOCs. Many of these products are considered *household hazardous wastes* and should be disposed of at special facilities or during special household hazardous waste collection programs in your area. Contact your town or visit the New York State Department of Environmental Conservation's website at *www.dec.ny.gov/chemical/8485.html* for more information about disposing of these products.
- Use products containing VOCs in well-ventilated areas or outdoors. Open windows and doors or use an exhaust fan to increase ventilation. Repeated or prolonged ventilation may be necessary for reducing levels from building materials (new carpeting or furniture) that release VOCs slowly over time.
- Carefully read labels and follow directions for use.

Where can I find out more?

- **New York State Department of Health**
  (800) 458-1158
  www.nyhealth.gov/environmental/
- **Indoor Air Quality and Your Home** from the New York State Energy Research and Development Authority *www.nyserda.org/publications/iaq.pdf*
- **The Inside Story: A Guide to Indoor Air Quality**
  www.epa.gov/iaq/pubs/insidest.html
- **New York State Department of Environmental Conservation** website for information about household hazardous waste disposal
  www.dec.ny.gov/chemical/8485.html
- **National Institute of Health's** website for information about chemicals found in many household products.
  hpd.nlm.nih.gov/products.htm

December 2007

Volatile Organic Compounds
Health Effects Fact Sheet
November 2000

Colorado Department of Public Health and Environment

WHAT ARE VOLATILE ORGANIC COMPOUNDS (VOCs)?

- Volatile Organic Compounds (VOCs) area a group of chemicals that contain organic carbon, and readily evaporate – changing from liquids to gases when exposed to air. Volatile Organic Compounds are usually in such solvents as paint wastes, dry cleaning chemicals, furniture stripper, carburetor cleaners and other solvents and waste sludges.
- Volatile Organic Compound Contamination in the environment is mainly the result of the historic disposal practices of industrial wastes containing these solvents. Many of them have been considered *hazardous materials* since the early 1970s, when the first environmental laws were enacted. Landfills, in particular, complied with these laws by adjusting their criteria for acceptance of appropriate landfill material, and excluded most industrial waste containing solvents.
- If used for drinking, cooking, bathing, or irrigation at relatively low concentrations, there is a possibility of exposure to Volatile Organic Compounds by: ingestion (if it is swallowed flowing from a garden hose, for example); respiration; or absorption through the skin. The amount of exposure is related to the concentration in water, and other factors.
- Volatile Organic Compounds generally do not stick (adsorb) to soils at low concentrations, and readily evaporate from water and soil when the water is used for irrigation purposes.

HOW ARE HUMAN HEALTH EFFECTS OF VOLATILE ORGANIC COMPOUNDS DETERMINED?

The potential for human health effect is related to dose and exposure pathway. That is, the amount of the chemical taken into the body over time. Dose is estimated, based on the concentration of the chemical in the water. Human health effects are also related to routes of exposure, or exposure pathways. The three primary routes of exposure for humans are:

- Ingestion (swallowing),
- Respiration (lungs), and
- Dermal absorption (through the skin).

If the exposure pathway is incomplete---no human contact—there will be no exposure.

For most common chemicals, the U.S. Environmental Protection Agency (EPA) establishes standards (or acceptable levels) for drinking water that are called "Maximum Contaminant Levels" (or MCLs). These Levels are based on available health effects data, and other factors (technology, for example), for each chemical, and are designed to protect municipal drinking water supplies, and ensure public safety.

Although Maximum Contaminant Levels are not used to regulate privately owned wells, the available standards are commonly used to evaluate the quality of water in them. Colorado Ground Water Standards set limits for concentrations of various chemicals in water supplies not known to be slated for domestic use. These standards currently are comparable to the Maximum Contaminant Levels. Drinking water standards are set to protect against the possibility of health effects from these chemicals. As long as the chemical concentration in water used for in-home purposes remains below drinking water standards, health effects are unlikely to occur.

WHAT ARE THE HUMAN HEALTH EFFECTS ASSOCIATED WITH VOLATILE ORGANIC COMPOUNDS?

Many Volatile Organic Compounds may produce health effects if humans are exposed to high enough concentrations. Most available toxicity information is based on animal testing. These results are the basis for determining human health effects, and serve as the basis for setting drinking water and air quality standards.

In general, long-term exposure to low concentrations of Volatile Organic Compounds in water or air, at or above regulatory standards—such as Maximum Contaminant Levels, may result in liver or kidney effects. These effects may include elevation of serum enzyme levels, mild cellular changes and changes in lipid metabolism. At somewhat higher concentrations, breathing some of these contaminants may cause irritation of the respiratory tract. The reproductive and developmental effects of these contaminants have been poorly studied.

Chloroform, trichloroethylene (TCE), dichloroethylene (DCE), and perchloroethylene (PCE) have been evaluated for their carcinogenic potential. Although health scientists disagree whether these chemicals might produce cancer in humans, public health officials have taken a cautious approach and have set conservative standards accordingly.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

1,2-DICHLOROETHENE
CAS # 540-59-0, 156-59-2, and 156-60-5

This fact sheet answers the most frequently asked health questions (FAQs) about 1,2-dichloroethene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to 1,2-dichloroethene occurs mainly in workplaces where it is made or used. Breathing high levels of 1,2-dichloroethene can make you feel nauseous, drowsy, and tired. *cis*-1,2-Dichloroethene has been found in at least 146 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA). *trans*-1,2-Dichloroethene was found in at least 563 NPL sites. 1,2-Dichloroethene was found at 336 sites, but the isomer (*cis*- or *trans*-) was not specified.

What is 1,2-dichloroethene?

(Pronounced 1,2-dī-klôr′ ō-ĕth′ēn)

1,2-Dichloroethene, also called 1,2-dichloroethylene, is a highly flammable, colorless liquid with a sharp, harsh odor. It is used to produce solvents and in chemical mixtures. You can smell very small amounts of 1,2-dichloroethene in air (about 17 parts of 1,2-dichloroethene per million parts of air [17 ppm]).

There are two forms of 1,2-dichloroethene; one is called *cis*-1,2-dichloroethene and the other is called *trans*-1,2-dichloroethene. Sometimes both forms are present as a mixture.

What happens to 1,2-dichloroethene when it enters the environment?

- 1,2-Dichloroethene evaporates rapidly into air.
- In the air, it takes about 5-12 days for half of it to break down.
- Most 1,2-dichloroethene in the soil surface or bodies of water will evaporate into air.
- 1,2-Dichloroethene can travel through soil or dissolve in water in the soil. It is possible that it can contaminate groundwater.
- In groundwater, it takes about 13-48 weeks to break down.
- There is a slight chance that 1,2-dichloroethene will break down into vinyl chloride, a different chemical which is believed to be more toxic than 1,2-dichloroethene.

How might I be exposed to 1,2-dichloroethene?

- Breathing 1,2-dichloroethene that has leaked from hazardous waste sites and landfills.
- Drinking contaminated tap water or breathing vapors from contaminated water while cooking, bathing, or washing dishes.
- Breathing 1,2-dichloroethene, touching it, or touching contaminated materials in the workplace.

How can 1,2-dichloroethene affect my health?

Breathing high levels of 1,2-dichloroethene can make you feel nauseous, drowsy, and tired; breathing very high levels can kill you.

When animals breathed high levels of *trans*-1,2-dichloroethene for short or longer periods of time, their livers and lungs were damaged and the effects were more severe with longer exposure times. Animals that breathed very high

levels of *trans*-1,2-dichloroethene had damaged hearts.

Animals that ingested extremely high doses of *cis*- or *trans*-1,2-dichloroethene died.

Lower doses of *cis*-1,2-dichloroethene caused effects on the blood, such as decreased numbers of red blood cells, and also effects on the liver.

The long-term (365 days or longer) human health effects after exposure to low concentrations of 1,2-dichloroethene aren't known. One animal study suggested that an exposed fetus may not grow as quickly as one that hasn't been exposed.

Exposure to 1,2-dichloroethene hasn't been shown to affect fertility in people or animals.

How likely is 1,2-dichloroethene to cause cancer?

The EPA has determined that *cis*-1,2-dichloroethene is not classifiable as to its human carcinogenicity.

No EPA cancer classification is available for *trans*-1,2-dichloroethene.

Is there a medical test to show whether I've been exposed to 1,2-dichloroethene?

Tests are available to measure concentrations of the breakdown products of 1,2-dichloroethene in blood, urine, and tissues. However, these tests aren't used routinely to determine whether a person has been exposed to this compound. This is because after you are exposed to 1,2-dichloroethene, the breakdown products in your body that are detected with these tests may be the same as those that come from exposure to other chemicals. These tests aren't available in most doctors' offices, but can be done at special laboratories that have the right equipment.

Has the federal government made recommendations to protect human health?

The EPA has set the maximum allowable level of *cis*-1,2-dichloroethene in drinking water at 0.07 milligrams per liter of water (0.07 mg/L) and *trans*-1,2-dichloroethene at 0.1 mg/L.

The EPA requires that any spills or accidental release of 1,000 pounds or more of 1,2-dichloroethene must be reported to the EPA.

The Occupational Health Safety and Health Administration (OSHA) has set the maximum allowable amount of 1,2-dichloroethene in workroom air during an 8-hour workday in a 40-hour workweek at 200 parts of 1,2-dichloroethene per million parts of air (200 ppm).

Glossary

Carcinogenicity: Ability of a substance to cause cancer.

CAS: Chemical Abstracts Service.

Fertility: Ability to reproduce.

Ingest: To eat or drink something.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Solvent: A chemical that can dissolve other substances.

References

This ToxFAQs information is taken from the 1996 Toxicological Profile for 1,2-Dichloroethene produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Tetrachloroethylene - ToxFAQs™

CAS # 127-18-4

This fact sheet answers the most frequently asked health questions (FAQs) about tetrachloroethylene. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Tetrachloroethylene is a manufactured chemical used for dry cleaning and metal degreasing. Exposure to very high concentrations of tetrachloroethylene can cause dizziness headaches, sleepiness, incoordination confusion, nausea, unconsciousness, and even death. Tetrachloroethylene has been found in at least 945 of the 1,699 National Priorities List sites identified by U.S. Environmental Protection Agency (EPA).

What is tetrachloroethylene?

Tetrachloroethylene is a nonflammable colorless liquid. Other names for tetrachloroethylene include perchloroethylene, PCE, perc, tetrachloroethene, and perchlor. Most people can smell tetrachloroethylene when it is present in the air at a level of 1 part in 1 million parts of air (1 ppm) or more.

Tetrachloroethylene is used as a dry cleaning agent and metal degreasing solvent. It is also used as a starting material (building block) for making other chemicals and is used in some consumer products.

What happens to tetrachloroethylene when it enters the environment?

- Tetrachloroethylene can be released into air, water, and soil at places where it is produced or used.
- Tetrachloroethylene breaks down very slowly in the air and so it can be transported long distances in the air. Half of the amount in the air will degrade in approximately 100 days.
- Tetrachloroethylene evaporates quickly from water into air. It is generally slow to break down in water.
- Tetrachloroethylene may evaporate quickly from shallow soils or may filter through the soil and into the groundwater below. It is generally slow to break down in soil.

How might I be exposed to tetrachloroethylene?

- When you bring clothes from the dry cleaners, they will release small amounts of tetrachloroethylene into the air.
- When you drink water containing tetrachloroethylene, you are exposed to it. You might also be exposed to tetrachloroethylene that is released into the air during showering and bathing.
- People residing near contaminated sites or dry cleaning locations may be exposed to higher levels than the general population.
- People working in the dry cleaning industries or using metal degreasing products may be exposed to elevated levels of tetrachloroethylene.

How can tetrachloroethylene affect my health?

Breathing high levels of tetrachloroethylene for a brief period may cause dizziness or drowsiness, headache, and incoordination; higher levels may cause unconsciousness and even death.

Exposure for longer periods to low levels of tetrachloroethylene may cause changes in mood, memory, attention, reaction time, and vision.

Studies in animals exposed to tetrachloroethylene have shown liver and kidney effects, and changes in brain chemistry, but we do not know what these findings mean for humans.

How likely is tetrachloroethylene to cause cancer?

Studies in humans suggest that exposure to tetrachloroethylene might lead to a higher risk of getting bladder cancer, multiple myeloma, or non-Hodgkin's lymphoma, but the evidence is not very strong.

Tetrachloroethylene

CAS # 127-18-4

In animals, tetrachloroethylene has been shown to cause cancers of the liver, kidney, and blood system.

EPA considers tetrachloroethylene likely to be carcinogenic to humans by all routes of exposure. The International Agency for Research on Cancer (IARC) considers tetrachloroethylene probably carcinogenic to humans. The Department of Health and Human Services (DHHS) considers tetrachloroethylene to be reasonable anticipated to be a human carcinogen.

How can tetrachloroethylene affect children?

It is not known whether children are more susceptible than adults to the effects of tetrachloroethylene.

A few studies in humans have suggested that exposure to tetrachloroethylene increased the numbers of babies with birth defects, but these studies were not large enough to clearly answer the question. Studies in animals exposed by inhalation or stomach tube have not shown clear evidence of specific birth defects.

How can families reduce the risks of exposure to tetrachloroethylene?

- Tetrachloroethylene has been found in low levels in some food. You can minimize the risk of your family's exposure by peeling and thoroughly washing fruits and vegetables before cooking.
- Use bottled water if you have concerns about the presence of tetrachloroethylene in your tap water. You may also contact local drinking water authorities and follow their advice.
- Prevent children from playing in dirt or eating dirt if you live near a waste site that has tetrachloroethylene.
- Tetrachloroethylene is widely used as a scouring solvent that removes oils from fabrics, as a carrier solvent, as a fabric finish or water repellant, and as a metal degreaser/cleaner. Follow instructions on product labels to minimize exposure to tetrachloroethylene.

Is there a medical test to show whether I've been exposed to tetrachloroethylene?

Tetrachloroethylene and its breakdown products (metabolites) can be measured in blood and urine. However, the detection of tetrachloroethylene or its metabolites cannot predict the kind of health effects that might develop from that exposure. Because tetrachloroethylene and its metabolites leave the body fairly rapidly, the tests need to be conducted within days after exposure.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set an 8-hour time weighted average permissible exposure limit of 100 ppm, an acceptable ceiling exposure limit of 200 ppm, and a maximum peak of 300 ppm (not to be exceeded for more than 5 minutes of any 3-hour period).

The National Institute for Occupational Safety and Health (NIOSH) recommends that workplace exposure to tetrachloroethylene be minimized due to concerns about its carcinogenicity.

References

This ToxFAQs™ information is taken from the 2014 Toxicological Profile for Tetrachloroethylene (Draft for Public Comment) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services in Atlanta, GA

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636, FAX: 770-488-4178.

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Trichloroethylene - ToxFAQs™

CAS # 79-01-6

This fact sheet answers the most frequently asked health questions (FAQs) about trichloroethylene. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Trichloroethylene is used as a solvent for cleaning metal parts. Exposure to very high concentrations of trichloroethylene can cause dizziness, headaches, sleepiness, incoordination, confusion, nausea, unconsciousness, and even death. The Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC) classify trichloroethylene as a human carcinogen. Trichloroethylene has been found in at least 1,045 of the 1,699 National Priorities List sites identified by the EPA.

What is trichloroethylene?

Trichloroethylene is a colorless, volatile liquid. Liquid trichloroethylene evaporates quickly into the air. It is nonflammable and has a sweet odor.

The two major uses of trichloroethylene are as a solvent to remove grease from metal parts and as a chemical that is used to make other chemicals, especially the refrigerant, HFC-134a. Trichloroethylene was once used as an anesthetic for surgery.

What happens to trichloroethylene when it enters the environment?

- Trichloroethylene can be released to air, water, and soil at places where it is produced or used.
- Trichloroethylene is broken down quickly in air.
- Trichloroethylene breaks down very slowly in soil and water and is removed mostly through evaporation to air.
- It is expected to remain in groundwater for long time since it is not able to evaporate.
- Trichloroethylene does not build up significantly in plants or animals.

How might I be exposed to trichloroethylene?

- Breathing trichloroethylene in contaminated air.
- Drinking contaminated water.
- Workers at facilities using this substance for metal degreasing are exposed to higher levels of trichloroethylene.
- If you live near such a facility or near a hazardous waste site containing trichloroethylene, you may also have higher exposure to this substance.

How can trichloroethylene affect my health?

Exposure to moderate amounts of trichloroethylene may cause headaches, dizziness, and sleepiness; large amounts may cause coma and even death. Eating or breathing high levels of trichloroethylene may damage some of the nerves in the face. Exposure to high levels can also result in changes in the rhythm of the heartbeat, liver damage, and evidence of kidney damage. Skin contact with concentrated solutions of trichloroethylene can cause skin rashes.

There is some evidence exposure to trichloroethylene in the work place may cause scleroderma (a systemic autoimmune disease) in some people. Some men occupationally-exposed to trichloroethylene and other chemicals showed decreases in sex drive, sperm quality, and reproductive hormone levels.

How likely is trichloroethylene to cause cancer?

There is strong evidence that trichloroethylene can cause kidney cancer in people and some evidence for trichloroethylene-induced liver cancer and malignant lymphoma. Lifetime exposure to trichloroethylene resulted in increased liver cancer in mice and increased kidney cancer and testicular cancer in rats.

The National Toxicology Program (NTP) has determined that trichloroethylene is a "known human carcinogen". The EPA and the International Agency for Research on Cancer (IARC) have determined that trichloroethylene is "carcinogenic to humans."

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Health Human Sciences

ATSDR

CS256651A

Trichloroethylene

CAS # 79-01-6

How can trichloroethylene affect children?

It is not known whether children are more susceptible than adults to the effects of trichloroethylene.

Some human studies indicate that trichloroethylene may cause developmental effects such as spontaneous abortion, congenital heart defects, central nervous system defects, and small birth weight. However, these people were exposed to other chemicals as well.

In some animal studies, exposure to trichloroethylene during development caused decreases in body weight, increases in heart defects, changes to the developing nervous system, and effects on the immune system.

How can families reduce the risk of exposure to trichloroethylene?

- Avoid drinking water from sources that are known to be contaminated with trichloroethylene. Use bottled water if you have concerns about the presence of chemicals in your tap water. You may also contact local drinking water authorities and follow their advice.
- Discourage your children from putting objects in their mouths. Make sure that they wash their hands frequently and before eating.
- Prevent children from playing in dirt or eating dirt if you live near a waste site that has trichloroethylene.
- Trichloroethylene is used in many industrial products. Follow instructions on product labels to minimize exposure to trichloroethylene.

Is there a medical test to show whether I've been exposed to trichloroethylene?

Trichloroethylene and its breakdown products (metabolites) can be measured in blood and urine. However, the detection of trichloroethylene or its metabolites cannot predict the kind of health effects that might develop from that exposure. Because trichloroethylene and its metabolites leave the body fairly rapidly, the tests need to be conducted within days after exposure.

Has the federal government made recommendations to protect human health?

The EPA set a maximum contaminant goal (MCL) of 0.005 milligrams per liter (mg/L; 5 ppb) as a national primary drinking standard for trichloroethylene.

The Occupational Safety and Health Administration (OSHA) set a permissible exposure limit (PEL) of 100 ppm for trichloroethylene in air averaged over an 8-hour work day, an acceptable ceiling concentration of 200 ppm provided the 8 hour PEL is not exceeded, and an acceptable maximum peak of 300 ppm for a maximum duration of 5 minutes in any 2 hours.

The National Institute for Occupational Safety and Health (NIOSH) considers trichloroethylene to be a potential occupational carcinogen and established a recommended exposure limit (REL) of 2 ppm (as a 60-minute ceiling) during its use as an anesthetic agent and 25 ppm (as a 10-hour TWA) during all other exposures.

References

This ToxFAQs™ information is taken from the 2014 Toxicological Profile for Trichloroethylene (Draft for Public Comment) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

ToxFAQs™ Ion the web: www.atsdr.cdc.gov/toxFAQs.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Vinyl Chloride - ToxFAQs™

CAS # 75-01-4

This fact sheet answers the most frequently asked health questions (FAQs) about vinyl chloride. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to vinyl chloride occurs mainly in the workplace. Breathing high levels of vinyl chloride for short periods of time can cause dizziness, sleepiness, unconsciousness, and at extremely high levels can cause death. Breathing vinyl chloride for long periods of time can result in permanent liver damage, immune reactions, nerve damage, and liver cancer. This substance has been found in at least 616 of the 1,662 National Priority List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is vinyl chloride?

Vinyl chloride is a colorless gas. It burns easily and it is not stable at high temperatures. It has a mild, sweet odor. It is a manufactured substance that does not occur naturally. It can be formed when other substances such as trichloroethane, trichloroethylene, and tetrachloroethylene are broken down. Vinyl chloride is used to make polyvinyl chloride (PVC). PVC is used to make a variety of plastic products, including pipes, wire and cable coatings, and packaging materials.

Vinyl chloride is also known as chloroethene, chloroethylene, and ethylene monochloride.

What happens to vinyl chloride when it enters the environment?

- Liquid vinyl chloride evaporates easily. Vinyl chloride in water or soil evaporates rapidly if it is near the surface.
- Vinyl chloride in the air breaks down in a few days to other substances, some of which can be harmful.
- Small amounts of vinyl chloride can dissolve in water.
- Vinyl chloride is unlikely to build up in plants or animals that you might eat.

How might I be exposed to vinyl chloride?

- Breathing vinyl chloride that has been released from plastics industries, hazardous waste sites, and landfills.
- Breathing vinyl chloride in air or during contact with your skin or eyes in the workplace.
- Drinking water from contaminated wells.

How can vinyl chloride affect my health?

Breathing high levels of vinyl chloride can cause you to feel dizzy or sleepy. Breathing very high levels can cause you to pass out, and breathing extremely high levels can cause death.

Some people who have breathed vinyl chloride for several years have changes in the structure of their livers. People are more likely to develop these changes if they breathe high levels of vinyl chloride. Some people who work with vinyl chloride have nerve damage and develop immune reactions. The lowest levels that produce liver changes, nerve damage, and immune reaction in people are not known. Some workers exposed to very high levels of vinyl chloride have problems with the blood flow in their hands. Their fingers turn white and hurt when they go into the cold.

The effects of drinking high levels of vinyl chloride are unknown. If you spill vinyl chloride on your skin, it will cause numbness, redness, and blisters.

Animal studies have shown that long-term exposure to vinyl chloride can damage the sperm and testes.

Vinyl Chloride

CAS # 75-01-4

How likely is vinyl chloride to cause cancer?

The U.S. Department of Health and Human Services (DHHS) has determined that vinyl chloride is a known carcinogen. Studies in workers who have breathed vinyl chloride over many years showed an increased risk of liver, brain, lung cancer, and some cancers of the blood have also been observed in workers.

How can vinyl chloride affect children?

It has not been proven that vinyl chloride causes birth defects in humans, but studies in animals suggest that vinyl chloride might affect growth and development. Animal studies also suggest that infants and young children might be more susceptible than adults to vinyl chloride-induced cancer.

How can families reduce the risk of exposure to vinyl chloride?

Tobacco smoke contains low levels of vinyl chloride, so limiting your family's exposure to cigarette or cigar smoke may help reduce their exposure to vinyl chloride.

Is there a medical test to determine whether I've been exposed to vinyl chloride?

The results of several tests can sometimes show if you have been exposed to vinyl chloride. Vinyl chloride can be measured in your breath, but the test must be done shortly after exposure. This is not helpful for measuring very low levels of vinyl chloride.

The amount of the major breakdown product of vinyl chloride, thiodiglycolic acid, in the urine may give some information about exposure. However, this test must be done shortly after exposure and does not reliably indicate the level of exposure.

Has the federal government made recommendations to protect human health?

Vinyl chloride is regulated in drinking water, food, and air. The EPA requires that the amount of vinyl chloride in drinking water not exceed 0.002 milligrams per liter (mg/L) of water.

The Occupational Safety and Health Administration (OSHA) has set a limit of 1 part vinyl chloride per 1 million parts of air (1 ppm) in the workplace.

The Food and Drug Administration (FDA) regulates the vinyl chloride content of various plastics. These include plastics that carry liquids and plastics that contact food. The limits for vinyl chloride content vary depending on the nature of the plastic and its use.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2006. Toxicological Profile for Vinyl Chloride (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1996**

This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl′ĭ-sī′klĭk ăr′ə-măt′ĭk hī′drə-kar′bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.

ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html

- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

MATERIAL SAFETY DATA SHEET

(POLYCHLORINATED BIPHENYLS)

COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients Name: polychlorinated biphenyls (PCBs)

HAZARD IDENTIFICATION

Reports of Carcinogenicity: YES

HEALTH HAZARDS ACUTE AND CHRONIC

- **Eyes**: Moderately irritating to eye tissues.
- **Skin**: Can be absorbed through intact skin, may cause de-fatting, potential for chloracne.
- **Inhalation**: Possible liver injury.
- **Ingestion**: Slightly toxic; reasonably anticipated to be carcinogenic.

EFFECTS OF OVER-EXPOSURE

Can cause dermatological symptoms; however, these are reversible upon removal of exposure source.

FIRST AID MEASURES

- **Eyes**: Irrigate immediately with copious quantities of running water for at least 15 minutes if liquid or solid PCBs get into them.
- **Skin:** Contaminated clothing should be removed and the skin washed thoroughly with soap and water. Hot PCBs may cause thermal burns.
- **Inhalation**: Remove to fresh air; if skin rash or respiratory irritation persists, consult a physician (if electrical equipment arcs over, PCBs may decompose to produce hydrochloric acid).
- **Ingestion**: Consult a physician. Do not induce vomiting or give any oily laxatives. (If large amounts are ingested, gastric lavage is suggested).

FIRE FIGHTING MEASURES: Flash Point: >141 ^{o}C (285.8 ^{o}F)

EXTINGUISHING MEDIA: PCBs are fire-resistant compounds.

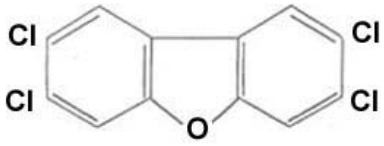
FIRE-FIGHTING PROCEDURES

Standard fire-fighting wearing apparel and self-contained breathing apparatus should be worn when fighting fires that involve possible exposure to chemical combustion products. Fire fighting equipment should be thoroughly cleaned and decontaminated after use.

UNUSUAL FIRE/EXPLOSION HAZARD

If a PCB transformer is involved in a fire-related incident, the owner of the transformer is required to report the incident. Consult and follow appropriate federal, provincial and local regulations.

***Note**: When askarel liquid becomes involved in a fire, toxic by-products of combustion are typically produced including polychlorinated dibenzofurans and polychlorinated dibenzodioxins, both known carcinogens. The structures of these chemical species are as follows:*

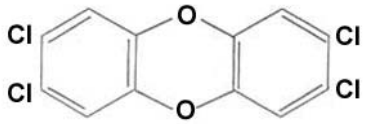


TCDF

$C_{12}H_{8-n}Cl_nO$

$n = 4 - 8$

2,3,7,8-tetrachlorodibenzofuran



TCDD

$C_{12}H_{8-n}Cl_nO_2$

$n = 4 - 8$

2,3,7,8-tetrachloro-dibenzo-p-dioxin

***Note**: 2,3,7,8-tetrachloro-dibenzo-p-dioxin is one of the most potent teratogenic, mutagenic and carcinogenic agents known to man.*

SPILL RELEASE PROCEDURES

Cleanup & disposal of liquid PCBs are strictly regulated by the federal government. Ventilate area. Contain spill/leak. Remove spill by means of absorptive material. Spill clean-up personnel should use proper protective clothing. All wastes and residues containing PCBs should be collected, containerized, marked and disposed of in the manner prescribed by applicable federal, provincial and local laws.

HANDLING AND STORAGE PRECAUTIONS

Care should be taken to prevent entry into the environment through spills, leakage, use, vaporization, or disposal of liquid. Avoid prolonged breathing of vapours or mists. Avoid contact with eyes or prolonged contact with skin. Comply with all federal, provincial and local regulations.

OTHER PRECAUTIONS

Federal regulations require PCBs, PCB items, storage areas, transformer vaults, and transport vehicles to be appropriately labelled.

RESPIRATORY PROTECTION

Use OHSA approved equipment when airborne exposure limits are exceeded. Full facepiece equipment is recommended and, if used, replaces need for face shield and/or chemical splash goggles. The respirator use limitations specified by the manufacturer must be observed.

VENTILATION

Provide natural or mechanical ventilation to control exposure levels below airborne exposure levels.

PROTECTIVE GLOVES: Wear appropriate chemical resistant gloves to prevent skin contact.

EYE PROTECTION: Wear chemical splash goggles and have eye baths available.

OTHER PROTECTIVE EQUIPMENT

Wear appropriate protective clothing. Provide a safety shower at any location where skin contact can occur.

WORK HYGIENIC PRACTICES

Wash thoroughly after handling. Supplemental safety and health : none

PHYSICAL/CHEMICAL PROPERTIES

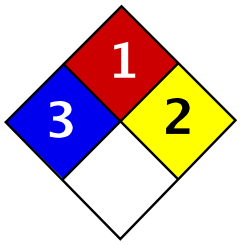
- **Vapour pressure:** (mm Hg @100 ^{o}F) 0.005 - 0.00006
- **Viscosity:** (CENTISTOKES) 3.6 - 540
- **Stability indicator/materials to avoid:** Yes
- **Stability Condition to Avoid:** PCBs are very stable, fire-resistant compounds.

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide, hydrogen chloride, phenolics, aldehydes, furans, dioxins

WASTE DISPOSAL METHODS

Consult the applicable PCB regulations prior to any disposal of PCBs or PCB-contaminated items.



Health	3
Fire	1
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Arsenic MSDS

Section 1: Chemical Product and Company Identification

Product Name: Arsenic

Catalog Codes: SLA1006

CAS#: 7440-38-2

RTECS: CG0525000

TSCA: TSCA 8(b) inventory: Arsenic

CI#: Not applicable.

Synonym:

Chemical Name: Arsenic

Chemical Formula: As

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Arsenic	7440-38-2	100

Toxicological Data on Ingredients: Arsenic: ORAL (LD50): Acute: 763 mg/kg [Rat]. 145 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to kidneys, lungs, the nervous system, mucous membranes.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

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

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

Serious Skin Contact: Not available.

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

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks, of heat, of oxidizing materials.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

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

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits highly toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not

present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids, moisture.

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

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 0.01 from ACGIH (TLV) [United States] [1995]
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

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

Odor: Not available.

Taste: Not available.

Molecular Weight: 74.92 g/mole

Color: Silvery.

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

Boiling Point: Not available.

Melting Point: Sublimation temperature: 615°C (1139°F)

Critical Temperature: Not available.

Specific Gravity: 5.72 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 145 mg/kg [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH.
Causes damage to the following organs: kidneys, lungs, the nervous system, mucous membranes.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Arsenic UNNA: UN1558 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Arsenic
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: Arsenic
Pennsylvania RTK: Arsenic
Massachusetts RTK: Arsenic
TSCA 8(b) inventory: Arsenic

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R22- Harmful if swallowed.
R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 2

Personal Protection: E

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

Health: 3

Flammability: 1

Reactivity: 2

Specific hazard:

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

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec.
-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec.
-SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.
-The Sigma-Aldrich Library of Chemical Safety Data, Edition II.
-Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

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Last Updated: 11/06/2008 12:00 PM

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Barium Metal

MSDS # 84.00

Section 1: Product and Company Identification

Barium Metal

Synonyms/General Names: Barium
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

Soft, silvery, lustrous metal immersed in heavy mineral oil; no odor.

HMIS (0 to 4)

Health	**3**
Fire Hazard	**3**
Reactivity	**2**

WARNING! Flammable solid, dangerous when wet, highly toxic by ingestion.
Flammable solid, keep away from all ignition sources. Contact with water produces flammable gas.
Target organs: Central nervous system, kidneys.

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

Section 3: Composition / Information on Ingredients

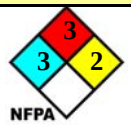
Barium Metal (7440-39-3), 100%

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 and explosive hydrogen gas.
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: Barium compounds: OSHA PEL: 0.5 mg/m^3 and ACGIH TLV: 0.5 mg/m^3, STEL: N/A.

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Section 9: Physical and Chemical Properties

Molecular formula	Ba.	**Appearance**	Silver metal in heavy mineral oil.
Molecular weight	137.33.	**Odor**	No odor.
Specific Gravity	3.62 g/mL @ 20°C..	**Odor Threshold**	N/A.
Vapor Density (air=1)	N/A.	**Solubility**	Reacts violently with water.
Melting Point	850°C.	**Evaporation rate**	N/A *(Butyl acetate = 1).*
Boiling Point/Range	1695°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.:	N/A.	**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
Barium: 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:	Barium.	**Canada TDG:**	Barium .
DOT Hazard Class:	4.3, pg II.	**Hazard Class:**	4.3, pg II.
Identification Number:	UN1400.	**UN Number:**	UN1400.

Section 15: Regulatory Information

EINECS: Listed (231-149.1) .
WHMIS Canada: B6:D2B: Reactive Flammable: Toxic Material.
TSCA: All components are listed or are exempt.
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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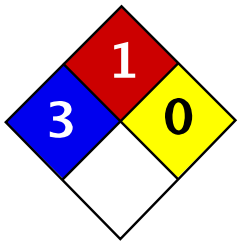

Health	3
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Cadmium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Cadmium

Catalog Codes: SLC3484, SLC5272, SLC2482

CAS#: 7440-43-9

RTECS: EU9800000

TSCA: TSCA 8(b) inventory: Cadmium

CI#: Not applicable.

Synonym:

Chemical Name: Cadmium

Chemical Formula: Cd

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Cadmium	7440-43-9	100

Toxicological Data on Ingredients: Cadmium: ORAL (LD50): Acute: 2330 mg/kg [Rat.]. 890 mg/kg [Mouse]. DUST (LC50): Acute: 50 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to kidneys, lungs, liver.
Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact: No known effect on eye contact, rinse with water for a few minutes.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: 570°C (1058°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Non-flammable in presence of open flames and sparks, of heat, of oxidizing materials, of reducing materials, of combustible materials, of moisture.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

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

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 0.01 (ppm)
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

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

Odor: Not available.

Taste: Not available.

Molecular Weight: 112.4 g/mole

Color: Silvery.

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

Boiling Point: 765°C (1409°F)

Melting Point: 320.9°C (609.6°F)

Critical Temperature: Not available.

Specific Gravity: 8.64 (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, methanol, diethyl ether, n-octanol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity: Reacts violently with potassium.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute oral toxicity (LD50): 890 mg/kg [Mouse].
Acute toxicity of the dust (LC50): 229.9 mg/m3 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP.
The substance is toxic to kidneys, lungs, liver.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: An allergen. 0047 Animal: embryotoxic, passes through the placental barrier.

Special Remarks on other Toxic Effects on Humans: May cause allergic reactions, exzema and/or dehydration of the skin.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:

Identification:

Special Provisions for Transport:

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Cadmium
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: Cadmium
Pennsylvania RTK: Cadmium
Massachusetts RTK: Cadmium
TSCA 8(b) inventory: Cadmium
SARA 313 toxic chemical notification and release reporting: Cadmium
CERCLA: Hazardous substances.: Cadmium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R26- Very toxic by inhalation.
R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 3

Flammability: 1

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec.
-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec.
-SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.
-The Sigma-Aldrich Library of Chemical Safety Data, Edition II.
-Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

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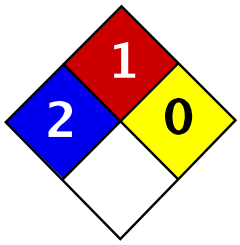

Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Chromium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chromium

Catalog Codes: SLC4711, SLC3709

CAS#: 7440-47-3

RTECS: GB4200000

TSCA: TSCA 8(b) inventory: Chromium

CI#: Not applicable.

Synonym: Chromium metal; Chrome; Chromium Metal Chips 2" and finer

Chemical Name: Chromium

Chemical Formula: Cr

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Chromium	7440-47-3	100

Toxicological Data on Ingredients: Chromium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Slightly hazardous in case of ingestion.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance may be toxic to kidneys, lungs, liver, upper respiratory tract.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

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

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

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

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: May be combustible at high temperature.

Auto-Ignition Temperature: 580°C (1076°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames and sparks, of heat.
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:
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Moderate fire hazard when it is in the form of a dust (powder) and burns rapidly when heated in flame.
Chromium is attacked vigorously by fused potassium chlorate producing vivid incandescence.
Pyrophoric chromium unites with nitric oxide with incandescence.
Incandescent reaction with nitrogen oxide or sulfur dioxide.

Special Remarks on Explosion Hazards:
Powdered Chromium metal +fused ammonium nitrate may react violently or explosively.
Powdered Chromium will explode spontaneously in air.

Section 6: Accidental Release Measures

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

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

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

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

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 0.5 (mg/m3) from ACGIH (TLV) [United States]
TWA: 1 (mg/m3) from OSHA (PEL) [United States]
TWA: 0.5 (mg/m3) from NIOSH [United States]
TWA: 0.5 (mg/m3) [United Kingdom (UK)]
TWA: 0.5 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

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

Odor: Odorless.

Taste: Not available.

Molecular Weight: 52 g/mole

Color: Silver-white to Grey.

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

Boiling Point: 2642°C (4787.6°F)

Melting Point: 1900°C (3452°F) +/- !0 deg. C

Critical Temperature: Not available.

Specific Gravity: 7.14 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water.
Soluble in acids (except Nitric), and strong alkalies.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

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

Corrosivity: Not available.

Special Remarks on Reactivity:
Incompatible with molten Lithium at 180 deg. C, hydrogen peroxide, hydrochloric acid, sulfuric acid, most caustic alkalies and alkali carbonates, potassium chlorate, sulfur dioxide, nitrogen oxide, bromine pentafluoride.
It may react violently or ignite with bromine pentafluoride.
Chromium is rapidly attacked by fused sodium hydroxide + potassium nitrate.
Potentially hazardous incompatibility with strong oxidizers.

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:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for

human.) by IARC.
May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause cancer based on animal data. There is no evidence that exposure to trivalent chromium causes cancer in man.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
May cause skin irritation.
Eyes: May cause mechanical eye irritation.
Inhalation: May cause irritation of the respiratory tract and mucous membranes of the respiratory tract.
Ingestion: May cause gastrointestinal tract irritation with nausea, vomiting, diarrhea.
Chronic Potential Health Effects:
Inhalation: The effects of chronic exposure include irritation , sneezing, reddness of the throat, bronchospasm, asthma, cough, polyps, chronic inflammation, emphysema, chronic bronchitis, pharyngitis, bronchopneumonia, pneumoconoisis. Effects on the nose from chronic chromium exposure include irritation, ulceration, and perforation of the nasal septum. Inflammation and ulceration of the larynx may also occur.
Ingestion or Inhalation: Chronic exposure may cause liver and kidney damage.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

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

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:

Connecticut hazardous material survey.: Chromium
Illinois toxic substances disclosure to employee act: Chromium
Illinois chemical safety act: Chromium
New York release reporting list: Chromium
Rhode Island RTK hazardous substances: Chromium
Pennsylvania RTK: Chromium
Minnesota: Chromium
Michigan critical material: Chromium
Massachusetts RTK: Chromium
Massachusetts spill list: Chromium
New Jersey: Chromium
New Jersey spill list: Chromium
Louisiana spill reporting: Chromium
California Director's List of Hazardous Substances: Chromium
TSCA 8(b) inventory: Chromium
SARA 313 toxic chemical notification and release reporting: Chromium
CERCLA: Hazardous substances.: Chromium: 5000 lbs. (2268 kg)

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

Other Classifications:

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

DSCL (EEC):
R40- Limited evidence of carcinogenic effect
S36/37/39- Wear suitable protective clothing, gloves and eye/face protection.
S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Teck

COPPER METAL
MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product Identity: Copper Metal

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

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

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

Date of Last MSDS Revision/Edit: February 26, 2010.

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

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient	Approximate Percent by Weight	CAS Number	Occupational Exposure Limits (OELs)		LD_{50} / LC_{50} Species and Route
Copper	99.99+%	7440-50-8	OSHA PEL	0.1 mg/m^3 fume 1.0 mg/m^3 dusts/mists	LD_{50}, mouse, oral >5,000 mg/kg
			ACGIH TLV	0.2 mg/m^3 fume 1.0 mg/m^3 dusts/mists	
			NIOSH REL	0.1 mg/m^3 (Respirable) fume 1.0 mg/m^3 dusts/mists	

NOTE: OELs for individual jurisdictions may differ from OSHA PELs. Check with local authorities for the applicable OELs in your jurisdiction. OSHA - Occupational Safety and Health Administration; ACGIH - American Conference of Governmental Industrial Hygienists; NIOSH - National Institute for Occupational Safety and Health. OEL – Occupational Exposure Limit, PEL – Permissible Exposure Limit, TLV – Threshold Limit Value, REL – Recommended Exposure Limit.

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

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview: Reddish metal that does not burn in bulk but may form explosive mixtures if dispersed in air as a fine powder and exposed to heat or flames. This metal is relatively non-toxic and poses little immediate hazard to personnel or the environment in an emergency situation.

Potential Health Effects: Inhalation of fumes or dust may result in irritation of the nasal mucous membranes. Inhalation of copper oxide may cause irritation of the upper respiratory tract and may result in a form of metal fume fever, characterized by flu-like symptoms such as chills, fever, nausea, and vomiting. Ingestion of copper metal may cause nausea, vomiting, headaches, dizziness, and gastrointestinal irritation. Direct eye contact may cause redness or pain. Direct skin contact may result in irritation. Discoloration of the skin often occurs from handling copper, but does not indicate any actual injury. Copper is not listed as a carcinogen by OSHA, the NTP, the ACGIH, IARC, or the EU. (See Toxicological Information, Section 11).

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

EU Risk Phrase(s): Not hazardous – no applicable Risk Phrases.

SECTION 4. FIRST AID MEASURES

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

Skin Contact: *Dust:* No health effects expected. If irritation does occur, flush with lukewarm, gently flowing water for 5 minutes. If irritation persists, obtain medical advice. *Molten Metal:* Flush contact area to solidify and cool but do not attempt to remove encrusted material or clothing. Cover burns and seek medical attention immediately.

Inhalation: Remove source of contamination or move victim from exposure area to fresh air. Obtain medical advice. NOTE: Metal fume fever may develop 3-10 hours after exposure. If symptoms of metal fume fever (flu-like symptoms) develop, obtain medical attention.

Ingestion: Never give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. Have victim drink 2 – 8 oz. (60 – 240 ml) of water. If vomiting occurs naturally, have victim rinse mouth with water again. Obtain medical advice and bring a copy of this MSDS.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Massive metal is not considered a fire or explosion hazard. Finely-divided copper metal dust or powder may be flammable or explosive when dispersed in the air at high concentrations and exposed to heat, flame, or other ignition sources. Explosions may also occur upon contact with certain incompatible materials (see Stability and Reactivity, Section 10).

Extinguishing Media: Do NOT use water, carbon dioxide, foam, or halons. Apply dry sand, dolomite, graphite, powdered sodium chloride, soda ash, or other suitable dry powders.

Fire Fighting: Fire fighters must be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask.

Flashpoint and Method: Not Applicable.

Upper and Lower Flammable Limit: Not Applicable.

Autoignition Temperature: Not Applicable.

SECTION 6. ACCIDENTAL RELEASE MEASURES

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

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

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

SECTION 7. HANDLING AND STORAGE

Store copper in a dry, covered area. Copper cathodes suspected of containing moisture should be THOROUGHLY DRIED before being added to a molten bath. Cathodes may contain cavities that collect moisture. Entrained moisture will expand explosively when immersed in a molten bath and potentially spatter molten metal out of the bath. Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate, designated areas.

EU Safety Phrase(s): Not hazardous – no applicable Safety Phrases.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

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

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

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

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Reddish metal	**Odour:** None	**Physical State:** Solid	**pH:** Not Applicable
Vapour Pressure: 1 mm at 1083°C Negligible @ 20°C	**Vapour Density:** Not Applicable	**Boiling Point/Range:** 2595° C	**Melting Point/Range:** 1083° C
Specific Gravity: 8.94	**Evaporation Rate:** Not Applicable	**Coefficient of Water/Oil Distribution:** Not Applicable	**Odour Threshold:** None
Solubility: Insoluble in water			

SECTION 10. STABILITY AND REACTIVITY

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

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

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

SECTION 11. TOXICOLOGICAL INFORMATION

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

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

Inhalation: An intense, short-term exposure to fumes from cutting or welding, etc. could result in the condition called metal fume fever. The symptoms of metal fume fever generally occur within 3 to 10 hours. They may include immediate dryness and irritation of the throat, tightness of the chest, and coughing that may later be followed by flu-like symptoms of fever, malaise, perspiration, frontal headache, muscle cramps, low back pain, occasionally blurred vision, nausea, and vomiting. Severe cases could cause pulmonary congestion and edema as well as acute encephalopathy with possible seizures, coma, and death. However, short-term exposures of

this magnitude are unlikely in industry today. Those experiencing a single acute episode of metal fume fever generally recover slowly but without apparent residual effects.

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

Chronic:
Prolonged exposure to copper dust or fume can cause irritation to the eye and skin. A green discoloration of the skin has been reported similar to that caused by wearing jewelry made of copper. Copper is not listed as a human carcinogen by the Occupational Safety and Health Administration (OSHA), the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), the American Conference of Governmental Industrial Hygienists (ACGIH) or the European Union (EU).

SECTION 12. ECOLOGICAL INFORMATION

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

SECTION 13. DISPOSAL CONSIDERATIONS

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

SECTION 14. TRANSPORT INFORMATION

No special shipping or transportation requirements in ingot form.

SECTION 15. REGULATORY INFORMATION

U.S.

Ingredient Listed on TSCA Inventory..... Yes

Hazardous Under Hazard Communication Standard..... Yes

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

EPCRA Section 302 Extremely Hazardous Substance..... No

EPCRA Section 311/312 Hazard Categories..... No Hazard Categories Apply

EPCRA Section 313 Toxic Release Inventory..... Copper.....CAS No. 7440-50-8
Percent by Weight - At least 99%

CANADIAN:

WHMIS Classification..... Not applicable. Copper is not a controlled product under WHMIS. This Material Safety Data Sheet is provided for information purposes only.

EUROPEAN UNION:

Listed on the European Inventory of Existing Commercial Chemical Substances (EINECS):..... Yes

EU Classification:..... Not hazardous.

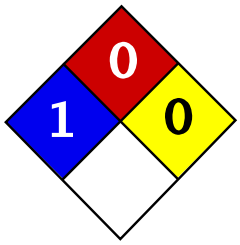
SECTION 16. OTHER INFORMATION

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

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, 7th Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2009, Guide to Occupational Exposure Values.
- American Conference of Governmental Industrial Hygienists, 2009, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P. G. Urben, Ed.) 1995.
- Canadian Centre for Occupational Health and Safety CHEMINFO Record No: 2073, Copper - *Last Revised 2005-03.*
- Commission de la santé et la sécurité du travail, Service du répertoire toxicologique, Cuivre , 2001-07.
- Industry Canada, Controlled Products Regulations SOR/88-66, as amended.
- International Chemical Safety Cards (WHO/IPCS/ILO) ICSC:0240 – Copper (Revised Sept 1993).
- International Labour Office (WHO/ILO) Encyclopedia of Occupational Health & Safety 4th Ed. CD-ROM Version (1998).
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Library of Medicine, Hazardous Substance Data Bank. (*last accessed 2010 -02-03*)
- National Oceanic and Atmospheric Administration, Office of Response and Restoration, CAMEO Chemicals – Database of Hazardous Materials [http://www.cameochemicals.noaa.gov/] *last accessed 2010-02-03*
- Patty's Toxicology, 5th Edition, (E Bingham, B Cohrssen & C H Powell, Ed.) 2001.
- U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Copper (Sept 2004).
- U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards. CD-ROM Edition September 2005.
- U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances (RTECS) CCOHS Web Access subscription.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

Notice to Reader

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



Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Lead MSDS

Section 1: Chemical Product and Company Identification

Product Name: Lead

Catalog Codes: SLL1291, SLL1669, SLL1081, SLL1459, SLL1834

CAS#: 7439-92-1

RTECS: OF7525000

TSCA: TSCA 8(b) inventory: Lead

CI#: Not available.

Synonym: Lead Metal, granular; Lead Metal, foil; Lead Metal, sheet; Lead Metal, shot

Chemical Name: Lead

Chemical Formula: Pb

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Lead	7439-92-1	100

Toxicological Data on Ingredients: Lead LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (permeator).
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance may be toxic to blood, kidneys, central nervous system (CNS).
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

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

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

Serious Skin Contact: Not available.

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

Serious Inhalation: Not available.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Non-flammable in presence of open flames and sparks, of shocks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

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

Special Remarks on Fire Hazards: When heated to decomposition it emits highly toxic fumes of lead.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not

present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

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

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 0.05 (mg/m3) from ACGIH (TLV) [United States]
TWA: 0.05 (mg/m3) from OSHA (PEL) [United States]
TWA: 0.03 (mg/m3) from NIOSH [United States]
TWA: 0.05 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

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

Odor: Not available.

Taste: Not available.

Molecular Weight: 207.21 g/mole

Color: Bluish-white. Silvery. Gray

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

Boiling Point: 1740°C (3164°F)

Melting Point: 327.43°C (621.4°F)

Critical Temperature: Not available.

Specific Gravity: 11.3 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, excess heat

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Can react vigorously with oxidizing materials.
Incompatible with sodium carbide, chlorine trifluoride, trioxane + hydrogen peroxide, ammonium nitrate, sodium azide, disodium acetylide, sodium acetylide, hot concentrated nitric acid, hot concentrated hydrochloric acid, hot concentrated sulfuric acid, zirconium.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC.
May cause damage to the following organs: blood, kidneys, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential:
Skin:
Lead metal granules or dust: May cause skin irritation by mechanical action.
Lead metal foil, shot or sheets: Not likely to cause skin irritation
Eyes:
Lead metal granules or dust: Can irritate eyes by mechanical action.

Lead metal foil, shot or sheets: No hazard. Will not cause eye irritation.
Inhalation:
In an industrial setting, exposure to lead mainly occurs from inhalation of dust or fumes.
Lead dust or fumes: Can irritate the upper respiratory tract (nose, throat) as well as the bronchi and lungsby mechanical action. Lead dust can be absorbed through the respiratory system. However, inhaled lead does not accumulate in the lungs. All of an inhaled dose is eventually abssorbed or transferred to the gastrointestinal tract. Inhalation effects of exposure to fumes or dust of inorganic lead may not develop quickly. Symptoms may include metallic taste, chest pain, decreased physical fitness, fatigue, sleep disturbance, headache, irritability, reduces memory, mood and personality changes, aching bones and muscles, constipation, abdominal pains, decreasing appetite. Inhalation of large amounts may lead to ataxia, deliriuim, convulsions/seizures, coma, and death.
Lead metal foil, shot, or sheets: 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:
Lead metal granules or dust: The symptoms of lead poisoning include abdominal pain or cramps (lead cholic), spasms, nausea, vomiting, headache, muscle weakness, hallucinations, distorted perceptions, "lead line" on the gums, metallic taste, loss of appetite, insomnia, dizziness and other symptoms similar to that of inhalation. Acute poisoning may result in high lead levels in the blood and urine, shock, coma and death in extreme cases.
Lead metal foil, shot or sheets: Not an ingestion hazard for usual industrial handling.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

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

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Lead
California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Lead
California prop. 65: This product contains the following ingredients for which the State of California has found to

cause reproductive harm (male) which would require a warning under the statute: Lead
California prop. 65 (no significant risk level): Lead: 0.0005 mg/day (value)
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: Lead
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: Lead
Connecticut hazardous material survey.: Lead
Illinois toxic substances disclosure to employee act: Lead
Illinois chemical safety act: Lead
New York release reporting list: Lead
Rhode Island RTK hazardous substances: Lead
Pennsylvania RTK: Lead

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

Other Classifications:

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

DSCL (EEC):
R20/22- Harmful by inhalation and if swallowed.
R33- Danger of cumulative effects.
R61- May cause harm to the unborn child.
R62- Possible risk of impaired fertility.
S36/37- Wear suitable protective clothing and gloves.
S44- If you feel unwell, seek medical advice (show the label when possible).
S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

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

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

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

Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:21 PM

Last Updated: 11/06/2008 12:00 PM

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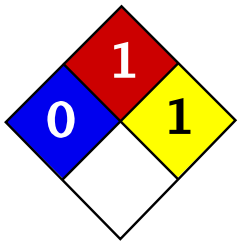

Health	1
Fire	3
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Magnesium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Magnesium

Catalog Codes: SLM4408, SLM2263, SLM3637

CAS#: 7439-95-4

RTECS: OM2100000

TSCA: TSCA 8(b) inventory: Magnesium

CI#: Not applicable.

Synonym: Magnesium ribbons, turnings or sticks

Chemical Name: Magnesium

Chemical Formula: Mg

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Magnesium	7439-95-4	100

Toxicological Data on Ingredients: Magnesium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at

least 15 minutes. Get medical attention if irritation occurs.

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

Serious Skin Contact: Not available.

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

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting 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: 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:
Highly flammable in presence of open flames and sparks, of heat.
Flammable in presence of acids, 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.
Explosive in presence of acids, of moisture.

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:
Magnesium turnings, chips or granules, ribbons, are flammable. They can be easily ignited. They may reignite after fire is extinguished. Produces flammable gases on contact with water and acid. May ignite on contact with water or moist air.
Magnesium fires do not flare up violently unless moisture is present.

Special Remarks on Explosion Hazards: Reacts with acids and water to form hydrogen gas with is highly flammable and eplosive

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Flammable solid.
Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep 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, moisture.

Storage:
Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Moisture sensitive. Dangerous when wet.

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 24.31 g/mole

Color: Silver-white

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

Boiling Point: 1100°C (2012°F)

Melting Point: 651°C (1203.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.74 (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:
Very slightly soluble in hot water.
Insoluble in cold water.
Insoluble in chromium trioxides, and mineral acids, alkalies.
Slightly soluble with decomposition in hot water.
Soluble in concentrated hydrogen fluoride, and ammonium salts.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, incompatible materials, water or moisture, moist air.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Violent chemical reaction with oxidizing agents.
Reacts with water to create hydrogen gas and heat. Must be kept dry.
Reacts with acids to form hydrogen gas which is highly flammable and explosive.
Magnesium forms hazardous or explosive mixtures with aluminum and potassium perchlorate; ammonium nitrate; barium nitrate, barium dioxide and zinc; beryllium oxide; boron phosphodiiodide; bromobenzyl trifluoride; cadmium cyanide; cadmium oxide; calcium carbide; carbonates; carbon tetrachloride; chlorine; chlorine trifluoride; chloroform; cobalt cyanide; copper cyanide; copper sulfate(anhydrous), ammonium nitrate, potassium chlorate and water; cupric oxide; cupric sulfate; fluorine; gold cyanide; hydrogen and calcium carbonate; hydrogen iodide; hydrogen peroxide; iodine; lead cyanide; mercuric oxide; mercury cyanide; methyl chloride; molybdenum trioxide; nickel cyanide; nitric acid; nitrogen dioxide; oxygen (liquid); performic acid; phosphates; potassium chlorate; potassium perchlorate; silver nitrate; silver oxide; sodium perchlorate; sodium peroxide; sodium peroxide and carbon dioxide; stannic oxide; sulfates; trichloroethylene; zinc cyanide; zinc oxide.

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, 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: May cause skin irritation by mechanical action. May get mechanical injury or embedding of chips/particles in skin. The particles that are embedded in the wounds may retard healing.
Eyes: May cause eye irritation by mechanical action. Mechanical injury may occur. Particles or chips may embed in eye and retard healing.
Inhalation: Low hazard for ususal industrial handling. It may cause respiratory tract irritation. However, it is unlikely due to physical form. When Magnesium metal is heated during welding or smelting process, Metal Fume Fever may result from inhalation of magnesium fumes. Metal Fume Fever is a flu-like condition consisting of fever, chills, sweating, aches, pains, cough, weakness, headache, nausea, vomiting, and breathing difficulty. Other symptoms may include metallic taste, increased white blood cell count. There is no permanent ill-effect.
Ingestion: Low hazard for usual industrial handling. There are no known reports of serious industrial poisonings with Magnesium. Ingeston of large amounts of chips, turnings or ribbons may cause gastrointestinal tract irritation with nausea, vomiting, and diarrhea. Acute ingestion may also result in Hypermagnesia. Hypermagnesia may cause hypotension, bradycardia, CNS depression, respiratory depression, and impairment of neuromuscular transmission (hyporeflexia, paralysis).

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: CLASS 4.1: Flammable solid.

Identification: : Magnesium UNNA: 1869 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Magnesium
Rhode Island RTK hazardous substances: Magnesium
Pennsylvania RTK: Magnesium

Massachusetts RTK: Magnesium
Massachusetts spill list: Magnesium
New Jersey: Magnesium
TSCA 8(b) inventory: Magnesium

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

Other Classifications:

WHMIS (Canada):
CLASS B-4: Flammable solid.
CLASS B-6: Reactive and very flammable material.

DSCL (EEC):
R11- Highly flammable.
R15- Contact with water liberates extremely flammable gases.
S7/8- Keep container tightly closed and dry.
S43- In case of fire, use dry chemical. Never use water.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 3

Reactivity: 2

Personal Protection: E

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

Health: 0

Flammability: 1

Reactivity: 1

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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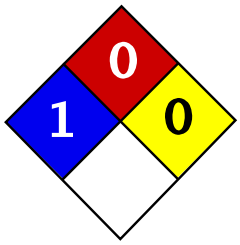

Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Manganese MSDS

Section 1: Chemical Product and Company Identification

Product Name: Manganese

Catalog Codes: SLM2245

CAS#: 7439-96-5

RTECS: OO9275000

TSCA: TSCA 8(b) inventory: Manganese

CI#: Not available.

Synonym:

Chemical Name: Manganese

Chemical Formula: Mn

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Manganese	7439-96-5	100

Toxicological Data on Ingredients: Manganese: ORAL (LD50): Acute: 9000 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance may be toxic to blood, lungs, brain, central nervous system (CNS).
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

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

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

Serious Skin Contact: Not available.

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

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Moderate fire potential, in the form of dust or powder, when exposed to flame.
When manganese if heated in the vapor of phosphorus at a very dull red heat, union occurs with incandescence.
Concentrated nitric acid reacts with powdered manganese with incandescence and explosion.
Powdered manganese ignites in chlorine.

Special Remarks on Explosion Hazards: Moderate explosion potential, in the form of dust or powder, when exposed to flame.

Section 6: Accidental Release Measures

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

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water

on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, reducing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 0.1 (mg/m3) from ACGIH (TLV) [United States]
TWA: 5 (mg/m3) [Canada]
TWA: 1 STEL: 3 (mg/m3) from NIOSH [United States]
TWA: 5 (mg/m3) from OSHA (PEL) [United States]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Odorless.

Taste: Not available.

Molecular Weight: 54.94 g/mole

Color: Grayish white.

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

Boiling Point: 2095°C (3803°F)

Melting Point: 1244°C (2271.2°F)

Critical Temperature: Not available.

Specific Gravity: 7.44 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, reducing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Superficially oxidized on exposure to air.
Reacts with aqueous solutions of sodium or potassium bicarbonate.
Reacts with dilute mineral acids with evolution of hydrogen and formation of divalent manganous salts.
Reacts with fluorine and chlorine to produce di or tri fluoride, and di and tri chloride, respectively.
In the form of powder, it reduces most metallic oxides on heating.
On heating, it reacts directly with carbon, phosphorus, antimony, or arsenic.
Also incompatible with hydroxides, cyanides, carbonates.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 9000 mg/kg [Rat].

Chronic Effects on Humans: May cause damage to the following organs: blood, lungs, brain, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
Manganese can cross the placenta.
May cause cancer (tumorigenic) based on animal data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: May cause skin irritaiton
Eyes: Dust may cause mechanical irritation.

Inhalation: Dust may cause respiratory tract irritation. May cause "Metal Fume Fever" which may include flu-like symptoms (fever, chills, upset stomach, vomiting, weakness, headache, body aches, muscle pains, dry mouth and throat, coughing, tightness of the chest). May affect behavior/Central Nervous system (change in motor activity, torpor, nervousness, tremor, yawning, mood swings, irritability, restlessness, fatigue, headache, apathy, languor, insomnia than somnolence, hallucinations, delusions, uncontrollable laughter followed by crying, compulsions, aggressivness, weakness in legs, memory loss, decreased libido, impotence, salivation, hearing loss, slow gait,), and respiration (dyspnea, shallow respiration, cyanosis, alveolar inflammation).
Ingestion: Repeated or prolonged exposure from ingestion may affect brain (degenerative changes), blood and metabolism.
Ingestion: May cause digestive tract irritation. There is a low gastrointesitnal absorption of manganese.
Chronic Potential Health Effects:
Inhalation: Repeated or prolonged exposure from inhalation may affect brain (degeneratiave changes), behavior/Central Nervous system with symptoms to acute exposure. May also affect liver (chronic liver disease, jaundice)
Ingestion: Repeated or prolonged exposure from ingestion may affect brain, blood and metabolism

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

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

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Illinois toxic substances disclosure to employee act: Manganese
Rhode Island RTK hazardous substances: Manganese
Pennsylvania RTK: Manganese
Minnesota: Manganese
Massachusetts RTK: Manganese
New Jersey: Manganese
New Jersey spill list: Manganese
Louisiana spill reporting: Manganese
California Director's List of Hazardous Substances: Manganese
TSCA 8(b) inventory: Manganese

SARA 313 toxic chemical notification and release reporting: Manganese

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

Other Classifications:

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

DSCL (EEC): Not applicable.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

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

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 11/06/2008 12:00 PM

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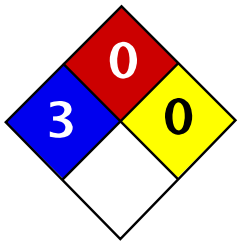

Material Safety Data Sheet
Mercury MSDS

Section 1: Chemical Product and Company Identification

Product Name: Mercury

Catalog Codes: SLM3505, SLM1363

CAS#: 7439-97-6

RTECS: OV4550000

TSCA: TSCA 8(b) inventory: Mercury

CI#: Not applicable.

Synonym: Quick Silver; Colloidal Mercury; Metallic Mercury; Liquid Silver; Hydragyrum

Chemical Name: Mercury

Chemical Formula: Hg

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Mercury	7439-97-6	100

Toxicological Data on Ingredients: Mercury LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Hazardous in case of skin contact (permeator).
CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.
The substance may be toxic to blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS).
Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

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

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

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

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

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

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 applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
When thrown into mercury vapor, boron phosphodiiodide ignites at once.
Flame forms with chlorine jet over mercury surface at 200 deg to 300 deg C.
Mercury undergoes hazardous reactions in the presence of heat and sparks or ignition.

Special Remarks on Explosion Hazards:
A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium.
CHLORINE DIOXIDE & LIQUID HG, WHEN MIXED, EXPLODE VIOLENTLY.
Mercury and Ammonia can produce an explosive compound.
A mixture of the dry carbonyl and oxygen will explode on vigorous shaking with mercury.
Methyl azide in the presence of mercury was shown to be potentially explosive.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Corrosive liquid. Poisonous liquid.
Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 25°C (77°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

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

Exposure Limits:
TWA: 0.025 from ACGIH (TLV) [United States] SKIN
TWA: 0.05 CEIL: 0.1 (mg/m3) from OSHA (PEL) [United States] Inhalation
TWA: 0.025 (mg/m3) [United Kingdom (UK)]
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Heavy liquid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 200.59 g/mole

Color: Silver-white

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

Boiling Point: 356.73°C (674.1°F)

Melting Point: -38.87°C (-38°F)

Critical Temperature: 1462°C (2663.6°F)

Specific Gravity: 13.55 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 6.93 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Ground mixtures of sodium carbide and mercury, aluminum, lead, or iron can react vigorously.
A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium.
Incompatible with boron diiodophosphide; ethylene oxide; metal oxides, metals(aluminum, potassium, lithium, sodium, rubidium); methyl azide; methylsilane, oxygen; oxidants(bromine, peroxyformic acid, chlorine dioxide, nitric acid, tetracarbonynickel, nitromethane, silver perchlorate, chlorates, sulfuric acid, nitrates,); tetracarbonylnickel, oxygen, acetylinic compounds, ammonia, ethylene oxide, methylsiliane, calcium,

Special Remarks on Corrosivity:
The high mobility and tendency to dispersion exhibited by mercury, and the ease with which it forms alloys

(amalga) with many laboratory and electrical contact metals, can cause severe corrosion problems in laboratories.
Special precautions: Mercury can attack copper and copper alloy materials.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC.
May cause damage to the following organs: blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May affect genetic material.
May cause cancer based on animal data.
Passes through the placental barrier in animal.
May cause adverse reproductive effects(paternal effects- spermatogenesis; effects on fertility - fetotoxicity, post-implantation mortality), and birth defects.

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Mercury UNNA: 2809 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Mercury
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: Mercury
Connecticut hazardous material survey.: Mercury
Illinois toxic substances disclosure to employee act: Mercury
Illinois chemical safety act: Mercury
New York acutely hazardous substances: Mercury
Rhode Island RTK hazardous substances: Mercury
Pennsylvania RTK: Mercury
Minnesota: Mercury
Massachusetts RTK: Mercury
New Jersey: Mercury
New Jersey spill list: Mercury
Louisiana spill reporting: Mercury
California Director's List of Hazardous Substances.: Mercury
TSCA 8(b) inventory: Mercury
SARA 313 toxic chemical notification and release reporting: Mercury
CERCLA: Hazardous substances.: Mercury: 1 lbs. (0.4536 kg)

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

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
CLASS E: Corrosive liquid.

DSCL (EEC):
R23- Toxic by inhalation.
R33- Danger of cumulative effects.
R38- Irritating to skin.
R41- Risk of serious damage to eyes.
R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S2- Keep out of the reach of children.
S7- Keep container tightly closed.
S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S39- Wear eye/face protection.
S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S46- If swallowed, seek medical advice immediately and show this container or label.
S60- This material and its container must be disposed of as hazardous waste.

S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

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

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Full suit.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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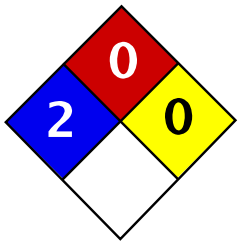

Health	2
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Nickel metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nickel metal

Catalog Codes: SLN2296, SLN1342, SLN1954

CAS#: 7440-02-0

RTECS: QR5950000

TSCA: TSCA 8(b) inventory: Nickel metal

CI#: Not applicable.

Synonym: Nickel Metal shot; Nickel metal foil.

Chemical Name: Nickel

Chemical Formula: Ni

Contact Information:

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

US Sales: **1-800-901-7247**
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1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Nickel metal	7440-02-0	100

Toxicological Data on Ingredients: Nickel metal LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer), of ingestion, of inhalation (lung sensitizer).
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to skin.
The substance may be toxic to kidneys, lungs, liver, upper respiratory tract.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

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

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

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 applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
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: Material in powder form, capable of creating a dust explosion. This material is flammable in powder form only.

Special Remarks on Explosion Hazards:
Material in powder form, capable of creating a dust explosion.
Mixtures containing Potassium Perchlorate with Nickel & Titanium powders & infusorial earth can explode.
Adding 2 or 3 drops of approximately 90% peroxyformic acid to powdered nickel will result in explosion.
Powdered nickel reacts explosively upon contact with fused ammonium nitrate at temperatures below 200 deg. C.

Section 6: Accidental Release Measures

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

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Keep away from incompatibles such as oxidizing agents, combustible materials, metals, acids.

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

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 1 (mg/m3) from ACGIH (TLV) [United States] Inhalation Respirable.
TWA: 0.5 (mg/m3) [United Kingdom (UK)]
TWA: 1 (mg/m3) from OSHA (PEL) [United States] InhalationConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid. Lustrous solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 58.71 g/mole

Color: Silvery.

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

Boiling Point: 2730°C (4946°F)

Melting Point: 1455°C (2651°F)

Critical Temperature: Not available.

Specific Gravity: Density: 8.908 (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.
Insoluble in Ammonia.
Soluble in dilute Nitric Acid.
Slightly soluble in Hydrochloric Acid, Sulfuric Acid.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, combustible materials, metals, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with strong acids, selenium, sulfur, wood and other combustibles, nickel nitrate, aluminum, aluminum trichloride, ethylene, p-dioxan, hydrogen, methanol, non-metals, oxidants, sulfur compounds, aniline, hydrogen sulfide, flammable solvents, hydrazine, and metal powders (especially zinc, aluminum, and magnesium), ammonium nitrate, nitryl fluoride, bromine pentafluoride, potassium perchlorate + titanium powder + indusorial earth.

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:
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP.
Causes damage to the following organs: skin.
May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

Other Toxic Effects on Humans:

Hazardous in case of inhalation.
Slightly hazardous in case of skin contact (irritant, sensitizer), of ingestion.

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose/Conc:
LDL [Rat] - Route: Oral; Dose: 5000 mg/kg
LDL [Guinea Pig] - Route: Oral; Dose: 5000 mg/kg

Special Remarks on Chronic Effects on Humans: May cause cancer based on animal test data

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: Nickel dust and fume can irritate skin.
Eyes: Nickel dust and fume can irritate eyes.
Inhalation: Inhalation of dust or fume may cause respiratory tract irritation with non-productive cough, hoarseness, sore throat, headache, vertigo, weakness, chest pain, followed by delayed effects, including tachypnea, dyspnea, and ARDS. Death due to ARDS has been reported following inhalation of high concentrations of respirable metallic nickel dust. Later effects may include pulmonary edema and fibrosis.
Ingestion: Metallic nickel is generally considered not to be acutely toxic if ingested. Ingestion may cause nausea, vomiting, abdominal , and diarrhea. Nickel may damage the kidneys(proteinuria), and may affect liver function. It may also affect behavior (somnolence), and cardiovascular system (increased cornary artery resistance, decreased myocardial contractility, myocardial damage, regional or general arteriolar or venus dilation).
Chronic Potential Health Effects:
Skin: May cause skin allergy. Nickel and nickel compounds are among the most common sensitizers inducing allergic contact dermatitis.
Inhalation: Chronic inhalation nickel dust or fume can cause chronic hypertrophic rhinitis, sinusitis, nasal polyps, perforation of the nasal septum, chronic pulmonary irritation, fibrosis, pulmonary edema, pulmonary eosinophilia, Pneumoconiosis, allergies (asthma-like allergy), and cancer of the nasal sinus cavities, lungs, and possibly other organs. Future exposures can cause asthma attacks with shortness of breath, wheezing, cough, and/or chest tightness. Chronic inhalation of nickel dust or fume may also affect the liver (impaired liver function tests), and blood (changes in red blood cell count).
Ingestion: Prolonged or repeated ingestion of nickel can be a source chronic urticaria and other signs of allergy. Chronic ingestion of NIckel may also affect respiration and cause pneumoconiosis or fibrosis.
Note: In the general population, sensitization occurs from exposure to nickel-containing coins, jewelry, watches,

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

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

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Nickel metal
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: Nickel metal
Connecticut hazardous material survey.: Nickel metal
Illinois toxic substances disclosure to employee act: Nickel metal
Illinois chemical safety act: Nickel metal
New York release reporting list: Nickel metal
Rhode Island RTK hazardous substances: Nickel metal
Pennsylvania RTK: Nickel metal
Michigan critical material: Nickel metal
Massachusetts RTK: Nickel metal
Massachusetts spill list: Nickel metal
New Jersey: Nickel metal
New Jersey spill list: Nickel metal
Louisiana spill reporting: Nickel metal
California Director's List of Hazardous Substances: Nickel metal
TSCA 8(b) inventory: Nickel metal

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

Other Classifications:

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

DSCL (EEC):
R40- Possible risks of irreversible effects.
R43- May cause sensitization by skin contact.
S22- Do not breathe dust.
S36- Wear suitable protective clothing.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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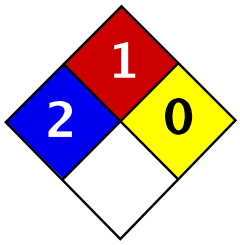

Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Selenium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Selenium

Catalog Codes: SLS2629

CAS#: 7782-49-2

RTECS: VS7700000

TSCA: TSCA 8(b) inventory: Selenium

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: Se

Contact Information:

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Houston, Texas 77396

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

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Selenium	7782-49-2	100

Toxicological Data on Ingredients: Selenium: ORAL (LD50): Acute: 6700 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

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

Special Remarks on Fire Hazards: Material in powder form, capable of creating a dust explosion.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 0.2 (mg/m3)
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Solid metallic powder.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 78.96 g/mole

Color: Not available.

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

Boiling Point: 684.9°C (1264.8°F)

Melting Point: 217°C (422.6°F)

Critical Temperature: Not available.

Specific Gravity: 4.81 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 6700 mg/kg [Rat].

Chronic Effects on Humans: Not available.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in animal. Excreted in maternal milk in human.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Selenium powder : UN2658 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Selenium
Massachusetts RTK: Selenium
TSCA 8(b) inventory: Selenium
SARA 313 toxic chemical notification and release reporting: Selenium
CERCLA: Hazardous substances.: Selenium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).

DSCL (EEC): R36- Irritating to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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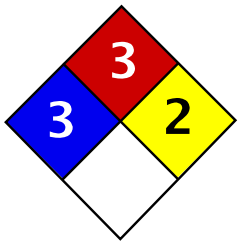

Health	3
Fire	3
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Sodium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium

Catalog Codes: SLS3505

CAS#: 7440-23-5

RTECS: VY0686000

TSCA: TSCA 8(b) inventory: Sodium

CI#: Not applicable.

Synonym: Natrium

Chemical Name: Sodium

Chemical Formula: Na

Contact Information:

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

US Sales: **1-800-901-7247**
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CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium	7440-23-5	100

Toxicological Data on Ingredients: Sodium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant). Hazardous in case of skin contact (permeator), of ingestion, of inhalation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

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

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 115°C (239°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Extremely flammable in presence of moisture.
Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid. Moisture reactive material.
SMALL FIRE: Obtain advice on use of water. Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:

Flammable solid that, in contact with water, emits flammable gases.
Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep under inert atmosphere. Keep container dry. Do not breathe dust. Never add water to this product In case of insufficient ventilation, wear suitable respiratory equipment If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

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

Odor: Not available.

Taste: Not available.

Molecular Weight: 22.99 g/mole

Color: Silvery.

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

Boiling Point: 881.4°C (1618.5°F)

Melting Point: 97.8°C (208°F)

Critical Temperature: Not available.

Specific Gravity: 0.97 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances:
Highly reactive with oxidizing agents, acids, moisture.
The product reacts violently with water to emit flammable but non toxic gases.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans: Not available.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Material is destructive to tissue of the mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.3: Material that emits flammable gases on contact with water.

Identification: : Sodium : UN1428 PG: I

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Sodium
Massachusetts RTK: Sodium
TSCA 8(b) inventory: Sodium
CERCLA: Hazardous substances.: Sodium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

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

DSCL (EEC):
R17- Spontaneously flammable in air.
R38- Irritating to skin.
R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 3

Reactivity: 2

Personal Protection: E

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

Health: 3

Flammability: 3

Reactivity: 2

Specific hazard:

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

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.
-The Sigma-Aldrich Library of Chemical Safety Data, Edition II.
-Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

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