DRUM INVESTIGATION/REMOVAL WORK PLAN

STERLING SITE NO. 3
EAST GREENBUSH, NEW YORK

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1.0 INTRODUCTION

The Sterling Drug Inc. Site 3 (Site) is located in the Town of East Greenbush, Rensselaer County, New York. A Site location plan is shown on Figure 1.1.

The Site occupies approximately seven acres and is located in an agricultural area. The Site is located within the Hudson River Floodplain and is located 2,000 feet east of the river. The Site is bordered to the east by Conrail and to the west by Papscanee Creek. From 1956 to 1977, Sterling disposed of pharmaceutical wastes at the Site including pharmaceutical intermediates, finished pharmaceutical products, research waste, filter cake and solvents. Drums containing waste and waste solvents were also disposed at the Site.

In 1989, Sterling agreed to conduct an Interim Remedial Measure (IRM) at the Site which included the excavation of buried drums and disposal of the contents of the drums and drum remains. During November 1989 to October 1990, approximately 8,500 drums were excavated and removed from the Site from three distinct disposal areas, being the North Area, South Area and Clay Breach Area (CBA) (see Figure 1.2). Waste material contained in the buried drums were bulked according to compatible waste streams, which included motor oil, aqueous waste (i.e., groundwater infiltration into damaged drums), spent organics, and exotic waste (i.e., thionyl chloride). The compatible waste streams were consolidated into overpacks and then characterized for off-site disposal.

During the IRM Drum Removal Program, Sterling was denied access to a portion of the Niagara Mohawk Power Corporation (NIMO) right-of-way in the central area of the landfill where three power transmission poles are located. This land was identified as a Safe Work Zone (SWZ) by NIMO. Figure 1.2 illustrates the NIMO SWZ. NIMO has decided to decommission these transmission poles and relocate new transmission poles outside of the former landfill area.

This Drum Investigation/Removal Work Plan (DIRWP) has been prepared in response to Item 1 of the New York State Department of Environmental Conservation (NYSDEC) letter dated July 21, 1998, and provided in Appendix A, to address locating any buried drums within the former NIMO SWZ. The DIRWP will also address the excavation, removal, and off-Site disposal of any drums and their contents, should drums be found. The DIRWP consists of the following:

- Site Work Plan;
- Sampling and Analysis Plan;

- Quality Assurance Project Plan; and
- Health and Safety Plan.

The general rationale for the work program is to initially conduct investigatory activities via a magnetometer survey and test pit excavations. This will define any areas of the landfill, not previously investigated, that may potentially contain buried drums. Once these areas have been defined, an estimate of the magnitude of the drum excavation program can be made and the excavation can be conducted in a systematic fashion to minimize potential releases to the environment.

1.1 DIRWP ORGANIZATION

The first part of this DIRWP, Sections 2.0 and 3.0, describes the tasks required to delineate areas that contain drums and to identify those areas within the former NIMO SWZ that do not require further investigation. Initial Site preparatory activities including decontamination, drum staging, personnel support and hygiene facilities are described in Section 2.0. Once Site preparatory activities are complete, the buried drum investigation program will be conducted consisting of a geophysical survey and test pit program as described in Section 3.0.

The second part of this DIRWP, Sections 4.0 to 11.0, addresses the removal and disposal of any drums, drum materials and grossly contaminated soil directly associated with the drums. The DIRWP presents the tasks required for drum excavation, staging, sampling, off-Site transportation and disposal. The protocols for handling contaminated soil within the drum excavation areas are also described.

Section 12.0 of the DIRWP presents a contingency plan which describes the necessary measures required to protect human health and the environment in the event of a release of any hazardous materials at or from the Site. Sections 13.0 and 14.0 present the reporting requirements and a tentative project schedule.

The Sampling and Analysis Plan (SAP), included as Appendix B, presents the detailed procedures and methods for the sampling and analysis of soil and drummed materials at the Site. Drummed material sampling and analyses will be conducted to determine compatibility and disposal characteristics of the wastes.

A Quality Assurance Project Plan (QAPP), included as Appendix C, provides the procedures to ensure that the sampling and analyses are conducted in conformance with the NYSDEC Quality Assurance/Quality Control (QA/QC) objectives.

The Health and Safety Plan (HASP), included as Appendix D, provides the minimum safety requirements that will be implemented during the activities conducted under the DIRWP.

The project organization chart is presented on Figure 1.3.

2.0 SITE PREPARATION

Initial Site preparation will include all activities necessary to prepare the Site prior to commencing any tasks under the DIRWP.

2.1 SITE SECURITY

A six foot chain link fence secures the former landfill with a lockable gate across the Site entrance. Access to the Site will be restricted to project personnel and other authorized personnel as necessary.

2.2 CLEARING

The drum investigation will take place after the Niagara Mohawk power pole relocation is complete. If the SWZ is still covered with brush and small trees, the vegetation will be cleared prior to work start up. This will facilitate Site activities such as the geophysical survey, test pits, and drum excavation and handling.

Any cleared vegetation will be chipped and stockpiled on-Site. This material may be used as fill on Site and will remain on the property.

2.3 PERSONNEL SUPPORT AND HYGIENE FACILITIES

The HASP specifies the following personnel support and hygiene facilities to be established at the Site for project startup to include:

- Personnel hygiene facility;
- Emergency medical facility (including emergency shower and eyewash station);
- Lavatory facilities; and
- Separate tanks for potable and waste water.

The on-Site groundwater treatment system (GWTS) is equipped with an emergency shower, eyewash station and washroom and can be used for personnel support and hygiene facilities. A portable shower and eye wash will be maintained at the work area. Potable water and wastewater tanks will be brought in and set-up on Site prior to project startup.

2.4 EQUIPMENT DECONTAMINATION FACILITY

During the initial investigation phase, minimal equipment decontamination will be required. During test pitting, the backhoe bucket will be cleaned between locations, only if it has contacted grossly contaminated waste material. If required, the existing decontamination pad located west of the SWZ and access road (see Figure 1.2) can be used to decontaminate the backhoe bucket and other equipment as required before moving to another test pit location. The integrity of the existing decontamination pad will be inspected and any repairs identified will be completed prior to commencing investigation activities.

At the completion of the project, the backhoe and any other equipment that contacted waste material will be decontaminated at the existing decontamination pad prior to leaving the Site.

"Caution" tape will be utilized to demarcate the limits of the exclusion zone(s) during the test pitting and drum excavation activities.

A pump and hosing will be available to remove decontamination waste waters to the wastewater holding tank on an as-required basis. A high-pressure steam cleaner will be used for decontamination of all equipment prior to leaving the Site regardless of whether or not any drums are found.

2.5 STAGING FACILITY

Prior to commencing the drum excavation activities, two staging facilities will be constructed. One staging facility will include two distinct areas: a drum staging area and a large container (e.g. roll-off) staging area. The second staging facility will be for grossly contaminated soil encountered during the drum excavation program. Typical construction details for the staging areas are presented on Figure 2.1.

The drum staging area will be used for the interim storage of overpacked excavated drums while conducting sampling, compatibility testing and characterization prior to the consolidation of wastes (if any) and off-Site disposal of the drums. The procedure for grounding drums prior to sampling is discussed in Section 3.3.2 of the SAP. The drum staging area may be used for the consolidating of compatible waste streams, or the repackaging of drummed waste. Bulking operations are discussed in Section 5.0. If

incompatible waste streams are determined during waste classification, the drums containing incompatible wastes will be kept separated by a minimum of ten feet and absorbent socks will also be placed within the ten feet separation distance between the incompatible wastes.

The area designated for roll-off staging will be approximately 15 feet wide by 35 feet long and will allow for the staging of a 40-cubic yard roll-off. This area will be expanded as required.

The second staging facility will be used for staging grossly contaminated soils or debris saturated with waste. These materials will be stockpiled on a series of staging pads each typically constructed as shown on Figure 2.1. A 40-mil PVC synthetic liner will be installed under each pad for leak and spill protection. A geotextile filter fabric will be placed over the sand drainage blanket to provide stability and to prevent clogging of the sand. In addition, each pad will be constructed with an integral sump, as shown on Figure 2.1, to allow for the removal of collected waters. The surface of the liner will be sloped, as shown, to direct gravity drainage towards the sump. Liquids collected in the sump will be pumped out as necessary and transferred to the wastewater tank. Sump liquids will be removed on an as-required basis based on visual inspection of the sumps. Soils stockpiled on the staging area will be covered at all times except during sampling activities.

Each soil staging pad will be approximately 16 feet wide by 50 feet long and will allow for the staging of approximately 100 cubic yards of soil. Initially, one staging cell will be constructed. Additional staging pads will be added as required. Soils will be placed on the pads using a front end loader. Since the pads will only be 16 feet wide, the loader will not be required to drive over the pad. The loader will approach and place the soils from the side of the pad.

Space will be provided on the drum staging area for the provision of a 2,000-gallon container for wastewater. Additional capacity will be provided as required.

Both staging facilities (drum/roll-off and soil) will be classified as Exclusion Zones (EZ) with all EZ requirements as presented in the HASP.

The decontamination and staging facilities will be demarcated in the field with caution tape.

2.6 ACCESS ROADS

An access road already exists along the west side of the landfill and as required, may need to be extending into the NIMO SWZ during investigation and excavation activities to allow for vehicle access from the appropriate staging areas to the excavation areas.

3.0 BURIED DRUM INVESTIGATION PROGRAM

3.1 GEOPHYSICAL INVESTIGATION

In order to delineate the possible presence of buried metal drums in the SWZ, CRA proposes to implement the following geophysical field investigation.

A total field magnetic survey will be conducted utilizing a GEM GSM-19 magnetometer or equivalent instrument. A grid consisting of 20-foot spaced survey lines and 20-foot spaced stations will first be established. Total field magnetic readings will then be measured at 10-foot line and station spacings, (i.e. at the node points and also between the node points of the 20 x 20 foot grid). Based on previous magnetometer surveys conducted by CRA, readings at every 10 feet usually have been adequate in delineating individual buried drums and/or clusters of drums.

Repeat readings will be measured hourly at a designated base location in a magnetically quiescent area, away from any source(s) which may cause magnetic interferences. These base station readings shall be used to determine the degree of diurnal drift which may occur during the course of the survey. If necessary, field readings will be corrected for any significant drift (i.e., hundreds of gammas relative to anomalies with intensities between 1,000 to 2,000 gammas above background) observed in the base data. Detailed field notes will be recorded as the survey is being conducted. Specifically, any surficial metallic debris which may exhibit an anomalous response will be identified by visual inspection, and its location will be documented.

The field data will be presented on a contoured plot, with the base corrected data posted at an appropriate scale. Anomalies, (if any), delineated with the magnetic survey, will be identified. A short description of these anomalies including location, magnetic intensity, and source, if possible, will be provided. Any metallic surficial debris which was observed during the course of the survey will also be documented on the final plot.

3.2 TEST PIT/TRENCH INVESTIGATION

It is anticipated that the results of the geophysical survey will identify anomalous areas for further investigation.

Test pits or trenching will be conducted at the Site to further investigate potential buried drums in the landfill. The results of the geophysical survey and any other visual surface evidence will be used to locate trenching areas and test pits that may be required. If the

geophysical investigation is unsuccessful in locating potential buried drums, due to interference from other sources, test trenches will be excavated at 10 foot spacings to investigate the entire SWZ.

The depths of excavation for each test pit/trench will be determined by the Engineer based on the following criteria:

- Depth will not exceed the depth to native soil; and
- Depth will not exceed the depth to the water table.

A detailed field log including photographs will be recorded for each excavation. The type and character of fill (or soil) encountered, the type and characteristics of any refuse, debris or waste material encountered and the depths of any water bearing zones will be noted on each test pit log.

If no magnetic anomalies are found within the landfill, NPEC proposes excavation of one test trench in a central area of the SWZ. This will provide visual verification that no drums are present in the area.

3.2.1 METHODOLOGY/PROCEDURE

Test pits/trenches will be excavated using a track mounted backhoe (or equivalent) with a non-toothed bucket capable of excavating to a depth of 10 feet below the ground surface (BGS). The backhoe operator compartment will be suitably equipped to protect the operator from waste materials or contaminated soil and water.

The side slopes of the test pits/trenches, and hence the bottom width, will be consistent with OSHA standards presented in 29 CFR Part 1926. Excavations will be conducted systematically in 1-foot lifts from existing ground surface to the bottom of the fill materials. Loose soils will require more moderate side slopes in order to reduce sloughing and collapse. Any drums or containers encountered during the course of the test pitting/trenching activities will be removed in accordance with the procedures presented in Section 4.0.

Soils and other debris excavated during the test pitting/trenching activities will be temporarily staged next to the excavation prior to being backfilled into the excavation from where it was generated.

The locations for each test pit/trench will be staked in the field and surveyed upon completion.

3.2.2 DATA REDUCTION/REPORTING

A log of each test pit/trench will be prepared which will include location, a description of the soils encountered, visual signs of contamination, depth of any water bearing zones and any unusual conditions encountered. The test pit will be screened with an organic vapor detector and explosimeter, calibrated daily, as set forth in the HASP. Each test pit will be photographed and/or videotaped to provide a permanent record of the exploration.

The locations of each test pit will be identified by referencing the grid system used for the geophysical survey (and will be surveyed into Site coordinates).

4.0 DRUM EXCAVATION PROGRAM

If drums are identified during the test pitting/trenching program as described in Section 3.2, they will be removed from the excavation in accordance with the following protocols.

4.1 EXCAVATION PROTOCOLS

Excavations to remove buried drums, will be completed using a tracked hydraulic excavator equipped with an earth excavation non-toothed bucket. All excavations will be completed in accordance with OSHA trenching requirements, 29 CFR Part 1926. As each drum area is excavated, any drums or drum parts which are encountered, and any grossly contaminated soil immediately associated with the drums or drum parts will be removed and staged at the staging areas presented in Section 2.5. Grossly contaminated soil is soil and/or debris that is saturated with waste. Identification of grossly contaminated soil will be by visual observation and/or OVA readings ≥100 ppm sustained for 15 seconds. Other soils, refuse or debris will be temporarily staged immediately adjacent to the excavation and backfilled within the specific area of excavation.

All drum removal areas will be plotted to scale on the Site Plan.

A preliminary classification check list will be completed as drummed waste is encountered (see Section 4.2.3) and a drum inventory log (see Section 5.0) will be completed at the staging pad. Soil profile descriptions will be recorded for each excavation area.

Excavated materials will be assigned the following classifications:

- intact drums including contents;
- drum fragments;
- grossly contaminated soils; or
- soils and debris.

It is anticipated that all drum removal activities will be conducted in dry or semi-dry conditions and that buried drums will not have to be removed from below the groundwater table. If small quantities of water enter the excavation from precipitation and/or sidewall seepage, this water will be allowed to infiltrate into the ground.

If there is evidence that buried drums are present below the groundwater table, dewatering will be required prior to removal of the drums. Drum removal activities in these areas would cease until a situation specific dewatering program is developed and approved by the NYSDEC.

In the event that drum failure results in the release of waste into standing water in the excavation, the contaminated water will be pumped from the excavation, containerized, and disposed in accordance with applicable regulations.

4.2 DRUM AND CONTAINERIZED WASTE HANDLING PROTOCOLS

4.2.1 GENERAL

All excavation, waste sampling and container handling activities will be conducted in accordance with the Health and Safety Plan (HASP) presented in Appendix D. All activities will be conducted in accordance with the protocols contained in the Occupational Safety and Health Administration (OSHA) Standard and Regulations contained in Title 29, Code of Federal Regulations, Part 1910 (29 CFR 1910) including the amended Sections in 29 CFR 1910.120, "Final Rule on Hazardous Waste Operations and Emergency Response".

This section applies to all activities involved in the handling of drums or drum parts that may have contained, or do contain, potentially hazardous waste materials in the solid or liquid state. The procedures described within this section specify the minimum requirements that will be implemented to minimize the potential for migration of waste constituents to the surrounding environment, and exposure to the surrounding population.

4.2.2 EQUIPMENT

Safety Equipment

During the handling of drums or containers, safety apparel and equipment as specified in the HASP, will be worn or used at all times. In particular, Level B protection which includes supplied air will be worn at all times while handling drums or containers whose contents are unknown.

Handling Equipment

All handling, moving and transporting of drums will be performed with mechanical equipment whenever possible. Drums shall be moved by grappler, non-metallic slings, within a backhoe bucket or front-end loader or by other means that will minimize damage to drums and release of contents therefrom. Movement or handling by personnel may be required in the event that mechanical means cannot be properly or safely employed due to drum breakage or leakage.

Portions of equipment that contact drums or containers will preferably be constructed of non-ferrous metals. Should steel equipment be used, contact portions will be coated or lined to preclude spark generation in accordance with 29 CFR § 1910.120. Portable pumps, if used, will be intrinsically safe.

Vehicular handling and transport equipment will be equipped with Class ABC fire extinguishers and shall comply with 29 CFR § 1910.157 and self-contained breathing apparatus (SCBA), if deemed necessary by the Site Safety Officer.

The equipment used for the handling and transport of drums or containers will be regularly maintained. A maintenance sheet will be available on Site and completed as required. In particular, the ignition, manifold and exhaust components will be maintained to prevent backfiring or generation of sparks within the exhaust gases.

Prior to removal from the Site, all equipment will be decontaminated as described in Section 7.0 of the Sampling and Analysis Plan (SAP) presented in Appendix B.

4.2.3 DRUM HANDLING

Working Groups

During the excavation of drums, a team of personnel specifically trained in the handling of containerized waste will be designated to perform this task. This team will contain no fewer than two people. During the handling of containerized waste, visual contact will be maintained between members of the working team at all times. All team members will be able to communicate with ease between themselves and will comply with HASP requirements. All communications will be transmitted via hand signals (during activities requiring SCBA) or verbal (during all other activities) in accordance with

29 CFR § 1910.120 with the exception of heavy equipment operations. Heavy equipment operators will be in radio communication with the field crew supervisor.

Point-of-Excavation Handling

As containerized waste is encountered, and prior to physically handling a drum, a preliminary classification check list will be completed. This list will include:

- screening of the container with an explosimeter;
- screening with an organic vapor detector for organic vapors;
- visual description of the drum, container contents and labeling information (if available and legible); and
- condition of the drum or container as it appears in the excavation.

All screening instruments will be calibrated daily. Backup instruments will be provided.

If, during this inspection, an open or leaking drum or container is observed to contain liquids, the liquids will be immediately pumped or bailed into a repack drum prior to removing the drum or container from the excavation. Portable intrinsically safe pumps will be provided for this purpose. If an open drum or container is identified to contain solids, the drum or container will be carefully removed from the excavation. If the container is neither open nor leaking, the container will be carefully removed from the excavation and examined for structural and hydraulic integrity. Drums that cannot be moved without rupture, leakage or spillage will be emptied, into a DOT approved salvage drum using a portable pump (for liquid wastes) or a hand shovel (for sludges). All intact drums with contents will be overpacked into DOT approved 85-gallon salvage drums prior to removal to the appropriate staging facility. Drums shall be removed from the excavation by grappler, non-metallic slings, within the backhoe bucket or by other means that will minimize damage to drums and release of contents therefrom.

Prior to overpacking drums, all identifying markings, words and symbols will be recorded both by photo documentation and notation in a drum log. Free liquids from leaking drums will be collected using an absorbent material, as discussed below.

After overpacking, the drums will be transported to the staging facility with a front-end loader or fork lift configured with a suitable carrying apparatus. All drums will be oriented on the staging facility on pallets to permit sampling of each individual drum for compatibility characterization and disposal parameters. Sufficient area to permit

forklift truck access to the drums will be maintained. All overpacked containers will be opened and sampled at the staging area.

All empty drum carcasses, drum parts, lids, and associated debris will be consolidated adjacent to the excavation in a 40-cubic yard roll-off. Drums containing less than one inch of residue will be considered empty. The site where the roll-offs are placed adjacent to the excavation area(s) will be prepared with a granular base, as required to support the roll-off and heavy equipment operation. Drum parts shall be removed from the excavation by grappler, non-metallic slings, within the backhoe bucket or by other means, and safety protocols under OSHA 29 CFR 1910.120 will be followed.

Prior to consolidating drum parts, all identifying markings, words and symbols will be recorded both by photo documentation and notation in a drum log.

After the roll-off is full, the roll-off will be transported to the appropriate staging facility. Additional roll-offs will be staged on Site for usage if necessary.

4.2.4 GROSSLY CONTAMINATED SOILS

Soil that is grossly contaminated or saturated with potentially hazardous waste will be identified by visual examination and OVA measurements during the excavation of drums. Excavated soils, immediately associated with the drums or drum parts, identified to be grossly contaminated, will be loaded onto on-Site transport units (front end loader) and removed to the designated staging pad (see Section 2.5).

Stockpiled grossly contaminated soils will be covered with an impermeable liner during periods of work stoppage, during precipitation events and at the end of each day. The liner will minimize air release (vapor or particulates) as well as preventing precipitation from contacting the soils. Air monitoring will be conducted for VOC emissions in the vicinity of the stockpile areas on a daily basis during operating days. This frequency may be reduced if air emissions are minimal as expected.

Stockpiled grossly contaminated soils will be subject to waste characterization (see Section 6.0) to determine appropriate treatment/disposal methods. The soils will also be subjected to the appropriate disposal analyses, as specified in the SAP.

Containerized materials encountered during the excavation of the buried wastes will be handled as described, in Section 5.0.

4.2.5 SURFACE WATER RUNOFF

If possible, all excavations will be conducted during dry conditions. Measures will be taken to minimize flow of surface water runoff into excavation areas where it may come in contact with potentially hazardous materials. Berms or diversion channels will be installed, as necessary, to divert flow away from contaminated areas.

5.0 HANDLING AND PACKAGING OF EXCAVATED WASTES

The sampling, handling and packaging of excavated wastes will be performed at the staging facility. All drums will be oriented to permit sampling of each individual drum. Sufficient area to permit forklift truck access to the drums will be maintained. Material handling operations at the staging facility, if not already performed at the point-of-excavation, will consist of:

- assignment of a unique container number to each drum easily visible and labeled both on top and side;
- notation of approximate volume of contents, condition of drum, pertinent labeling information, visual appearance of contents and physical state;
- photographic logging of each intact drum/overpack unit;
- segregating solid and liquid waste drums on the basis of visual observation or, in the event of uncertainty in accordance with the Paint Filter Test;
- collection of representative samples for compatibility testing and waste characterization; and
- consolidation of similar waste streams on the basis of compatibility testing data and placement in compatible groupings at the staging facility pending ultimate disposal. Drums containing compatible materials will be placed in the same row. Drums containing incompatible materials will be separated by a minimum of ten feet. (Note: All drums staged at the facility will be contained within overpacks which are elevated on wooden pallets).

Excavated materials which are removed and placed in the appropriate staging facility will be kept separate according to whether the materials are drummed solid wastes, drummed liquid wastes, bulked drum parts or grossly contaminated soils immediately associated with drums or drum parts. Excavated grossly contaminated soils will be placed on a separate staging pad(s) for temporary storage while awaiting characterization.

Compatible liquid wastes, if consolidated into a bulk container, will be pumped from the drums using a portable pump. In the event that drums, subsequent to pumping liquid wastes, contain excessive sludge/residue, the drums shall be scraped out with a hand shovel.

Drummed wastes which are visually identifiable as solids and solidified sludges may be emptied from the containers and bulked with other compatible dry wastes designated for off-Site disposal.

Drums whose contents were consolidated for bulk transport will not be reused. The drums will be crushed and placed in 40-yard roll-offs for disposal. Overpack drums may be reused on Site.

The handling and packaging of all drums will be conducted in accordance with the requirements of the HASP.

Following waste characterization and consolidation, drum wastes and grossly contaminated soils will be disposed of off Site in accordance with State regulations.

6.0 WASTE SAMPLING

Waste characterization and testing will be conducted as required on excavated containerized liquid and solid waste to determine the appropriate disposal and/or treatment method to ensure compliance with 40 CFR 261 and/or the New York State Codes, Rules and Regulations, 6 NYCRR Part 371. In addition, testing will be conducted to ensure that drummed materials are consolidated in a safe manner for transport and disposal. Waste characterization will also be conducted on excavated grossly contaminated soils.

All sampling and analytical procedures and protocols are presented in the SAP and associated QAPP. The SAP presents NYSDEC-approved methods for sampling and analysis of the various matrices for compatibility, disposal characteristics, Target Compound List (TCL) parameters, Target Analyte List (TAL) parameters and Toxicity Characteristic Leaching Procedure (TCLP) parameters. Table 6.1 presents the analytical requirements for waste characterization.

7.0 ENVIRONMENTAL CONTROL

7.1 SURFACE WATER CONTROL

All excavation, staging and consolidation operations will be carried out under dry conditions to the maximum extent possible. During excavation activities surface water runoff will be prevented from entering excavations using dikes and ditching around the perimeter of the excavation to divert runoff away from the excavation, as necessary. Precipitation which may enter an excavation will be allowed to infiltrate into the ground.

During excavation activities, all provisions necessary to maintain the excavations and the staging pads free from water will be available on Site. The work force will maintain sufficient pumping equipment, machinery and tanks in good working condition for all emergencies, such as power outage.

Grossly contaminated soil will be covered with an impermeable liner during periods of work stoppage including periods of precipitation and at the end of each working day. Any liquids accumulated in the staging pad sumps will be transferred to the wastewater storage tank.

Precipitation will be prevented from contacting consolidated empty drums/drum parts. The roll-off in which the empty drums/drum parts are consolidated, will be equipped with a water-tight lid. The lid will be closed during periods of work stoppage including periods of precipitation and at the end of each working day.

Subsequent to the completion of excavation activities, each excavated area will be backfilled with soil and/or debris and graded to provide sufficient slope to allow surface drainage away from the excavated areas.

7.2 DUST CONTROL

Dust control measures will be implemented as required to prevent the generation of dust during excavation and handling operations. Dust control measures will consist of watering down access roads on Site and/or spraying a fine mist over areas being excavated.

7.3 EROSION AND SEDIMENT CONTROL

Temporary erosion and sediment control measures will be installed prior to the start of drum excavation activities and maintained, as appropriate, until vegetation from Site rehabilitation has been established. The locations for the sediment and erosion controls will be determined in the field prior to excavation.

Sediment and erosion controls will include straw bale dikes and/or silt fences to intercept sediment-laden surface water runoff from the drum excavation areas. Typical construction details for these control measures are presented in Appendix E.

7.4 GENERAL HOUSEKEEPING

Daily accumulations of non-hazardous solid waste material such as discarded safety equipment, debris and rubbish will be collected in garbage bags and disposed of in accordance with State regulations. Refuse removal services are already provided on a regular basis for the GWTS operation for uncontaminated solid waste.

The Site will not be allowed to become littered with general non-hazardous refuse and/or waste materials from the working areas, but will be maintained in a neat and orderly condition throughout the duration of the project.

8.0 SPILL CONTROL AND RESPONSE

8.1 SCOPE

During all active work at the Site involving the transport and handling of excavated drums or other wastes, the Contractor will be required to implement and maintain an on-Site and off-Site Spill Control and Response Plan. This plan, as presented herein, will provide contingency measures for potential releases of material from drummed or other wastes handled on Site.

8.2 MATERIAL HANDLING

Bulked Liquids and Solids

All vehicles provided for the handling of bulked liquids (e.g. wastewater) and solids will be required to be in a good state of repair and will be operated by trained operators in a safe manner to prevent spills during handling. Should any tankers be used for hauling bulked liquids, they must be licensed for that purpose and must be inspected to ensure that all valves, manways and other access ports are secured to prevent leaks. Prior to use, the hauler will be required to document that the tanker is clean. Haulage units used for bulked solids will be inspected to ensure that their tailgates are secured and the loads are tarped to avoid spillage or tracking of excavated material.

Drummed Waste

The handling and transport of drummed waste will be, at all times, conducted in a controlled and safe manner which will minimize damage to structurally sound drums, repacks or overpacks. Section 4.2 addresses drum handling procedures and equipment to be used which provides protection for the handling of explosive and/or shock sensitive waste.

Extreme care will be exercised in opening drums or other sealed containers in which the contents may be harmful to sampling personnel. When practical, a drum will not be moved or opened unless the drum appears to be structurally sound.

Drums will be opened in such a manner that excess interior pressure, as evidenced by bulging or swelling, has been safely relieved. If pressure cannot be relieved from a remote location, appropriate shielding will be placed between sampling personnel and the drums to reduce the risks of injury.

Prior to transferring drums to the appropriate staging facility all drums will be overpacked into DOT approved 85-gallon salvage drums. All drums that cannot be moved without rupture, leakage or spillage will be emptied into a DOT approved 85-gallon salvage drum using a portable pump (for liquid wastes) or a hand shovel (for solids and sludges). Drums shall be moved by grappler, non-metallic slings, within a backhoe bucket or front-end loader or by other means that will minimize damage to containers and release of contents therefrom. A minimum inventory of two additional overpack units, in addition to those required to overpack the drums, will be provided on Site adjacent to the staging area and each active excavation area.

Equipment

The following equipment will be available on Site and used for any unexpected spills:

- sand, fill or other non-combustible absorbent;
- 85-gallon DOT approved overpack drums (two adjacent to staging area and each active excavation area);
- front end loader and/or backhoe; and
- shovels.

Hand tools which are used will generally be discarded with the waste material unless it is determined appropriate to decontaminate the tools. If tools are decontaminated, they will receive a detergent wash in addition to steam cleaning or hot water washing.

8.3 SPILL PREVENTION AND RESPONSE

The handling and transport of drummed waste will be, at all times, conducted in a controlled and safe manner which will minimize damage to the containers and prevent release of the contents. All intact drums with contents will be overpacked prior to removal to the appropriate staging facility, thereby mitigating the potential of leakage during movement to the staging facility. Additional overpack units will be provided at the excavation area for use in the event of leakage or spillage.

In the event that a drum or container of liquid is spilled outside of the excavation areas, the drum handling team will immediately respond to the spill. The spilled liquids will be confined to the immediate area of the spill and the liquids will be pumped, with the use of a portable pump, into a repack drum. The spilled liquids will be confined by

diking around the spill with native material or with an inert absorbent. Any residual liquids which cannot be pumped will be absorbed with a sufficient quantity of inert absorbent to ensure that no free liquids remain. If the spill occurred on soil, the visibly affected soil will be treated as contaminated material based on a visual determination of spill contamination. This material will be considered grossly contaminated soil and will be staged accordingly. Spills that occur outside of an area of excavation will be marked and reported to the NYSDEC.

Liquids spilled within excavations will be pumped, with the use of a portable hand pump, into a repack drum. Soil/fill adjacent to the spill area will be placed to absorb any residual liquid. Materials underlying the spill zone will be treated as contaminated materials based on a visual determination of spill contamination. This material will be excavated and staged in the stockpile of grossly contaminated soils, as discussed in Section 4.2.4.

In the event that a spill comes into contact with standing water, the effected water will be pumped from the excavation, containerized, and disposed/treated in accordance with applicable regulations. Absorbent material will be available during excavation of buried drums and handling of waste for use in the event of a liquid spill.

9.0 OFF-SITE DISPOSAL

Approved Disposal Facilities

NYSDEC will be provided advance notification of the off-Site facilities that have been selected for the treatment or disposal, as appropriate, of drummed or bulk wastes, and the disposal of wastewaters. All facilities identified for hazardous waste disposal will be RCRA compliant and/or TSCA compliant, as applicable, and will comply with the requirements specified hereafter. Completed waste profiles and the supporting analytical data will be provided to NYSDEC for review a minimum of 5 business days prior to the shipment of waste from the Site.

All waste disposal will be at NPEC approved facilities. All waste profile and/or classification documents will be approved and signed by authorized NPEC personnel.

Any wastes excavated, which are staged and deemed to be non-hazardous as determined by the waste characterization study, will be transported to a sanitary landfill for disposal. Non-hazardous wastewaters will be treated on Site using the existing groundwater treatment system.

Letter of Agreement

Each designated disposal facility will provide a letter of agreement. This agreement will specify the total estimated quantities of wastes and the intended method of disposal for each waste stream. Each Letter of Agreement will provide the facility name and NYSDEC Identification number, facility locations, name of responsible contact for facility, telephone number for the contact, signed letter of agreement to accept wastes as specified, the unit of measure utilized at the facility for costing purposes, waste characterization requirements and expected schedule for shipment. A copy of all Letters of Agreement will be provided to the NYSDEC, if shipped to a facility outside the State of New York, a minimum of five (5) business days prior to shipment of the waste.

10.0 OFF-SITE WASTE TRANSPORTATION

10.1 PREPARATION OF OFF-SITE TRANSPORT VEHICLES

All off-Site transport vehicles will be prepared as appropriate prior to receiving drummed or bulk waste. Drummed wastes will be loaded and secured in a manner which will prevent damage to the containerized materials and meets all applicable DOT transport requirements.

A weatherproof tarp will be provided and secured over each shipment leaving the Site. Exception will only be made for enclosed transport units.

Following tarping, each transport vehicle will be decontaminated to ensure that no loose soil, sludge or other material is tracked off Site. Particular attention will be paid to removing materials from tires, undercarriages, and portions of vehicles which may have been in contact with waste materials during loading operations. Transport drivers will remain in their vehicle cabs while they are in the Contaminant Reduction Zone and the Exclusion Zone as specified in the HASP.

10.2 OFF-SITE WASTE TRANSPORTATION AND DISPOSAL

10.2.1 MANIFESTING AND LABELING

All excavated drums, overpacks and bulk transport units designated for off-Site disposal will be labeled and manifested (if RCRA hazardous) prior to leaving the Site for off-Site disposal facilities. The analytical results obtained in accordance with Section 5.0 will be used for manifesting purposes and for determining the necessary placarding of vehicles. The manifest forms and records will be consistent with 40 CFR Part 262 "Standards Applicable to Generators of Hazardous Waste", 40 CFR Part 263 "Standards Applicable to Transporters of Hazardous Waste", and 6 NYCRR Part 372 "Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities".

A NYSDEC hazardous waste generator number, obtained prior to shipping wastes off Site, will be used on all manifests. All waste leaving the Site will be weighed upon arrival at the disposal/treatment facility.

10.2.2 AUTHORIZED TRANSPORTERS

Only transporters which are licensed by EPA, DOT and the State of New York will be used for the transport of any hazardous materials. Transporters will be in compliance with applicable state and federal hazardous waste transportation requirements (i.e., 40 CFR Part 263 and 6 NYCRR Part 364). If drums or bulk wastes are scheduled for facilities outside of the State of New York, transporters will be required to be licensed in the appropriate State(s) as well as comply with other applicable Federal laws including DOT requirements.

If wastes are deemed to be non-hazardous (based upon receipt and review of supporting analytical data) then transporters will be licensed for general transportation of sanitary wastes or as required by New York for the transport of Special Waste. These wastes will be disposed of in an appropriate sanitary landfill. This determination will be made in accordance to the results from the waste characterization.

10.2.3 TRANSPORTATION ROUTES

All transportation routes to off-Site facilities will be predetermined prior to commencing off-Site transport of waste materials. A primary and secondary route to each facility will be identified. The secondary route will be used only if the primary route becomes impossible due to weather and road conditions or blockage from traffic accidents. The appropriate State and interstate officials will be consulted as to whether any proposed routes are scheduled for construction or seasonal closures which will occur during implementation of this project.

All applicable DOT requirements will be complied with during transportation (i.e. 24-hour notification hotline).

11.0 PROJECT CLOSEOUT

11.1 GENERAL

All closeout activities will be coordinated and performed in such a manner that no waste materials scheduled for off-Site disposal or mobilized facilities remain at the Site upon completion of this program. Constructed facilities (i.e., decontamination facility, staging facility, snow fence) will be removed if it is determined that they will not be utilized for further activities at the Site.

As discussed in Section 4.0, all excavations will be backfilled and regraded at the completion of the excavation activities.

11.2 EXCLUSION ZONE SURFICIAL CLEANUP

It is anticipated that the tracking of waste materials will be minimal due to the use of the vehicle decontamination station and access roads. If necessary, surficial cleanup of roadways will be performed after all excavated waste drums have been removed from the excavations. Visibly contaminated soils will be placed with the stockpiled soil for characterization/disposal.

11.3 FINAL EQUIPMENT DECONTAMINATION

A final decontamination of all equipment will be performed on the equipment decontamination pad. Decontamination of equipment will consist of wire brushing to remove loose dirt and debris and adhered residues, water rinsing using a solution of water and Alconox, and a final water rinse with a high pressure low volume steam cleaning unit. Particular attention will be paid to joints, sprockets, and undercarriages. The Engineer will inspect each piece of equipment and may require additional cleaning, as deemed necessary, prior to removal from the Site. This inspection will be recorded by the Engineer in the Site log. The Site Safety Officer is ultimately responsible for ensuring that the equipment has been sufficiently decontaminated prior to leaving the Site.

11.4 STORED WASTEWATER REMOVAL

The stored wastewaters will be transported and treated at the on-Site groundwater treatment system. Following emptying of the wastewater tank, the tank interior will be

decontaminated with a high-pressure water wash supplemented by detergent (Alconox or Liquinox). Any decontamination wastewater generated will be collected and discharged to the on-Site groundwater treatment system.

11.5 FINAL CLEANUP

Final cleanup will involve cleaning the Site of litter and trash resulting from the work and leaving the Site in a neat and orderly condition. Litter and trash resulting from the work will be disposed of at a local sanitary landfill.

12.0 CONTINGENCY PLAN

The following contingency measures will be implemented to provide the necessary protection to human health and the environment in the event of a release of any hazardous materials at or from the Site. Activities that could potentially result in the release of hazardous materials include the test pit program; drum excavation, handling, staging, sampling, transportation and disposal.

12.1 ON-SITE CONTINGENCY PLAN

If release of hazardous material occurs on Site, the protocols presented in Section 10.0 of the HASP will be followed and the individual that observes the release will immediately:

- notify the Site Safety Officer, NPEC Project Manager, and CRA Project Manager;
- take immediate action to control and contain the release;
- keep unnecessary personnel away, isolate the area of release, and deny entry;
- do not allow anyone to touch released material;
- stay upwind; keep out of low areas; and
- keep combustibles away from the released material.

If human health or the environment are threatened, the Engineer will notify the National Response Center (NRC) (800) 438-2427, the State Emergency Response Commission (SERC) (518-457-4107), and any potentially affected residents or establishments as soon as possible. The SERC and the NRC will be notified of any release of reportable quantities including all releases which threaten human health or the environment. The NYSDEC will be notified of all releases within 24 hours and will determine if releases other than those noted above require notification to the NRC.

An employee alarm system to signify a major release or an emergency will consist of three short blasts using an air horn. An air horn will always be maintained at the Site during active work hours and will be immediately available to all personnel involved in Site activities.

Upon implementing the above procedures, the immediate areas of the release, including downwind areas, will be scanned with the organic vapor detector to identify the level of protection required for personnel safety equipment to clean up the released material. As

a minimum, personnel will wear all protective clothing specified in the HASP including supplied air respiratory protection, as required. Air monitoring will determine if the level of respiratory protection can be downgraded. The air monitoring action levels as presented in the HASP will be followed during any clean-up of a release.

Should releases occur from drums containing solid wastes, the released material will be placed into containers and covered. Each container will be labeled as to contents.

Liquid and/or sludge spills will be first covered with an absorbent to absorb any free liquids to minimize the amount that may infiltrate into the ground. The absorbent material and soils contacted by the spill will be excavated and placed in containers. These containers will be labeled to indicate contents.

An assessment will then be made to determine the need to conduct post-clean-up soil sampling and analysis. NYSDEC will be provided with a copy of the assessment report. Collected samples will be analyzed for the waste constituents previously identified on Site. If analytical data are available for the released materials, these data will be used to determine the analytes of concern.

A release report will be prepared by NPEC and submitted to the NYSDEC, summarizing the release and response action.

12.2 OFF-SITE CONTINGENCY PLAN

Only authorized transporters, as discussed in Section 10.2.2, will be used for the transportation of hazardous waste. If a release of material from a transport vehicle occurs while in transit, the following actions will be taken by the transport operator to reduce potential migration of the waste material.

- Immediately notify the Contractor, who will in turn notify the NPEC Project Manager (Mr. Clyde Siverd (716) 477-1162), the CRA Project Manager (Mr. Jamie Puskas (519) 884-0510), and the NYSDEC On-Site Coordinator (OSC). In the event of a release of a reportable quantity, the NRC ((800) 438-2427) will also be notified;
- Take immediate measures within the capabilities of the transport driver to control the release, if necessary;
- Contain and eliminate the release, if possible;

- The driver must remain within a safe distance of the vehicle, and will keep unnecessary people away, isolate the area of the release and deny entry to unauthorized personnel;
- Stay upwind, keeping out of low areas, and do not allow contact with the released material;
- Contact the appropriate local authorities (police, fire department, traffic control, etc.) and local hazardous materials response unit; and,
- Other actions, as advised by the local spill response authorities.

Upon implementing these procedures, the same action to clean up the release will be implemented as described in Section 8.0.

13.0 REPORTING

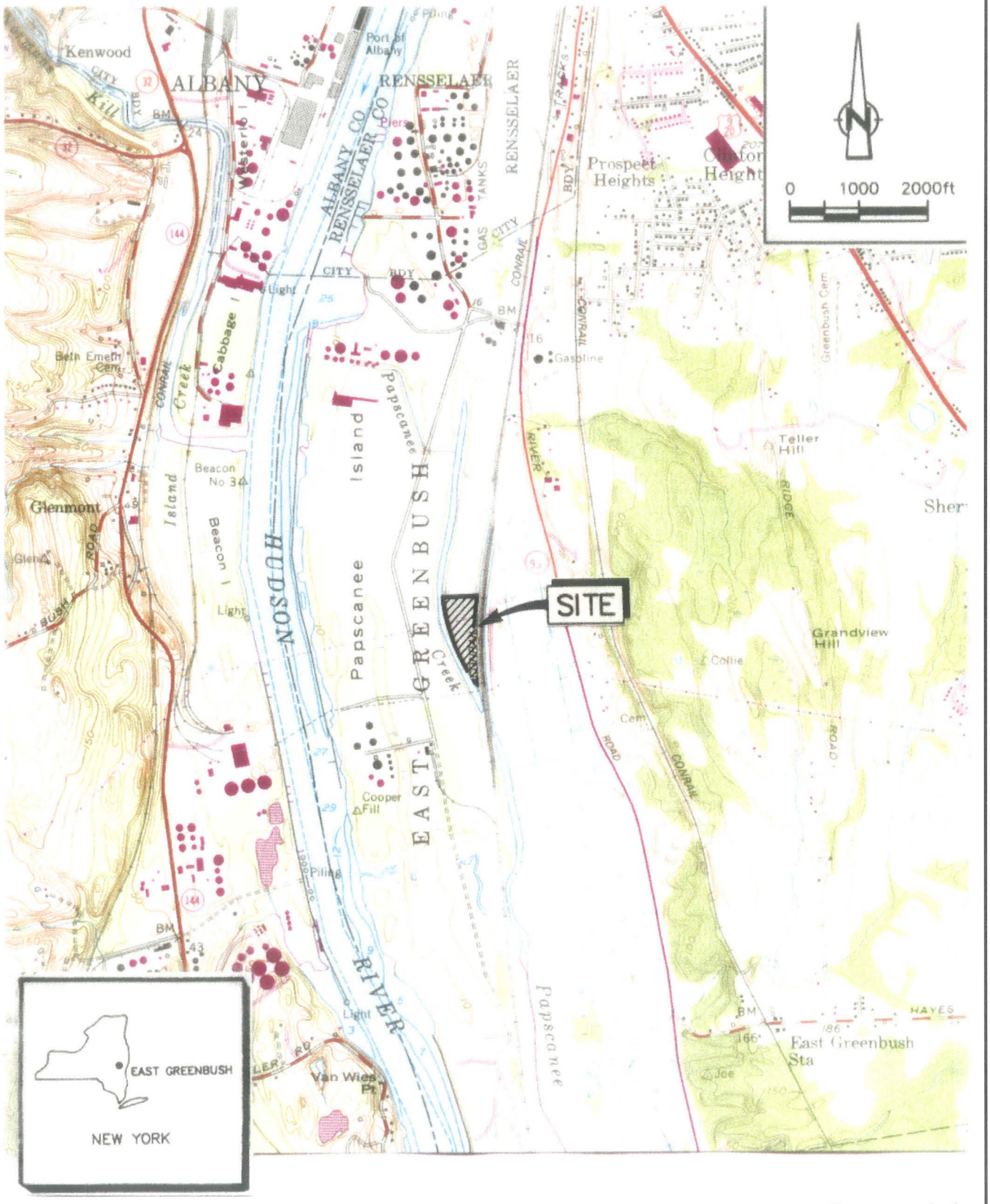
Following the completion of all activities presented in the DIRWP a report entitled "Drum Investigation/Removal Report" will be submitted to the NYSDEC. The Drum Investigation/Removal Report will present the results of the work tasks identified in the DIRWP and will include the following:

- synopsis of all work performed;
- identification and detailed description of all NYSDEC-approved modifications to the DIRWP which occurred during performance of the work;
- results of all sampling and analysis including QA/QC data and chain-of-custody records;
- a list of all laboratories, transporters, and disposal or recycling facilities utilized during the program;
- copies of all manifests and bills of lading generated in connection with the transport of materials off Site;
- copies of all "certificates of destruction" of all hazardous materials which are disposed and/or treated off-Site;
- copies of all photographs;
- copies of all explosimeter and OVA logs; and
- copies of all daily field notes.

In addition to the Drum Investigation/Removal Report, progress on this project will be reported along with the progress summarized for the GWTS and vacuum extraction system weekly activity report submitted to the NYSDEC.

14.0 PROJECT SCHEDULE

The proposed DIRWP activities are tentatively scheduled for July 1999 during dry weather conditions and will be coordinated with NIMO during the decommissioning of the existing transmission poles in the former SWZ. The NYSDEC will be advised of any modifications or updates to the project in the weekly progress reports.



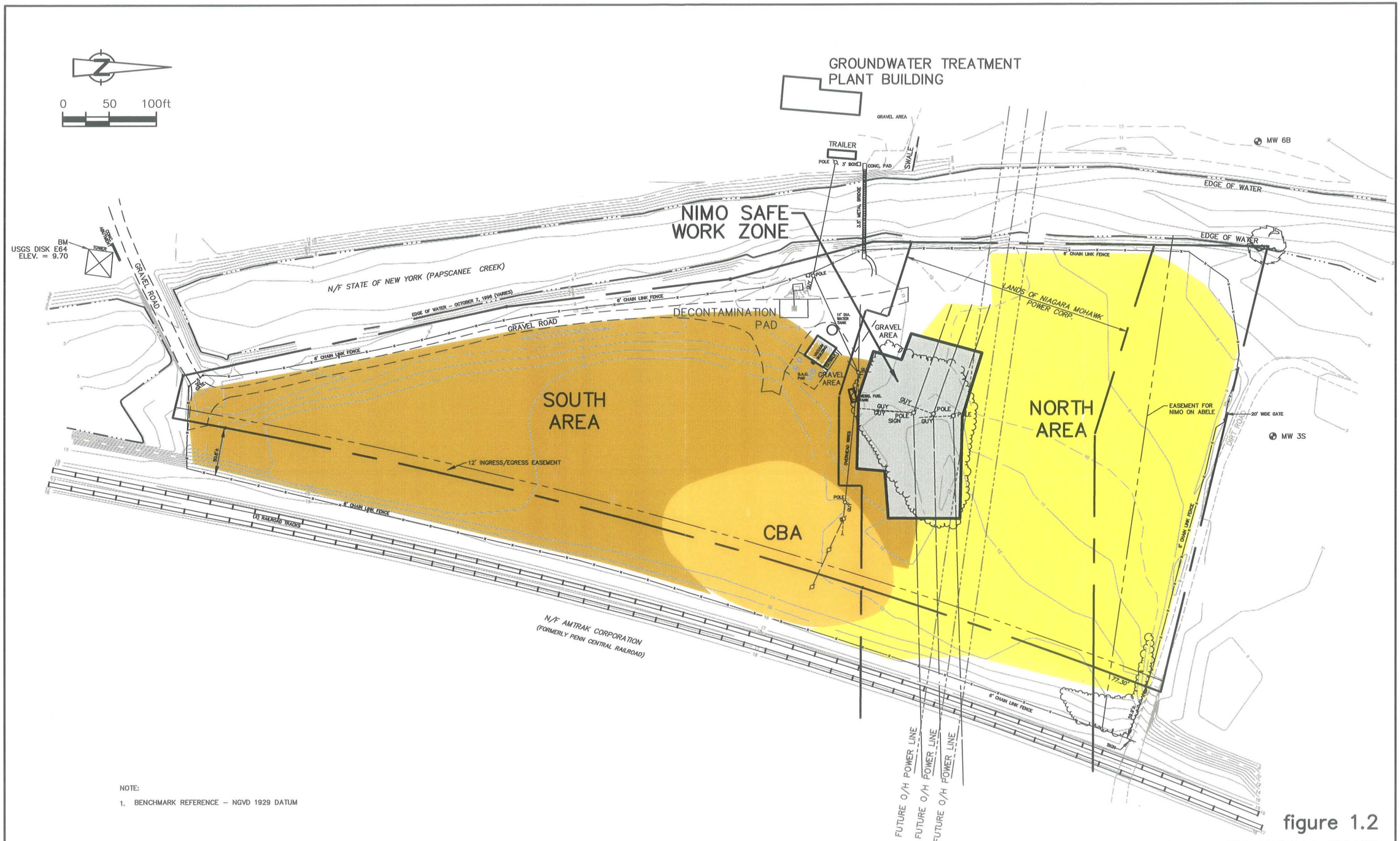
SOURCE:
U.S.G.S. TOPOGRAPHIC MAP QUADRANGLE
DELMAR AND EAST GREENBUSH, N.Y.

figure 1.1

SITE LOCATION
STERLING SITE 3
East Greenbush, New York

CRA

07830-90(021)GN-WA001 JUL 22/99



NOTE:

1. BENCHMARK REFERENCE – NGVD 1929 DATUM

figure 1.2

NIMO SAFE WORK ZONE
STERLING SITE 3
East Greenbush, New York

CRA

07830-90(021)GN-WA006 JUL 22/99

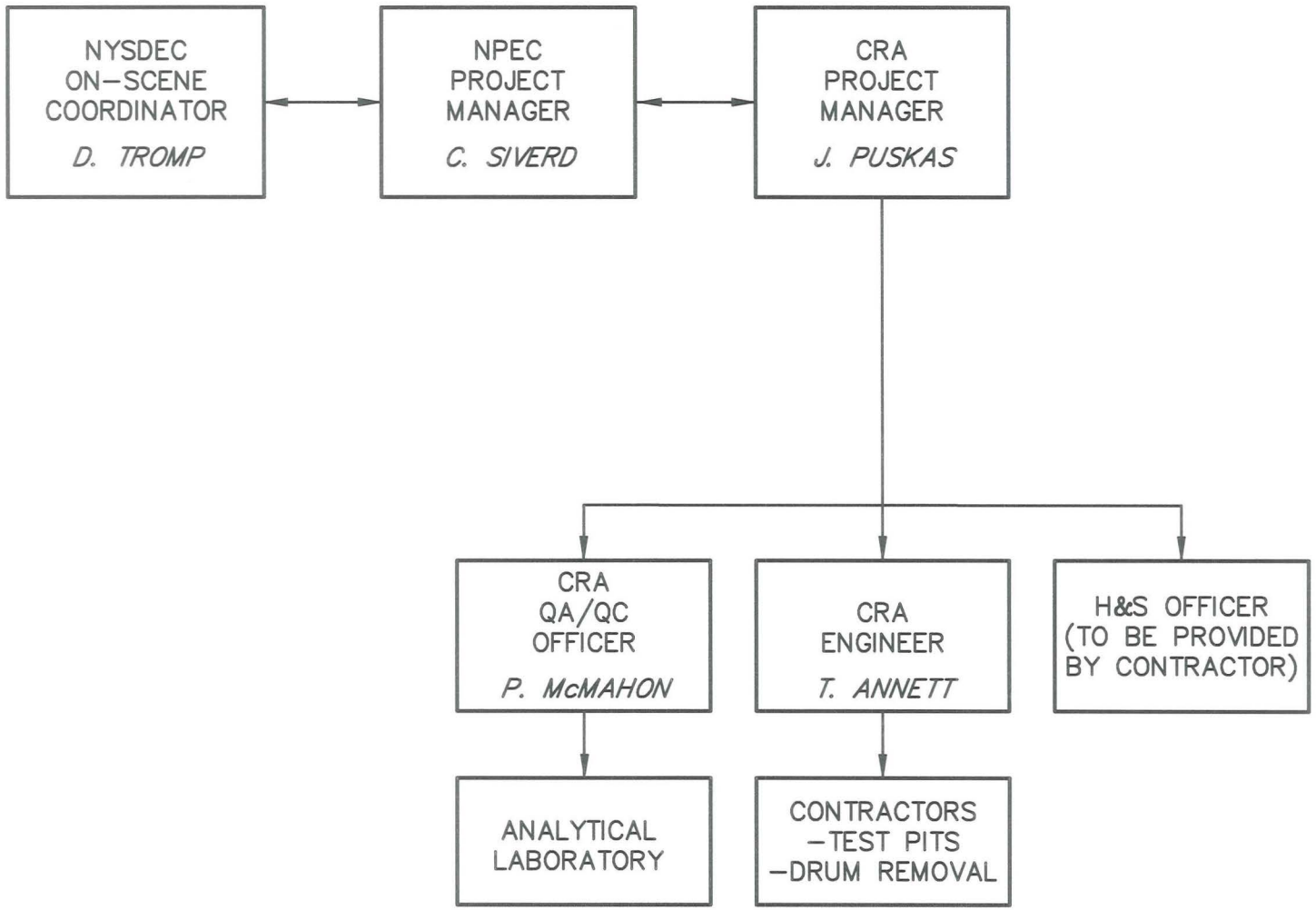
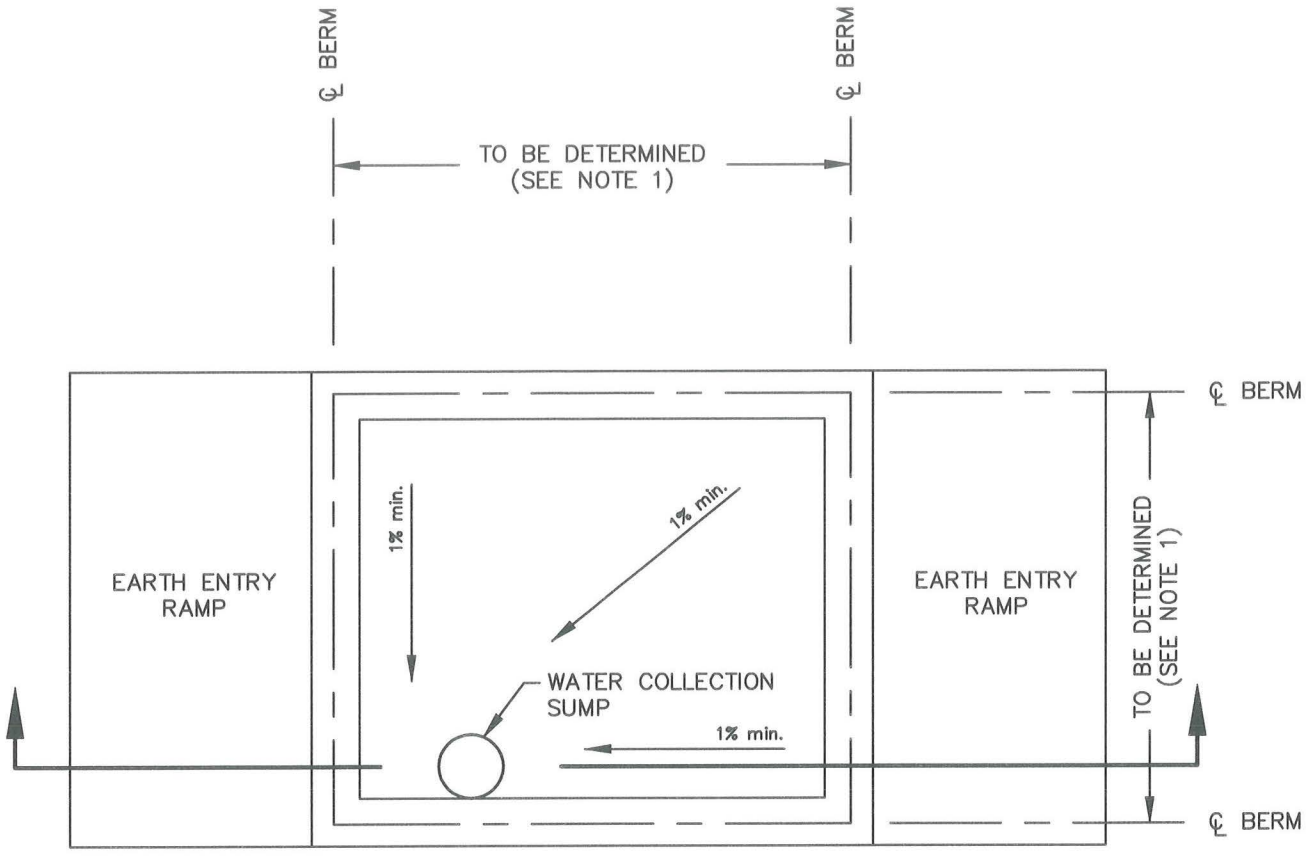


figure 1.3

PROJECT ORGANIZATION
STERLING SITE 3
East Greenbush, New York

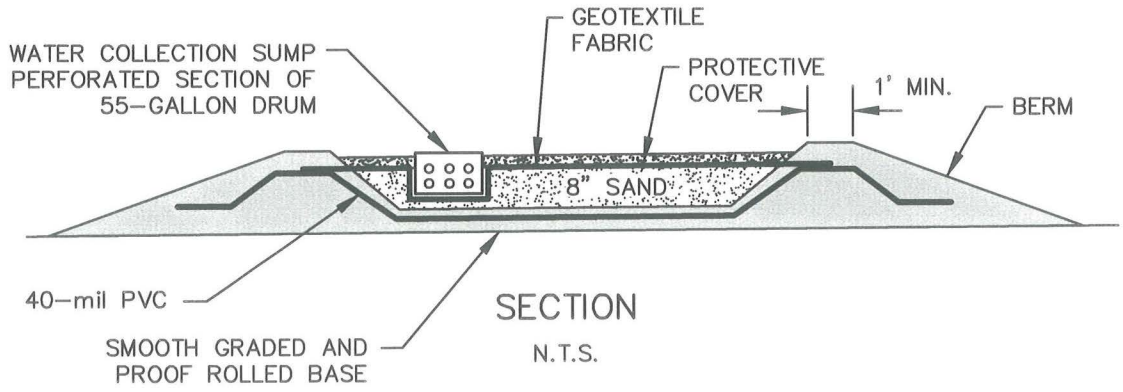
CRA

07830–90(021)GN–WA002 JUL 22/99



PLAN VIEW

N.T.S.



SECTION

N.T.S.

NOTE:
THE FINAL DIMENSIONS OF THE STAGING PAD ARE DEPENDENT ON THE NUMBER OF DRUMS TO BE STAGED.

figure 2.1

TYPICAL STAGING PAD
STERLING SITE 3
East Greenbush, New York

CRA

TABLE 6.1

WASTE CHARACTERIZATION ANALYSIS
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

Physical Characteristics	
Physical State	Sample inspection
Free Liquids	Sample inspection/Paint filter test (SW-846, Method 9095)
Specific Gravity	Volume and weight measurement
Solids	ASTM-D-3977-80
Ash Content	ASTM E-830-87
BTU	ASTM E-711-87
TOC	EPA SW-846, Method 9060
Total Organic Halides	EPA SW-846, Method 9020
Compatibility Testing	As described in Attachment A of Appendix C
Chemical Composition	
Metals	EPA SW-846, Method 6010/7000 series for TAL (2) metals
Cyanide	EPA SW-846, Methods 9010/9012
Organic	
TCL (3)	
Volatiles	EPA SW-846, Method 8260
Organochlorine Pesticides and PCBs	EPA SW-846, Methods 8081/8082
TCL Semi-volatiles	EPA SW-846, Method 8270
Other Components (General Chemistry)	
Sulfides	EPA SW-846, Method 9030
Phenols	EPA SW-846, Method 8041
Sulfur	ASTM E-775-87
Chlorine	ASTM E-776-87
Hazardous Characteristics	
Reactivity	EPA SW-846, Section 7.3, Chapter 7
Corrosivity/pH	EPA SW-846, Methods 9040/9045
TCLP	40 CFR Part 268, Appendix II
Ignitability	EPA SW-846, Method 1010

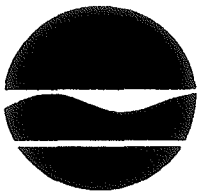
Notes:

(1) EPA SW-846, Test Methods for Evaluating Solid Waste, Third Edition, 1986 and subsequent revisions.
(2) TAL = Target Analyte List
(3) TCL = Target Compound List
(4) ASTM - "Annual Book of ASTM Standards", American Society for Testing and Materials, 1991.

APPENDIX A

NYSDEC JULY 21, 1998 LETTER

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233-7010



John P. Cahill
Commissioner

July 21, 1998

Rec'd ORA
JUL 28 1998

Ms. Judith E. Ausmus
Director of Operations
360 North Pastoria Environmental Corporation
3400 Ridge Road West, Suite 5-341
Rochester, NY 14626

Dear Ms. Ausmus:

Re: Sterling Site 3
Site No. 442011

NYSDEC has reviewed your letter dated April 27, 1998 summarizing responses to the Department's comments on the preliminary cap design. As discussed with Walter Van Veen of Conestoga-Rovers & Associates, and with yourself, NYSDEC has the following concerns remaining to be addressed in the final design:

1. Regarding test trenching protocol (Response 6): NYSDEC agrees waste in general (trash and debris) may be left on site. Our intended focus in this comment is any drums encountered. We are concerned in particular with the area surrounding the power transmission poles to be removed or cut off and left in place: we understand Sterling to have been denied access to this approximately 50-foot radial limit during the 1990 drum removal. A drum investigation at that location, and if necessary, removal, must be conducted prior to cap construction.

2. Response 9: The version of 6NYCRR Part 360 effective December 31, 1988 should not be designated as applicable for this design. As discussed in my January 15, 1997 to you, neither the 1988 nor 1993 version of Part 360 is applicable due to the closure date of the Site 3 landfill. It is recommended to state in the design report that the 1993 Part 360 regulations have been consulted for guidance together with current landfill design practices.

3. Response 13: The proposed limit of two inches for particles beneath the hydraulic barrier may be acceptable with proper subgrade preparation; however, NYSDEC expects that manufacturer's recommendation of subgrade specifications will be followed for any specific hydraulic barrier. Many manufacturers we encounter recommend smaller particle sizes because of the vulnerability of their liner materials to puncture.

As discussed with you last week, NYSDEC is continuing to review the revised justification for omission of flood controls, and is preparing an Explanation of Significant Difference from the 1992 Record of Decision. We are also in receipt of your June 10, 1998 letter concerning removal of secondary VE system carbon units from the site, and concur in this action. Feel free to call me at (518) 457-5637 if you have any questions.

Sincerely,

Kathleen A. McCue, P.E.
Project Manager
Division of Environmental Remediation

cc: J. Gabriel, NPEC
E. Stern, Eastman Kodak
J. Puskas, CRA

APPENDIX B

SAMPLING AND ANALYSIS PLAN

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1.0 INTRODUCTION

This report presents the Sampling and Analysis Plan (SAP) for the Drum Investigation/Removal Work Plan (DIRWP) for Sterling Site 3 (Site), located in East Greenbush, New York. The SAP contains the sampling and analytical protocols required for characterizing containerized liquid and solid waste and grossly contaminated soil or debris for disposal purposes.

The DIRWP activities are to be conducted in the area of the former Niagara Mohawk Power Corporation (NIMO) Safe Work Zone (SWZ). This area is presented on Figure 1.2 of the DIRWP.

The DIRWP activities, including sampling and analysis, are tentatively scheduled for July 1999 and will be coordinated with NIMO's decommissioning of the existing transmission poles in the former NIMO SWZ.

2.0 GENERAL SAMPLING PROTOCOLS

The following protocols will be employed during all sampling throughout this program:

All sampling instruments and equipment will be cleaned in accordance with the protocols presented in Section 7.0 prior to sampling at each location.

A new pair of disposable latex gloves will be used at each location to be sampled for chemical analyses. Additional glove changes will be undertaken as conditions warrant.

All sampling generated wastes such as gloves, tyveks, etc. will be collected and contained for proper disposal.

Samples will be labeled noting the location and/or interval, date, time and sampler's initials. A hard cover bound field book will be maintained to record all samples and sampling events.

All collected samples will be iced in laboratory supplied coolers after collection and labeling. Any remaining space will be filled with packing to cushion the containers within the shipment coolers. Each cooler will be sealed with a transportation security seal containing the sampler's initials. The cooler will then be sealed with packing tape. All samples will be delivered to the laboratory by commercial courier or Contractor personnel, within 48 hours following sample collection.

Samples will remain under the control of the Engineer until relinquished to the laboratory or commercial courier under a chain-of-custody (see Section 6.3 of the QAPP, Appendix C).

Additional protocols specific to each sampling method are presented in the following sections.

3.0 WASTE SAMPLING

3.1 GENERAL

Waste characterization and testing will be conducted as required on excavated containerized liquid and solid wastes to determine the appropriate disposal mode and ensure compliance with 40 CFR 261 and/or the New York State Codes, Rules and Regulations, 6 NYCRR Part 371. In addition, testing will be conducted to ensure that drummed materials are consolidated in a safe manner for transport and disposal. Waste characterization will also be conducted on excavated grossly contaminated soils.

The following subsections describe the procedures which will be implemented for sampling drummed liquid wastes, drummed solid wastes, and bulk soils for compatibility and/or characterization purposes.

3.2 WET WASTES/DRY WASTES SEGREGATION

Waste materials will be segregated as wet wastes or dry wastes when the drums are opened on the staging pad. Materials for which classification as a wet or dry waste is not readily apparent will be classified using the Paint Filter Test (Method 9095). The results of the test will govern disposal classification. In accordance with 40 CFR Part 264 - Subpart N - Landfills, materials passing the Paint Filter Test may be disposed of as a solid waste. Materials failing the Paint Filter Test will be considered liquid wastes and will be disposed at an appropriate off-Site RCRA or TSCA compliant facility if found to be hazardous (based upon waste characterization testing).

3.3 SAMPLE COLLECTION PROTOCOLS

3.3.1 SAMPLING OF SOIL

Sampling of the bulk grossly contaminated soil will be conducted at the staging area for the waste materials. Composite samples will be collected which are representative of the staged materials. All soil samples will be analyzed for TCL, TAL, and TCLP parameters and cyanide in accordance with the QAPP.

Sampling of stockpiled soil is required to characterize the soil for treatment/disposal purposes. A four-point composite sample will be collected from each stockpile (approximately 100 C.Y.) as follows:

A new pair of disposable latex gloves shall be used at each sample location for the preparation of samples.

A new five-foot length of two-inch diameter aluminum tubing or a split-spoon sampler shall be decontaminated in accordance with Section 7.0 prior to use at each sample location.

The aluminum tube or split-spoon sampler shall be forced horizontally into the face of the stockpile as deep as possible and then extracted.

The collected soil shall be emptied into a clean stainless steel bowl and homogenized prior to collecting the analytical sample, with the exception of samples for VOC analyses. Samples for VOC analyses will be transferred directly from the sampler to the sample container prior to homogenizing the sample.

The sample shall be collected with clean utensils and placed into appropriate sample containers (see Table C.5.1, Appendix C).

3.3.2 DRUMMED MATERIAL SAMPLING

This section describes the general procedures that will be followed when opening and sampling drummed waste containers removed from the excavation areas and transported to the staging area. Drum handling protocols will follow those outlined in the DIRWP.

Safety Equipment

During the sampling of drummed materials, personal protective equipment as specified within the HASP, will be worn or used at all times.

SCBA, as required by the HASP, will be worn at all times while sampling any drummed waste or while cleaning and sampling spilled materials for which physical and hazardous characteristics have not been determined.

Sampling Equipment

Materials and equipment required for sampling are as follows:

- Sample bottles as specified in the QAPP.

- A uniquely numbered sample identification label affixed to sample container.
- Chain-of-Custody data sheets.
- 4-foot by 3/4-inch I.D. glass sampling thief.
- Stainless steel trowel or spoon for collection of solid or sludge samples, if applicable.
- Remotely operated pneumatic ram or check key device.
- Brass mallet and chisel.
- Bung wrench.

All drums will be sampled on the staging pads to minimize spillage onto ground surface.

Presampling Safety Considerations

Extreme care will be exercised in opening drums or other sealed containers in which the contents may be harmful to sampling personnel. When practical, a drum will not be moved or opened unless the drum appears to be structurally sound.

Drums will be opened in such a manner that excess interior pressure, as evidenced by bulging or swelling, has been safely relieved. If pressure cannot be relieved from a remote location, appropriate shielding will be placed between sampling personnel and the drums to reduce the risks of injury.

After the initial opening and visual inspection of the drum contents, drums will be segregated visually into two classes, solid or liquid, and moved to the portion of the staging pad reserved for preliminary staging and sampling. Drums will be staged in an upright position. Drummed liquids will be further segregated into liquids of unknown content and visually identifiable liquids such as waste paints. All drums and mechanical equipment will be grounded prior to the commencement of sampling.

During the initial inspection, any customized containers, suspicious looking drums, or drums labeled as containing hazardous materials (explosives, etc.) will be clearly marked for special handling.

Drum Entry

All drums will be grounded prior to sampling. A metal grounding rod will be driven into the ground adjacent to the staging area. A wire, leading from the rod, will then be clipped to the drum.

If the bung can be removed, the sampling of contained liquids will be safely accomplished by glass thief. Following sampling, the glass thief will be broken and discarded within the drum. A drum that has a badly rusted bung, or that cannot be sampled as above, will be entered with a hydraulically operated non-sparking penetrating device operated remotely (i.e., brass road attached to backhoe arm). All drums within the staging area will be contained within overpack drums. The overpack drums will always be closed except during sampling operations.

Sampling Procedures

The following procedures will be adhered to during sampling of drummed liquid waste.

- Remove cover from sample container.
- Insert sampling thief almost to the bottom of the drum or until a solid layer is encountered. About one foot of tubing should extend above the drum. A representative sample of the liquid in the entire drum will be collected for compatibility testing and waste characterization.
- Allow the liquid waste in the drum to reach its natural level in the tube.
- Cap the top of the sampling tube with a double-gloved thumb or stopper, ensuring liquids do not come into contact with the sampler's thumb or stopper.
- Carefully remove the capped tube from the drum and insert the uncapped end in the sample container. Do not spill liquid on outside of bottle.
- Release the thumb or stopper and allow the glass thief to drain completely and fill the sample container. Repeat the above steps until sufficient volume has been collected for analysis.
- Remove tube from the sample container, break in two pieces and place the tube in the drum.
- Cap the sample container tightly and place prelabeled sample container in a carrier.
- Replace the bung or place plastic over the drum.
- Transport the sample to the laboratory for analysis.

Sampling of drummed solids or sludges, if encountered, will in general conform to the preceding procedures with the following exceptions:

Sample collection will be accomplished using a stainless steel trowel or spoon. All sampling equipment will be cleaned prior to use. Reusable sampling equipment will be cleaned between subsequent drums using the protocol presented in Section 7.0.

A representative sample of drummed solids or sludges will be collected, if practical.

The sample collected will be a composite of a minimum of four samples collected from representative locations throughout the drummed solids or sludges.

Absorbent material will be readily available at all times at the staging areas.

3.3.3 SAMPLE SHIPMENT

All samples will be packed according to the protocols presented in the QAPP. The samples will then be placed on ice or cooler packs in laboratory supplied coolers after labeling. Samples will be shipped together on a daily basis to the project laboratory by overnight courier or delivered by sampling personnel. All sample shipment will conform to 49 CFR § 172.101 DOT regulations for shipping high hazard samples. Samples will be maintained at 4°C at the laboratory until completion of all analytical work.

Each cooler will be sealed with two transportation security seals containing the sampler's initials. The cooler will then be sealed with packing tape.

3.3.4 CHAIN-OF-CUSTODY

Samples will remain under the control of sampling personnel in the field until relinquished to the laboratory in accordance with the QAPP.

4.0 DRUMMED WASTE COMPATIBILITY TESTING

Drummed wastes will be segregated according to waste classes prior to consolidation, if any, and waste characterization for disposal. The waste classes determined by the testing referenced in this section will permit an assessment of material incompatibilities and chemical characteristics which need to be further addressed for disposal purposes. Materials which have the same compatibility characteristics, as determined in accordance with this Section, may be consolidated, for disposal. All wastes will be properly characterized in accordance with the receiving disposal facility requirements (see Section 5.0).

The determination of waste classes will be conducted at an off-Site laboratory using samples collected in the field following the protocols outlined in Section 3.3.2.

4.1.1 FIELD ASSESSMENT

All wastes will be visually classified as to state (liquid or solid), color, viscosity and other identifying features.

Phase determination will be implemented to assess whether the waste is a liquid, solid, or heterogeneous mixture. This determination may sometimes be difficult for very viscous liquids or resins, but it is not crucial because the same characterization tests are performed on both solids and liquids. The determination of liquid wastes, if not readily apparent, will be in accordance with Section 3.2.

Visual classification and phase determination will be performed by sampling personnel during sample collection.

4.1.2 LABORATORY ANALYSES

Samples submitted to the laboratory for compatibility analyses will be analyzed for the following parameters:

- phase;
- ignitability;
- water reactivity;
- water solubility;

- oxidizer;
- peroxide;
- pH;
- nitric/perchloric acid;
- sulfide;
- cyanide;
- presence of halogens; and
- flammability.

The procedures for compatibility testing are presented in Attachment A of Appendix D.

4.1.3 PCB SCREENING

All drummed waste determined to fall under the same waste classification will also be screened for PCB contamination. A five sample composite will be prepared by collecting a split sample in the laboratory from the total volume collected. The composite sample will be screened for PCBs using SW-846 Methods 8081/8082 (see Appendix C). Should the composite sample yield PCBs at a concentration greater than 10 ppm, individual samples from which the five composite sample was prepared, will be screened for PCBs.

4.2 COMPATIBILITY TESTING AND CONSOLIDATION

The mixing of incompatible materials will be minimized by consolidating primarily materials which are determined to belong to the same waste class. The mixing of materials from the same waste class will prevent incompatible reactions from occurring. Where waste materials from different waste classes are considered for consolidation, the information obtained from the tests will be used in conjunction with the compatibility information contained in the USEPA document "A Method For Determining the Compatibility of Hazardous Wastes", EPA-600/2-80-076, dated April 1980 for assessing the potential for incompatible reactions.

Compatibility testing for the purpose of consolidation wastes from different classes will be performed using small quantities of the materials proposed for consolidation. Compatibility testing will typically be conducted for binary combinations by adding one component to the other and monitoring for resultant physical reactions that occur.

The materials will be classified as incompatible when reaction consequences include any of the following[1]:

i) heat generated by chemical reaction;

ii) fire produced by extremely exothermic reactions;

iii) generation of innocuous gases (i.e., N_2, CO_2, etc.) which can cause pressurization of closed containers potentially resulting in container rupture;

iv) generation of toxic gases (i.e., HCN, H_2S, etc.);

v) generation of flammable gases (i.e., H_2, C_2H_2, etc.);

vi) explosion due to extremely vigorous reactions or reactions producing sufficient heat to detonate unstable reactions or reaction products;

vii) violent polymerization resulting in the generation of extreme heat and sometimes toxic/flammable gases; and

viii) solubilization of toxic substances.

Compatibility testing of ternary combinations will not be attempted unless two of the materials have already been binary tested and the resulting compatible product is used for testing.

(1) USEPA, "A Method for Determining the Compatibility of Hazardous Wastes", EPA-600/2-80-076, April 1980.

5.0 WASTE CHARACTERIZATION

Following compatibility testing and consolidation, composite samples will be collected from each waste and analyzed for TCL volatiles, semi-volatiles, pesticides/PCBs, TAL inorganics, reactivity, corrosivity and ignitability (see Table C.8.1, Appendix C). Solid wastes which are determined to have chemical constituents in excess of twenty (20) times the Regulatory Levels for Toxicity Characteristic per 40 CFR 261 will also be tested using the Toxicity Characteristic Leaching Procedure (TCLP). The TCLP samples may be collected and extracted at the same time as the TCL/TAL samples and the decision to analyze the extract will be made based on the TCL/TAL results.

Depending upon the proposed treatment/disposal method(s), additional testing may include other analyses listed in Table 6.1 of the DIRWP. These additional sampling and analysis requirements, if any, will be identified by the selected disposal facilities. The waste characterization requirements will be confirmed following selection of the Contractor and identification of disposal facilities.

Any additional sampling and analysis of drummed materials, as required by the disposal facilities, will be performed following consolidation, if conducted, and will consist of the analysis of representative composite samples of each group of materials (same waste characteristics). Where disposal facilities identify waste constituent limitations imposed by their acceptance criteria or operating licenses, a "lab scale" composite of compatible materials proposed for consolidation will be prepared. The analysis of the "lab scale" composite will be performed prior to performing the actual field consolidation to ensure that consolidated materials are acceptable to the disposal facilities.

NYSDEC will be informed of the names of the laboratories being used prior to shipping the samples for analysis.

The field consolidation of liquids, if conducted, will at all times follow the addition sequence determined from the laboratory compatibility testing. Consolidation of compatible liquids will be performed in the appropriate transportation units (i.e., liquid waste transportable tanker).

6.0 SOIL CHARACTERIZATION

If grossly contaminated soils are encountered during the removal of drums at the Site the grossly contaminated soils will be excavated and stockpiled within the appropriate staging facility (see Section 4.2.4 DIRWP).

During and at the completion of excavation activities, the stockpiled soils will be sampled and characterized for the full Target Compound List/Target Analyte List (TCL/TAL), TCLP, and disposal characteristic parameters as presented in Section 5.0 and Table C.5.1 in Appendix C. Samples will be collected and analyses completed in accordance with the protocols specified in the QAPP.

7.0 SAMPLING EQUIPMENT CLEANING PROTOCOL

Prior to the collection of any samples designated for chemical analysis, all sampling equipment and tools will be decontaminated with the following procedure:

i) clean water wash with non-phosphate detergent to remove all visible foreign matter,

ii) tap water rinse,

iii) rinse with pesticide-grade isopropanol/hexane/isopropanol,

iv) rinse with deionized water. The volume of water used must be at least five times the volume of solvent used in step (iii), and

v) air dry for 15 minutes.

Fluids used for cleaning will not be recycled. All wash water, rinse water and decontamination fluids will be transferred to clearly labeled drums pending final disposal.

Following final rinse, sampling equipment will be visually inspected to verify that they are free of particulates and other solid material which may contribute to possible sample cross-contamination.

All cleaned equipment will be placed on polyethylene sheeting or covered with aluminum foil to avoid contact with a contaminated surface prior to use.

APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN (QAPP)

PROJECT TITLE: Sterling Site 3 QAPP

PREPARED BY: CONESTOGA-ROVERS & ASSOCIATES (CRA)

Approved By: _____ Date: _____
Project Manager - Consultant

Approved By: _____ Date: _____
QA/QC Officer
Analytical Activities - Consultant

Approved By: _____ Date: _____
QA/QC Officer
Field Activities - Consultant

Approved By: _____ Date: _____
Project Manger - Project Laboratory

Approved By: _____ Date: _____
QA/QC Officer -
Laboratory Activities - Project Laboratory

Approved By: _____ Date: _____
NYSDEC Remedial Project Manager

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1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) presents the policies, organization, objectives, functional activities and specific Quality Assurance (QA) and Quality Control (QC) activities designed to achieve the data quality goals associated with the Drum Investigation/Removal Work Plan (DIRWP) to be implemented at the Sterling Site 3 (Site) in East Greenbush, New York. The purpose and objective of the QAPP is to ensure that the analytical results are accurate and representative of field conditions. The analytical methods and QA/QC procedures presented in this QAPP are referenced from and shall be consistent with the guidelines established in the documents entitled, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA SW-846, 3rd edition, November 1986 and subsequent revisions; "Annual Book of ASTM Standards", American Society for Testing and Materials, 1991; "Methods for the Determination of Organic Compounds in Drinking Water", EPA-600/4-88/039, December 1988 and "Methods for the Chemical Analysis of Water and Wastes", EPA-600/4-79-020, revised March 1983. This QAPP is an integral part of the Sampling and Analysis Plan (SAP) contained in Appendix B of the DIRWP. Procedures for the drummed waste compatibility testing are outlined in Attachment A. These tests are included in the QAPP for reference, but are not subject to the level of QA/QC required for the traditional laboratory testing detailed herein.

2.0 PROJECT DESCRIPTION

The DIRWP is designed to facilitate the identification, excavation and staging, sampling and analysis, and off-Site transportation and disposal of potentially buried drums within the former Niagara Mohawk Power Corporation (NIMO) Safe Work Zone (SWZ) at the Site. In addition, samples will be collected of grossly contaminated soils associated with the drums and removed from the excavations.

2.1 BACKGROUND

Background information concerning the Site and Scope of Work are presented in the DIRWP.

2.2 SCHEDULE

The proposed DIRWP activities are tentatively scheduled for July 1999 during dry weather conditions and will be coordinated with NIMO during the decommissioning of the existing transmission poles in the former SWZ.

2.3 SAMPLING PROGRAM

The sampling program associated with the Site activities is outlined in the SAP. The sampling program consists of compatibility testing for the purpose of consolidation and then the collection and analysis of containerized solid and liquid wastes to facilitate the treatment/disposal of these materials. Grossly contaminated soil encountered during the drum excavation program will also be sampled and analyzed.

Details regarding sampling procedures and protocols are provided in the SAP.

The matrices that may potentially be sampled include liquid and solid waste materials, and soils.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Conestoga-Rovers & Associates (CRA), under the direction of 360 North Pastoria Environmental Corporation (NPEC), has overall responsibility for all phases of the Site activities. CRA will supervise all field investigations and, using the information compiled from this program, will facilitate the removal of materials from the Site. All reports based on Site activities will be produced by CRA.

The project laboratory will perform all chemical analyses of samples collected during the Site activities.

Both CRA and the project laboratory will provide project management as appropriate to their responsibilities. CRA will provide administrative oversight and QA/QC for all deliverables. All final project deliverables will be issued by CRA.

Figure C.3.1 presents the organizational chart for the sampling and analysis segments of the project. The functional responsibilities of each of the key technical personnel will be as follows:

Project Manager

- overview of field activities
- overview of laboratory activities
- decide laboratory data corrective action
- data assessment
- preparation and review of reports
- technical representation of project activities
- managerial guidance to technical group
- approval of the QAPP
- evidence file custodian

QA/QC Officer - Analytical Activities

- systems audits - laboratory activities
- overview and review field QA/QC
- coordinate supply of performance evaluation samples
- review laboratory QA/QC

- data validation and assessment
- advise on data corrective action procedures
- preparation and review of reports
- QA/QC representation of project activities

Quality Assurance Officer - Field Activities

- management of field activities and field QA/QC
- data assessment
- technical representation of field activities

Project Manager - Project Laboratory

- ensures all resources of the laboratory are available on an as-required basis
- overview of final analytical reports
- approval of the QAPP

Operations Manager - Project Laboratory

- coordinate laboratory analyses
- supervise in-house chain-of-custody
- schedule sample analyses
- oversee data review
- oversee preparation of analytical reports
- approve final analytical reports prior to submission to CRA

QA/QC Officer - Laboratory Activities - Project Laboratory

- overview laboratory quality assurance
- overview QA/QC documentation
- conduct detailed data review
- decide laboratory actions, if required
- technical representation of laboratory QA procedures
- preparation of laboratory SOPs as necessary
- approval of the QAPP

Sample Custodian - Project Laboratory

- receive and inspect the incoming sample containers
- record the condition of the incoming sample containers
- sign appropriate documents
- verify chain of custody and its correctness
- notify laboratory manager and laboratory supervisor of sample receipt and inspection
- assign a unique identification number and customer number, and enter each into the sample receiving log
- with the help of the operations manager, initiate transfer of the samples to appropriate lab sections
- control and monitor access/storage of samples and extracts

Primary responsibility for project quality control rests with CRA's QA/QC Officer. Ultimate responsibility for project quality rests with CRA's Project Manager. Independent quality assurance will be provided by the analytical laboratory project manager and QA/QC Officer prior to release of all data to CRA.

4.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for field sampling, chain of custody preparation, laboratory analyses and reporting that will provide representative and accurate data. Specific procedures to be used for chain of custody preparation, calibration, laboratory analyses, reporting, quality control, audits, preventive maintenance, and corrective actions are presented in other sections of this QAPP. Specific procedures relative to sampling are presented in the DIRWP and the SAP (see Appendix B).

Data quality objectives (DQOs) have been established in accordance with the USEPA guidance document entitled, "Data Quality Objectives for Remedial Response Activities", dated March 1987, to ensure that the database developed during the investigation meets the objectives and quality necessary for its intended use, namely, to facilitate the treatment/disposal of waste materials at the Site, and to provide a legally defensible database.

The purpose of this section is to define the goals for the level of QA effort. Objectives for accuracy, precision, sensitivity, completeness, representativeness, and comparability of measurement data from the analytical laboratory will be discussed. In addition, QA objectives for field measurements will also be discussed.

4.1 LEVEL OF QA/QC EFFORTS

4.1.1 FIELD QA/QC SAMPLING

To assess the quality of data resulting from the field sampling program samples for matrix spike analyses will be collected (where appropriate) and submitted to the analytical laboratory.

Field QA/QC samples that shall be provided to the analytical laboratory will be as identified below:

a) Sufficient sample volume will be supplied to the laboratory in order to perform matrix spike/matrix spike duplicate (MS/MSD) analyses at a frequency of one per 20 investigative samples.

The sampling and analysis program is summarized in Table C.4.1, which lists the parameters to be measured, the number, type and frequency of sampling, and the level

of QA effort required for each matrix. It should be noted that the parameters for waste characterization to be analyzed are dependent on the methods of disposal and the requirements of the disposal facility. Consequently, additional or fewer analyses may be required.

MS/MSD samples will be analyzed to evaluate analytical accuracy and precision.

4.1.2 LABORATORY QA/QC EFFORT

4.1.2.1 ACCURACY, PRECISION AND SENSITIVITY OF ANALYSES

The fundamental QA objective with respect to the accuracy, precision and sensitivity of analytical data is to achieve the QC acceptance criteria of each analytical protocol. The sensitivities required for these analyses will be at least the targeted detection limits listed in Tables C.4.2 through C.4.4 for the matrices of concern, barring any chemical interferences or dilutions required due to elevated concentrations of the subject analyte(s). In these cases, the laboratory detection limits will be substituted for the targeted detection limits in accordance with the method(s) protocols.

The method(s) precision (relative percent difference) will be determined from duplicate sample analyses or MS/MSD sample analyses. A minimum of one sample per 20 investigative samples will be analyzed in duplicate or spiked and analyzed in duplicate. Results of these analyses will be compared to the acceptance criteria presented in the appropriate methods, as identified in Section 8.0.

The method accuracy (percent recovery) will be determined by spiking selected samples (matrix spikes) with test compounds or analytes. Accuracy will be reported as the percent recovery of the test compound or analyte and will be compared to acceptance criteria, as identified in Section 8.0.

4.1.2.2 COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

The QA objective for completeness is to collect and analyze all environmental samples in a manner such that valid data is obtained. Achievement of this objective will rely on the use of strict sample identification and custody procedures, use of standard reference materials, proper instrument calibration and maintenance, analysis of quality control samples, performance audits, and corrective action anytime QC acceptance criteria are exceeded.

An objective of this program is the collection of samples that are representative of the matrix from which they were collected. Achievement of this objective will rely on the use of sampling procedures, as described in the SAP, that have been designed with the goal of obtaining representative samples.

The QA objective for comparability is the generation of Site characterization data that can be used to make valid comparisons with analytical data that may be generated in the future at this Site.

This objective also involves the analysis of environmental samples collected during the sampling program in a manner that produces results comparable to the results that would be obtained by another laboratory using the same analytical procedure. This is achieved by the use of standard materials traceable to the National Institute of Standards and Technology (NIST), the use of standardized accepted procedures for sample collection and sample analysis, and analysis of quality control samples to validate the analytical results.

4.2 FIELD MEASUREMENTS

Measurement data will be generated in many field activities. These activities may include, but are not limited to, the following:

i) documenting time and weather conditions;

ii) determining drum content volumes and layering; and

iii) determining waste stream volumes and weights.

The general QA objective for such measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the use of standardized procedures.

5.0 SAMPLING PROCEDURES

The procedures for sample collection and for performing all related field activities are described in detail in the SAP.

5.1 SAMPLE CONTAINERS, PRESERVATION, SAMPLE HOLDING TIMES AND SHIPPING MEANS

Required sample containers, sample preservation methods, shipping means and required sample holding times are presented in Table C.5.1.

5.2 FIELD DECONTAMINATION OF SAMPLING EQUIPMENT

Procedures to be used for sampling equipment cleaning are presented in the SAP.

6.0 SAMPLE CUSTODY AND DOCUMENT CONTROL

The following documentation procedures will be used during sampling and analysis to provide chain of custody control during transfer of samples from collection through storage. Recordkeeping documentation will include the use of the following:

i) a field logbook (bound, with numbered pages) to document sampling activities in the field;

ii) labels to identify individual samples;

iii) chain of custody forms to document the analyses to be performed; and

iv) laboratory sample custody logbook.

6.1 FIELD LOGBOOK

In the field, the sampler will record in the field logbook the following information for each sample collected:

i) unique sample identification number;

ii) sample matrix;

iii) name of sampler;

iv) sample source;

v) time and date;

vi) pertinent data (i.e., drum volume and layering);

vii) analysis to be conducted;

viii) sampling method (i.e., grab, composite);

ix) appearance of each sample (i.e., color, turbidity, sediment);

x) preservative added, if any;

xi) number of sample bottles collected; and

xii) pertinent weather data.

Each field logbook page will be signed by the sampler.

All field logbooks, sample labels and chain of custody records will be recorded in waterproof, non-erasable black ink. Entry errors, if made, shall be voided by crossing

out with a single line and the corrected information will be inserted. All such corrections shall be initialed and dated by the person making the entry.

6.2 SAMPLE IDENTIFICATION

A sample numbering system will be used to identify each collected sample by unique sample number. This system will provide a tracking number to allow retrieval and cross-referencing of sample information. A listing of the sample identification numbers with written descriptions of sample location, type and date will be maintained by the Contractor. The sample numbering system which may be used is described as follows:

Example: L-060192-AA-YYY
Where: L-Designated sample type
(L=Liquid, S=Solid, SL=Soil, GW=Groundwater)
060192: date of collection (mm/dd/yy)
AA: sampler initials
YYY: sequential number starting with 001 at the start of the project

The sample number shall be noted on the sample label in waterproof ink. Sample labels shall be firmly affixed to the samples they identify.

QA/QC samples will also be numbered with a unique sample number.

6.3 CHAIN OF CUSTODY RECORD

A chain of custody form will be completed to document the transfer of sample containers. Figure C.6.1 illustrates a typical chain of custody form. Custody seals will be placed around each cooler as presented in the SAP. The cooler will then be sealed with packing tape. Sample container labels will include sample number, place of collection and date and time of collection. Samples may be held up to 24 hours prior to shipment via overnight courier to the laboratory.

The chain of custody form, completed at the time of sampling, will include, but not be limited to, the sample number, date and time of sampling, and the name of the sampler. The chain of custody form will be signed, timed and dated by the sampler when transferring the samples. Custody transfers will be recorded for each individual sample. For example, if samples are split and sent to more than one laboratory, a record sheet will accompany each sample. The number of custodians in the chain of possession will be kept to a minimum. The chain of custody forms will be returned to CRA.

A chain of custody form will be prepared for each cooler being shipped to the laboratory. Each chain of custody form will consist of four copies which will be distributed as follows:

- The shipper will retain one copy.
- Three copies will be enclosed in a waterproof envelop within the cooler with the samples.
- The cooler will then be sealed properly for shipment. The coolers will be sealed with nylon strapping tape. Custody seals will be placed over the cooler opening in such a manner as to indicate tampering during shipment.
- The laboratory, upon receiving the samples, will complete the three remaining copies.
- The laboratory will maintain one copy for their records.
- One copy will be returned to CRA by the laboratory upon receipt of the samples.
- One copy will be returned to CRA with the data deliverables package.

Upon receipt of the cooler at the laboratory, the cooler and the seal and each sample container custody seal will be inspected by the designated sample custodian. The condition of the cooler and the sample container custody seals will be noted on the chain of custody form by the sample custodian. If either the cooler seal or the individual sample container custody seals are intact, the sample containers will be accepted for analyses. The sample custodian will document the date and time of receipt of the cooler, and sign the chain of custody form.

If damage or discrepancies are noticed, they will be recorded in the remarks column of the chain of custody form, dated and signed. Any damage or discrepancies will be reported to the laboratory supervisor who will inform the laboratory manager and QA/QC Officer, who will in turn notify CRA.

Completed chain of custody forms describing the transport to and receipt at the laboratory are required to be returned to CRA with the hard copy of the analytical report in order to facilitate data validation.

6.4 SAMPLE DOCUMENTATION IN THE LABORATORY

Each sample or group of samples shipped to the laboratory for analysis will be given a unique identification number. The laboratory sample custodian will record the client

name, number of samples and date of receipt of samples in the Sample Control Logbook.

The laboratory will be responsible for maintaining analytical logbooks and laboratory data. Raw laboratory data produced from the analysis of samples submitted for this program will be inventoried and maintained by the laboratory for a period of five years. The laboratory will advise CRA 60 days prior to expiration of the five years. CRA will advise the laboratory regarding the need for additional storage prior to expiration of the 60 days.

6.5 STORAGE OF SAMPLES

After the sample custodian has completed the chain of custody forms and the incoming sample log, the chain of custody forms will be checked to ensure that all samples are stored in the appropriate locations. All samples will be stored within an access controlled custody room and will be maintained under appropriate preservation requirements until all analytical work is complete.

6.6 SAMPLE DOCUMENTATION

Evidentiary files for the entire project shall be inventoried and maintained by CRA and shall consist of the following:

A	Work Plan
B	Project Logbooks
C	Field Data Records
D	Sample Identification Documents
E	Chain of Custody Records
F	Laboratory Data, etc.
G	Correspondence
H	Report Notes, Calculations, etc.
I	References, Copies of Pertinent Literature
J	Miscellaneous - Photos, Maps, Drawings, etc.
K	Final Report

The evidentiary file materials shall be the responsibility of the Project Manager with respect to maintenance and document removal.

7.0 CALIBRATION PROCEDURES AND FREQUENCY

The calibration procedures that will be used for the analyses of the samples collected during the Site activities shall be in accordance with the analytical methods presented in Section 8.0, Table C.8.1.

8.0 ANALYTICAL PROCEDURES

The analytical methodologies that will be used for the analysis of the samples collected during the Site activities are referenced in Table C.8.1. The parameters to be analyzed will depend on the requirements of the disposal facility and, consequently, additional or fewer analyses may be required that those presented in Table C.8.1.

8.1 DETECTION LIMIT REQUIREMENTS

The data generated during the Site activities will have targeted detection limits that are consistent with those presented in Tables C.4.2 through C.4.4. If any chemical interferences are present or dilutions are required due to elevated concentrations of the subject analyte(s), the laboratory detection limits will be substituted for the targeted detection limits in accordance with the method(s) protocols.

In addition, for samples initially analyzed by gas chromatography/mass spectrometry (GC/MS) (excluding TCLP analyses), a library search will be executed for Non-Target Compound List (TCL) sample components for the purpose of tentative identification. Up to ten substances of greatest apparent concentration for the volatile organic fraction and 20 substances of greatest apparent concentration for the base neutral/acid (BNA) extractable fraction will be tentatively identified via a forward search of the NIST Mass Spectral Library.

Computer library search routines will not use normalization routines that would misrepresent the library or unknown spectra when compared to each other. Only after visual comparison of sample spectra with the nearest library searches will the mass spectral interpretation specialist assign a tentative identification.

8.2 IDENTIFICATION

Identification of all targeted TCL analytes will be accomplished with an authentic standard of the analyte. When authentic standards are not available (i.e., for non-TCL compounds) identification will be considered tentative.

For gas chromatographic determinations of specific analytes, the relative retention time of the unknown will be compared with that of the authentic standard. Since a true identification by GC is not possible, an analytical run for compound confirmation will be followed according to the specifications in the methods. Peaks must elute within daily retention-time windows established for each indicator parameter to be declared a

tentative or confirmed identification. Retention time windows are determined by a standard 72-hour study defined in each method. Results of the study are to be filed in the laboratory and available for inspection during a QC audit.

For gas chromatographic/mass spectrometric determinations of specific analytes, the spectrum of the analyte will conform to a literature representation of the spectrum or to a spectrum of the authentic standard obtained after satisfactory tuning of the mass spectrometer. The appropriate analytical methods will be consulted for specific criteria for matching the mass spectra, relative response factors, and relative retention times to those of authentic standards.

8.3 QUANTIFICATION

The procedures for quantification of analytes are discussed in the appropriate specific analytical methods.

Estimation of the concentration of an organic compound not contained within the calibration standard may be accomplished by comparing the mass spectral response of the compound with that of an internal standard. This procedure is specified in the referenced methods.

9.0 DATA REDUCTION, VALIDATION, ASSESSMENT AND REPORTING

9.1 GENERAL

The laboratory will perform analytical data reduction and validation in-house under the direction of the laboratory QA/QC Officer. The laboratory QA/QC Officer will be responsible for assessing data quality and advising CRA of any qualifications, based on the QC criteria outlined in appropriate methods, which would caution the data user of possible unreliability. Laboratory data reduction, validation, and reporting will be conducted as detailed in the following:

- Raw data produced and checked by the responsible analyst will be turned over for independent review by another analyst.
- The laboratory Operations Manager will review the data for attainment of the quality control criteria presented in the referenced analytical methods.
- Upon completion of all reviews and acceptance of the raw data by the laboratory Operations Manager, a computerized report will be generated and sent to the laboratory QA/QC Officer.
- The laboratory QA/QC Officer will complete a thorough inspection of all data.
- The laboratory QA/QC Officer and area supervisor will decide whether any sample reanalysis is required.
- Upon acceptance of the preliminary reports by the laboratory QA/QC Officer, final reports will be generated and signed by the laboratory Project Manager.

CRA's QA/QC Officer will conduct an evaluation of laboratory data reduction and reporting. These evaluations will consider the finished data sheets, and recovery data for surrogate and matrix spikes. The material will be checked for legibility, completeness, correctness, and the presence of requisite dates, initials and signatures. The results of these checks will be assessed and reported to CRA's Project Manager noting any discrepancies and their effect upon the acceptability of the data. All information garnered from QA/QC checks will be discussed in the final report.

Validation of the analytical data will be performed by CRA's QA/QC Officer for analytical activities. The process of data validation includes the following:

i) determination of sample holding times;

ii) evaluation of laboratory/reagent blank contamination;

iii) evaluation of analytical accuracy via comparison of surrogate and matrix spike results against control criteria;

iv) assessment of analytical precision based on duplicate analyses and/or MS/MSD analyses; and

v) evaluation of the analytical data forms presented in Section 9.2 of the QAPP.

Assessment of analytical and in-house data will include checks on data consistency by looking for comparability of duplicate analyses, comparability to previous data from the same sampling location (if available), adherence to the accuracy and precision control criteria detailed in this document and anomalously high or low parameter values. The results of the data validations will be reported to CRA's Project Manager, noting any discrepancies and their effect upon the acceptability of the data. Data validation will be performed utilizing the following documents for guidance:

i) USEPA National Functional Guidelines for Organic/Inorganic Data Review, 1994; or

ii) EPA-approved equivalent procedures.

9.2 REPORTING AND DELIVERABLES REQUIREMENTS

The laboratory shall be required to submit two copies of a final complete analytical report within 30 calendar days of receipt of the final sample from the sampling event.

The analytical report submitted by the laboratory shall conform to all reporting and deliverable requirements specified below. The analytical report shall include, for each sample:

- date collected;
- date of sample receipt;
- date extracted or digested;
- date analyzed;
- method for sample preparation;
- analytical methodology;
- method of sample cleanup;
- method detection limits;
- sample dilution factor; and

- a case narrative including a discussion of all QC problems and corrective actions taken.

The following forms will accompany the analytical data packages:

Organics

Analytical Results (Form 1)
Surrogate Recoveries (Form 2)
Matrix Spike/Matrix Spike Duplicates (Form 3)
Blank Summary (Form 4)
GC/MS Tuning (Form 5)
Initial and Continuing Calibration (Forms 6 and 7)
Internal Standard and Evaluation Standards Summary (Form 8)
Pesticide/PCB Standard Summary (Form 9)
Pesticide/PCB Identification (Form 10)

Inorganics

Analytical Results (Form 1)
Calibration Data (Form 2A)
CRDL Standard Data (Form 2B)
Blank Data (Form 3)
ICP Interference Check Sample Data (Form 4)
Matrix Spike Data (Forms 5A and 5B)
Duplicate Data (Form 6)
Laboratory Control Sample (Form 7)
MSA Results (Form 8)
ICP Serial Dilutions (Form 9)
Holding Times (Form 10)
Instrument Detection Limits (Form 11)
ICP Interelement Correction Factors (Forms 12A and 12B)
ICP Linear Ranges (Form 13)
Analysis Run Log (Form 14)

The case narrative to each analytical report shall describe, in lay terms, any and all QA/QC problems encountered during analysis of the samples. For each sample for which QA/QC problems are encountered, the following specific information shall be reported in the case narrative:

- CRA's sample number;
- laboratory sample number;
- date of sample collection;
- date of sample receipt at the laboratory;
- date of sample analysis;
- sample matrix;
- parameters analyzed;
- data with outlying quality control;
- specific analytical problems that occurred; and
- the corrective action that was taken or attempted to resolve the problems.

9.3 QUANTITATION TECHNIQUES - ORGANICS AND INORGANICS

Equations for calculation of measured TCL organic, TAL inorganic and general chemistry parameters are presented in the methods referenced in Section 8.0, Table C.8.1.

9.4 DOCUMENT CONTROL SYSTEM

A document control system ensures that all documents are accounted for when the project is complete.

CRA shall assign a project number to this project. This number will appear on sample identification tags, logbooks, data sheets, control charts, project memos and analytical reports, document control logs, corrective action forms and logs, QA plans and other project analytical records.

10.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY - LABORATORY QC

Specific procedures related to internal laboratory QC samples (namely matrix spikes, surrogate spikes, blanks, QC check samples and matrix spike duplicates) are detailed in the following subsections.

10.1 BLANKS

A reagent blank will be analyzed by the laboratory at a frequency of one blank per 20 analyses or, in the event that an analytical round consists of less than 20 samples, one reagent blank will be analyzed. The reagent blank, an aliquot of analyte-free water or solid will be carried through the entire analytical procedure.

10.2 MATRIX SPIKE/MATRIX SPIKE DUPLICATES

A MS/MSD sample will be analyzed at a frequency of one per 20 investigative samples. Tables C.10.1 and C.10.2 present a summary of the compounds and/or analytes and acceptable criteria for TCL/TAL constituents. Percent spike recoveries will be used to evaluate analytical accuracy while relative percent difference (RPD) between the spike and matrix spike duplicate will be used to assess analytical precision. Acceptable criteria for all other constituents will be as identified in the appropriate methods (see Section 8.0) or established by the laboratory.

10.3 SURROGATES

Surrogates are used in all GC/MS and GC analyses. Every blank, standard and environmental sample including MS/MSD samples, will be spiked with surrogate compounds prior to purging volatiles or extracting semi-volatiles.

Surrogates will be spiked into samples according to the appropriate analytical methods. Surrogate spike recoveries will fall within the control limits set by procedures specified in the method for analytes falling within the quantitation limits without dilution. Dilution of samples to bring the analyte concentration into the linear range of calibration may dilute the surrogates out of the quantification limit; assessment of analytical quality in these cases will be based on the quality control embodied in the check and the MS/MSD samples.

Table C.10.3 presents a summary of the surrogate recovery control limits for TCL parameters.

10.4 BLIND CHECK SAMPLES

Check samples may be included with other samples submitted for analyses. In general, the check sample will be obtained from NYSDEC and supplied to CRA. The analytes contained in the check sample will be a representative subset of the analytes of interest.

Results of any check sample analyses will be compared to method accuracy and precision criteria. Accuracy and precision are defined in Section 13.0.

11.0 PERFORMANCE AND SYSTEM AUDITS AND FREQUENCY

For the purpose of external evaluation, performance evaluation check samples from the NYSDEC are analyzed periodically by the analytical contractor.

Internally, the evaluation of data from these samples is done on a continuing basis over the duration of a given project.

CRA's QA/QC Officer may carry out performance and/or systems audits to ensure that data of known and defensible quality are consistently produced during the program.

System audits are qualitative evaluations of all components of field and laboratory quality control measurement systems and they determine if the measurement systems are being used appropriately. The audits may be carried out before all systems are operational, during the program, or after the completion of the program. Such audits typically involve a comparison of the activities given in the QAPP described herein with activities actually scheduled or performed. A special type of systems audit is the data management audit. This audit addresses only data collection and management activities.

The performance audit is a quantitative evaluation of the measurement systems used for a monitoring program. It requires testing the measurement systems with samples of known composition or behavior to evaluate precision and accuracy. During an early sampling event for this program, a performance audit may be conducted by or under the auspices of CRA's QA/QC Officer without the knowledge of the analyst.

In addition, one external QA audit may be conducted by CRA prior to the analysis of any investigatory samples. Additional external QA audits will only be performed if deemed necessary by CRA's QA/QC Officer. The project laboratory may also undergo QA audit(s) by the NYSDEC, if so requested.

12.0 PREVENTIVE MAINTENANCE

Specific preventive maintenance protocols for laboratory equipment will be consistent with the laboratory's standard operation procedures.

Routine maintenance of the GC/MS instruments will be performed as per manufacturer's recommendations. The GC/MS operations manager is responsible for the preventive maintenance of the GC/MS instruments.

The preventive maintenance of the GC instruments will be done on an "as-needed" basis. Several maintenance procedures will be conducted on a routine basis. Manufacturer's recommendations provide the primary basis for the established maintenance schedule.

Manufacturer's service contracts provide primary maintenance for most major instruments (i.e., GC instruments, atomic absorption spectrometers, analytical balances, etc.). All aspects of routine and non-routine instrument maintenance are recorded in logbooks, and the logbook is dedicated to each instrument.

13.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS

13.1 QA MEASUREMENT QUALITY INDICATORS

13.1.1 PRECISION

Precision will be assessed by comparison of the analytical results between duplicate samples or duplicate matrix spike samples (MS/MSDs) (see Equation i, Section 13.2).

13.1.2 ACCURACY

Accuracy will be assessed by comparing a set of analytical results to the accepted or "true" values that would be expected (see Equation ii, Section 13.2). In general, MS/MSD and check sample recoveries will be used to assess accuracy.

13.1.3 OUTLIERS

Procedures discussed previously will be followed by documenting deviations. In the event that a result deviates significantly from established control limits, this deviation will be noted and its effect on the quality of the remaining data assessed and documented.

13.2 STATISTICAL EVALUATIONS

Standard statistical formulae shall be used in examination of the data and determination of their precision and accuracy. Statistical formulae which will be applied include:

i) Relative Percent Difference (RPD)

$$RPD = \frac{X_1 - X_2}{\frac{X_2 + X_2}{2}} \times 100$$

X_1 = result of original analysis
X_2 = result of duplicate analysis

RPD will be used to assess analytical precision.

ii) Percent Recovery

Percent recovery of spikes and check samples will be used to establish analytical accuracy and will be evaluated as follows:

$$\text{Matrix Spike Recovery} = \left(\frac{A-B}{C}\right) \times 100$$

Where:

A = the analyte concentration determined experimentally from the spike sample;
B = the background level determined by a separate analysis of the unspiked sample; and
C = the amount of the spike added.

Accuracy will be assessed from spike percent recoveries, audit sample performance, and QC check sample recoveries.

14.0 CORRECTIVE ACTION

The need for corrective action may be identified by system or performance audits or by standard QC procedures. The essential steps in the corrective action system will be:

i) identifying and defining the problem and checking the predetermined limits for data acceptability beyond which corrective action is required;

ii) assigning responsibility for investigating the problem;

iii) investigating and determining the cause of the problem;

iv) determination of a corrective action to eliminate the problem (this may include reanalysis or resampling and reanalysis);

v) assigning and accepting responsibility for implementing the corrective action;

vi) implementing the corrective action;

vii) verifying that the corrective action has eliminated the problem; and

viii) documenting the corrective action taken.

For each measurement system, CRA's QA/QC Officer will be responsible for initiating the corrective action and the laboratory supervisor will be responsible for implementing the corrective action.

15.0 QUALITY ASSURANCE REPORT TO MANAGEMENT

Management will receive reports on the performance of the measurement system and the data quality following the conclusion of the project.

Minimally, these reports will include:

i) assessment of measurement quality indicators (i.e., data accuracy, precision and completeness);

ii) results of system audits; and

iii) QA problems and recommended solutions.

CRA's QA/QC Officer will be responsible for preparing these reports. The final report for the project will include a separate QA section which will summarize data quality information and detail an overall data assessment and validation in accordance with the data quality objectives outlined in this QAPP.

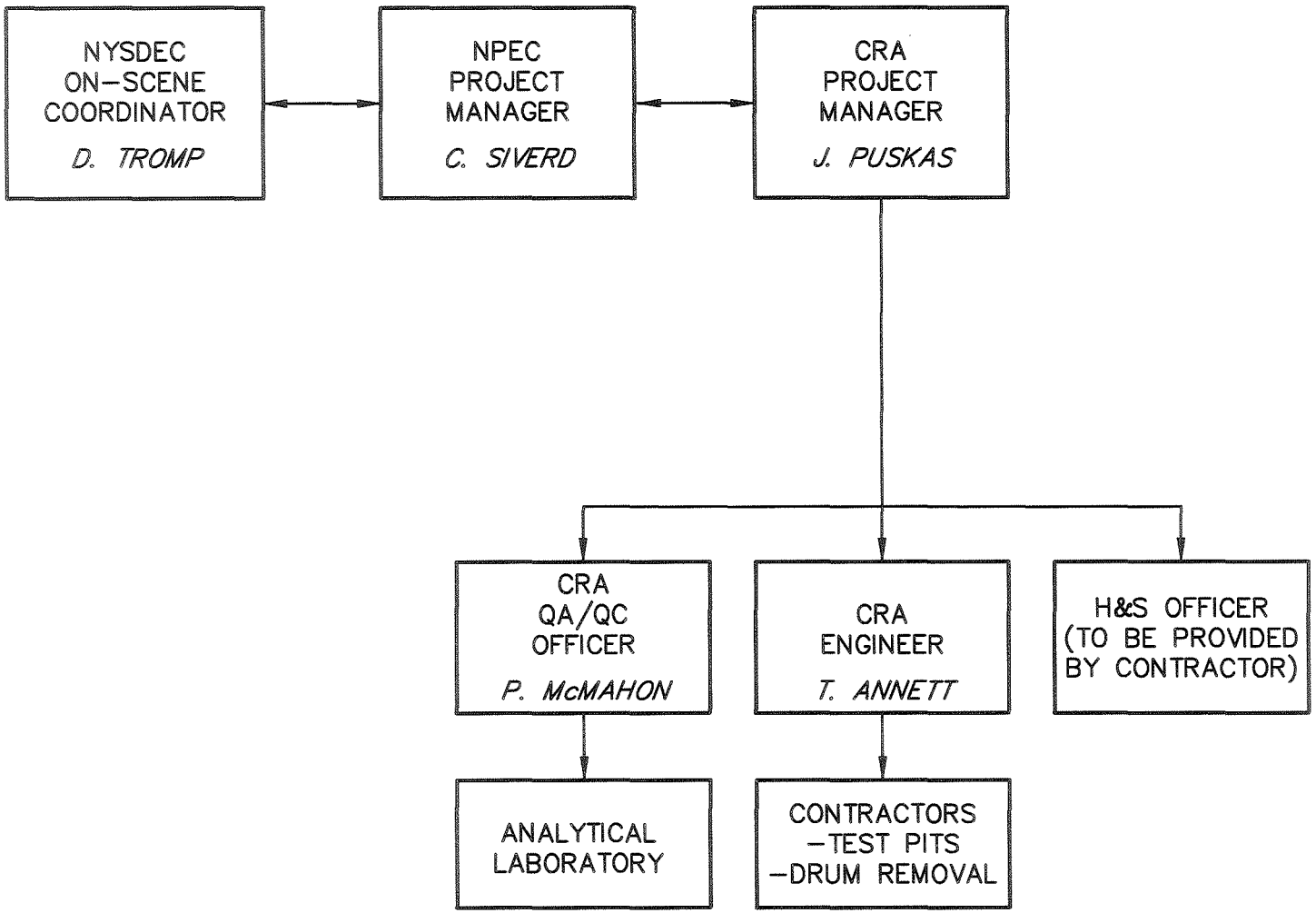

figure C.3.1

PROJECT ORGANIZATION
STERLING SITE 3
East Greenbush, New York

CRA

07830–90(021)GN–WA003 JUL 22/99

CHAIN OF CUSTODY RECORD

CRA
CONESTOGA-ROVERS & ASSOCIATES
2055 Niagara Falls Blvd., Suite Three
Niagara Falls, NY 14304 (716)297-6150

SHIPPED TO (Laboratory Name):

REFERENCE NUMBER:

SAMPLER'S SIGNATURE: _____ PRINTED NAME: _____

SEQ. No.	DATE	TIME	SAMPLE No.	SAMPLE TYPE	No. OF CONTAINERS	PARAMETERS	REMARKS
TOTAL NUMBER OF CONTAINERS						HEALTH/CHEMICAL HAZARDS	

RELINQUISHED BY: ① _____	DATE: TIME:	RECEIVED BY: ② _____	DATE: TIME:
RELINQUISHED BY: ② _____	DATE: TIME:	RECEIVED BY: ③ _____	DATE: TIME:
RELINQUISHED BY: ③ _____	DATE: TIME:	RECEIVED BY: ④ _____	DATE: TIME:

METHOD OF SHIPMENT: WAY BILL No.

White —Fully Executed Copy
Yellow —Receiving Laboratory Copy
Pink —Shipper Copy
Goldenrod —Sampler Copy

SAMPLE TEAM: _____ _____

RECEIVED FOR LABORATORY BY: _____

DATE: _____ TIME: _____

figure C.6.1
CHAIN OF CUSTODY FORM
STERLING SITE 3
East Greenbush, New York

CRA

07830-90(021)GN-WA004 JUL 22/99

TABLE C.4.1

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

Sample Matrix	*Laboratory Parameters*	*Investigative Samples*	*MS/MSD MS/DUP (1)*	*Total*
Containerized Waste	Compatibility Testing	tbd (3)	0	tbd
Containerized Waste	Waste Characterization (2) TCL/TAL, TCLP	tbd	5%	tbd
Soil	Waste Characterization (2) TCL/TAL, TCLP	tbd	5%	tbd

(1) Matrix spike/matrix spike duplicate samples are required for organic samples. Matrix spike/laboratory duplicate samples are required for inorganic samples.
(2) Parameters to be analyzed are dependent on the methods of disposal and the requirements of the disposal facility selected. A tentative list of parameters is presented in Table 8.1.
(3) The number of investigative samples will be dependent upon the number of waste streams determined during the compatibility testing for containerized waste and by visual determination for soil and groundwater.

TABLE C.4.2

TARGETED DETECTION LIMITS FOR ORGANIC ANALYSES
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

		Targeted Detection Limits		
Compound	*Cas No.*	*Liquid Waste (mg/L)*	*Solid Waste (mg/kg)*	*Soil (µg/kg)*
Volatile Compounds				
Chloromethane	74-87-3	10	5.0	10
Bromomethane	74-83-9	10	5.0	10
Vinyl chloride	75-01-4	10	5.0	10
Chloroethane	75-00-3	10	5.0	10
Methylene chloride	75-09-2	10	2.5	5
Acetone	67-64-1	10	5.0	10
Carbon disulfide	75-15-0	10	2.5	5.0
1,1-Dichloroethene	75-35-4	10	2.5	5.0
1,1-Dichloroethane	75-34-3	10	2.5	5.0
1,2-Dichloroethene (Total)	40-59-0	10	2.5	5.0
Chloroform	67-66-3	10	2.5	5.0
1,2-Dichloroethane	107-06-2	10	2.5	5.0
2-Butanone	78-93-3	10	5.0	10
1,1,1-Trichloroethane	71-55-6	10	2.5	5.0
Carbon tetrachloride	56-23-5	10	2.5	5.0
Vinyl acetate	108-05-4	10	5.0	10
Bromodichloromethane	75-27-4	10	2.5	5.0
1,2-Dichloropropane	78-87-5	10	2.5	5.0
cis-1,3-Dichloropropene	10061-01-5	10	2.5	5.0
Trichloroethene	79-01-6	10	2.5	5.0
Dibromochloromethane	124-48-1	10	2.5	5.0
1,1,2-Trichloroethane	79-00-5	10	2.5	5.0
Benzene	71-43-2	10	2.5	5.0
trans-1,3-Dichloropropene	10061-02-6	10	2.5	5.0
Bromoform	75-25-2	10	2.5	5.0
4-Methyl-2-pentanone	108-10-1	10	5.0	10
2-Hexanone	591-78-6	10	5.0	10
Tetrachloroethene	127-18-4	10	2.5	5.0
Toluene	108-88-3	10	2.5	5.0
1,1,2,2-Tetrachloroethane	79-34-5	10	2.5	5.0
Chlorobenzene	108-90-7	10	2.5	5.0
Ethyl Benzene	100-41-4	10	2.5	5.0
Styrene	100-42-5	10	2.5	5.0
Xylenes (Total)	1330-20-7	10	2.5	5.0

TABLE C.4.2

TARGETED DETECTION LIMITS FOR ORGANIC ANALYSES
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

		Targeted Detection Limits		
Compound	*Cas No.*	*Liquid Waste (mg/L)*	*Solid Waste (mg/kg)*	*Soil (µg/kg)*
Base/Neutral/Acid Compounds				
Phenol	108-95-2	10	20	330
bis(2-Chloroethyl) ether	111-44-4	10	20	330
2-Chlorophenol	95-57-8	10	20	330
1,3-Dichlorobenzene	541-73-1	10	20	330
1,4-Dichlorobenzene	106-46-7	10	20	330
Benzyl alcohol	100-51-6	10	20	330
1,2-Dichlorobenzene	95-50-1	10	20	330
2-Methylphenol	95-48-7	10	20	330
bis(2-Chloroisopropyl) ether	108-60-1	10	20	330
4-Methylphenol	106-44-5	10	20	330
N-Nitroso-di-n-dipropylamine	621-64-7	10	20	330
Hexachloroethane	67-72-1	10	20	330
Nitrobenzene	98-95-3	10	20	330
Isophorone	78-59-1	10	20	330
2-Nitrophenol	88-75-5	10	20	330
2,4-Dimethylphenol	105-67-9	10	20	330
Benzoic Acid	65-85-0	50	100	1,600
bis(2-Chloroethoxy) methane	111-91-1	10	20	330
2,4-Dichlorophenol	120-83-2	10	20	330
1,2,4-Trichlorobenzene	120-82-1	10	20	330
Naphthalene	91-20-3	10	20	330
4-Chloroaniline	106-47-8	10	20	330
Hexachlorobutadiene	87-68-3	10	20	330
4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	20	330
2-Methylnaphthalene	91-57-6	10	20	330
Hexachlorocyclopentadiene	77-47-4	10	20	330
2,4,6-Trichlorophenol	88-06-2	10	20	330
2,4,5-Trichlorophenol	95-95-4	50	100	1,600
2-Chloronaphthalene	91-58-7	10	20	300
2-Nitroaniline	88-74-4	50	100	1,600

TABLE C.4.2

TARGETED DETECTION LIMITS FOR ORGANIC ANALYSES
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

		Targeted Detection Limits		
Compound	*Cas No.*	*Liquid Waste (mg/L)*	*Solid Waste (mg/kg)*	*Soil (µg/kg)*
Base/Neutral Acid Extractables				
Dimethylphthalate	131-11-3	10	20	330
Acenaphthylene	208-96-8	10	20	330
2,6-Dinitrotoluene	606-20-2	10	20	300
3-Nitroaniline	99-09-2	50	100	1,600
Acenaphthene	83-32-9	10	20	300
2,4-Dinitrophenol	51-28-5	50	100	1,600
4-Nitrophenol	100-02-7	50	100	1,600
Dibenzofuran	132-64-9	10	20	330
2,4-Dinitrotoluene	121-14-2	10	20	330
Diethylphthalate	84-66-2	10	20	300
4-Chlorophenyl-phenyl-ether	7005-72-3	10	20	330
Fluorene	86-73-7	10	20	330
4-Nitroaniline	100-01-6	50	100	1,600
4,6-Dinitro-2-methylphenol	534-52-1	50	100	1,600
N-Nitrosodiphenylamine	86-30-6	10	20	330
4-Bromophenyl-phenylether	101-55-3	10	20	330
Hexachlorobenzene	118-74-1	10	20	330
Pentachlorophenol	87-86-5	50	100	1,600
Phenanthrene	85-01-8	50	20	330
Anthracene	120-12-7	10	20	330
Di-n-butylphthalate	84-74-2	10	20	330
Fluoranthene	206-44-0	10	20	330
Pyrene	129-00-0	10	20	330
Butylbenzylphthalate	85-68-7	10	20	330
3,3'-Dichlorobenzidine	91-94-1	20	40	660
Benzo(a)anthracene	56-55-3	10	20	330
Chrysene	218-01-9	10	20	330
bis(2-Ethylhexyl)phthalate	117-81-7	10	20	330
Di-n-Octylphthalate	117-84-0	10	20	330
Benzo(b)fluoranthene	205-99-2	10	20	330
Benzo(k)fluoranthene	207-08-9	10	20	330
Benzo(a)pyrene	50-32-8	10	20	330
Indeno(1,2,3-cd)pyrene	193-39-5	10	20	330
Dibenz(a,h)anthracene	53-70-3	10	20	330
Benzo(g,h,i)perylene	191-24-2	10	20	330

TABLE C.4.2

TARGETED DETECTION LIMITS FOR ORGANIC ANALYSES
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

		Targeted Detection Limits		
Compound	*Cas No.*	*Liquid Waste (mg/L)*	*Solid Waste (mg/kg)*	*Soil (µg/kg)*
Pesticides/PCBs				
alpha-BHC	319-84-6	10	20	8.0
beta-BHC	319-85-7	10	20	8.0
delta-BHC	319-86-8	10	20	8.0
gamma-BHC (Lindane)	58-89-9	10	20	8.0
Heptachlor	76-44-8	10	20	8.0
Aldrin	309-00-2	10	20	8.0
Heptachlor epoxide	1024-57-3	10	20	8.0
Endosulfan I	959-98-8	10	20	8.0
Dieldrin	60-57-1	20	20	16.0
4,4'-DDE	72-55-9	20	20	16.0
Endrin	72-20-8	20	20	16.0
Endosulfan II	33213-65-9	20	20	16.0
4,4'-DDD	72-54-8	20	20	16.0
Endosulfan sulfate	1031-07-8	20	20	16.0
4,4'-DDT	50-29-3	20	20	16.0
Methoxychlor	72-43-5	100	20	80.0
Endrin ketone	53494-70-5	20	20	16.0
alpha-Chlordane	5103-71-9	10	20	80.0
gamma-Chlordane	5103-74-2	10	20	80.0
Toxaphene	8001-35-2	100	50	16.0
Aroclor-1016	12674-11-2	50	10	80.0
Aroclor-1221	11104-28-2	50	10	80.0
Aroclor-1232	11141-16-5	50	10	80.0
Aroclor-1242	53469-21-9	50	10	80.0
Aroclor-1248	12672-29-6	50	10	80.0
Aroclor-1254	11097-69-1	50	10	160
Aroclor-1260	11096-82-5	50	10	160

Notes:

(1) Solid waste targeted detection limits provided are based on wet weight results. Actual detection limits shall be reported on a dry weight basis and as such, detection limits will be higher.

-- Detection limits are provided for guidance purposes only as they may not always be technically achieveable due to such factors as matrix interference and elevated analyte concentrations which would require sample dilution. In these cases, the laboratory detection limits will be substituted for the targeted detection limits in accordance with the method(s) protocols.

TABLE C.4.3

TARGETED DETECTION LIMITS FOR METALS
AND GENERAL CHEMISTRY ANALYSES
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

	Targeted Detection Limits Liquid Waste (µg/L)	*Targeted Detection Limits Solid Waste (mg/kg)*	*Targeted Detection Limits Soil (mg/kg)*
Metals			
Aluminum	2,000	80	40
Antimony	120	20	12
Arsenic	20	5	2
Barium	200	80	40
Beryllium	10	5	1
Cadmium	10	10	1
Calcium	2,000	80	1,000
Chromium	20	10	2
Cobalt	100	20	10
Copper	50	40	5
Iron	200	20	20
Lead	10	10	0.6
Magnesium	10,000	80	1,000
Manganese	30	10	3
Mercury	2	0.3	0.04
Nickel	80	20	8
Potassium	10,000	80	1,000
Selenium	10	5	1
Silver	20	10	2
Sodium	10,000	80	1,000
Thallium	20	20	2
Vanadium	100	20	10
Zinc	40	10	4
General Chemistry			
Cyanide, total	50	1.0	2.0
Phenols	100	1.0	NA
Sulfide	50	1.0	NA
Total Solids	5000	NA	NA
Total Organic Carbon	2000	100	NA
% Ash	NA	NA	NA
Heat Content (BTU)	NA	NA	NA
Specific Gravity	NA	NA	NA
Flash Point	NA	NA	NA
Total Organic Halides	100	1.0	NA
pH	NA	NA	NA
Cyanide, Reactive	100	NA	NA
Free Liquids	NA	NA	NA
Sulfide, Reactive	100	1%	NA
Sulfur	1%	1%	NA
Chlorine	1%	1%	NA
Corrosivity	NA	NA	NA

Notes:

- Detection limits are provided for guidance purposes only as they may not always be technically achieveable due to such factors as matrix interferences and elevated analyte concentrations which would require sample dilution. In these cases, the laboratory detection limits will be substituted for the targeted detection limits in accordance with the method(s) protocols.
- NA - Not Applicable

TABLE C.4.4

TARGETED DETECTION LIMITS FOR TCLP ANALYSES
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

Parameter		*Regulatory Limit (mg/L)*	*Targeted Detection Limit (mg/L)*
Analyses:	**Metals**		
	Arsenic	5.0	1.0
	Barium	100.0	10
	Cadmium	1.0	0.1
	Chromium	5.0	1.0
	Lead	5.0	1.0
	Mercury	0.2	0.01
	Selenium	1.0	0.1
	Silver	5.0	1.0
	Pesticides		
	Chlordane	0.03	0.01
	Endrin	0.02	0.01
	Heptachlor	0.008	0.005
	(Heptachlor-epoxide)	0.008	0.005
	Lindane	0.4	0.2
	Methoxychlor	10.0	5.0
	Toxaphene	0.5	0.3
	Herbicides		
	2,4-D	10.0	5.0
	2,4,5-TP (Silvex)	1.0	0.5
	Volatiles		
	Benzene	0.5	0.1
	Carbon tetrachloride	0.5	0.1
	Chlorobenzene	100.0	0.1
	Chloroform	6.0	0.1
	1,2-Dichloroethane	0.5	0.1
	1,1-Dichloroethene	0.7	0.1
	Methyl ethyl ketone	200.0	0.1
	Tetrachloroethene	0.7	0.1
	Trichloroethene	0.5	0.1
	Vinyl chloride	0.2	0.1

TABLE C.4.4

TARGETED DETECTION LIMITS FOR TCLP ANALYSES
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

Parameter		*Regulatory Limit (mg/L)*	*Targeted Detection Limit (mg/L)*
Analyses:	**Semi-Volatiles**		
	o-Cresol (2-Methylphenol)	200.0	0.1
	m & p-Cresol (3 & 4-Methylphenol)	200.0	0.1
	Cresol (total)	200.0	0.1
	1,4-Dichlorobenzene	7.5	0.1
	2,4-Dinitrotoluene	0.13	0.10
	Hexachlorobenzene	0.13	0.10
	Hexachloro-1,3-butadiene	0.5	0.10
	Hexachloroethane	3.0	1.0
	Nitrobenzene	2.0	1.0
	Pentachlorophenol	100.0	1.0
	Pyridine	5.0	1.0
	2,4,5-Trichlorophenol	400.0	1.0
	2,4,6-Trichlorophenol	2.0	1.0

Notes:

- Detection limits are provided for guidance purposes only as they may not always be technically achievable due to such factors as matrix interferences and elevated analyte concentrations which would require sample dilution. In these cases, the laboratory detection limits will be substituted for the targeted detection limits in accordance with the method(s) protocols.
- NA - Not Applicable

TABLE C.5.1

CONTAINER, PRESERVATION, SHIPPING AND PACKAGING REQUIREMENTS
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

Analysis	*Sample Containers*	*Preservation*	*Maximum Holding Times(1)*	*Volume of Sample*	*Shipping Means*	*Packaging*
MATRICES						
Liquid						
TCL-Volatiles	2 x 40 ml glass teflon septum	Cool, 4°C	14 days from collection to analysis	Fill completely	Federal Express Priority 1	Vermiculite or Foam Chips
TCL-Base/Neutral and Acid Extractables (BNAs)	2 x 1L amber glass bottles	Cool, 4°C	14 days from collection to extraction, 40 days extraction to analysis	Fill to neck of bottles	Federal Express Priority 1	Vermiculite or Foam Chips
TCL-Pesticides/PCBs	2 x 1L amber glass bottles	Cool, 4°C	14 days from collection to extraction, 40 days extraction to analysis	Fill to neck of bottles	Federal Express Priority 1	Vermiculite or Foam Chips
TAL-Metals	1 x 1L plastic or glass bottles	Cool, 4°C	6 months (mercury 28 days) from collection to analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
Cyanide	1 x 1L glass bottle	Cool, 4°C	14 days from collection to analysis	Fill to neck of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
Ignitability, Corrosivity, Reactivity	1 x 1L amber glass bottle	Cool, 4°C	28 days from collection to analysis	Fill to neck of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
Physical Characteristics, Compatibility Testing, General Chemistry	2 x 1L amber glass bottles	Cool, 4°C	28 days from collection to analysis	Fill to neck of bottles	Federal Express Priority 1	Vermiculite or Foam Chips

TABLE C.5.1

CONTAINER, PRESERVATION, SHIPPING AND PACKAGING REQUIREMENTS
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

Analysis	*Sample Containers*	*Preservation*	*Maximum Holding Times(1)*	*Volume of Sample*	*Shipping Means*	*Packaging*
MATRICES						
Solid/Soil						
TCL-Volatiles	1 x 4 oz wide mouth glass jar	Cool, 4°C	14 days from collection to analysis	Fill completely	Federal Express Priority 1	Vermiculite or Foam Chips
TCL BNAs/Pest/PCBs	2 x 8 oz. wide mouth glass jar	Cool, 4°C	14 days from collection to extraction, 40 days extraction to analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
TAL-Metals	1 x 8 oz. wide mouth glass jar	Cool, 4°C	6 months (mercury 28 days) from collection to analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
Cyanide	1 x 8 oz. wide mouth glass jar	Cool, 4°C	14 days from collection to analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
TCLP VOC	One 4-ounce glass	Cool, 4°C	14 days for TCLP extraction, 14 days TCLP extraction to analysis	Fill completely	Federal Express Priority 1	Vermiculite or Foam Chips
TCLP-BNA, Pesticide/Herbicide	2-100 mL glass	Cool, 4°C	14 days for TCLP extraction, 7 days for preparative extraction, 40 days for analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
TCLP-Metals (except mercury)	One 500-mL glass	Cool, 4°C	180 days for TCLP extraction, 180 days TCLP extraction to analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
TCLP-Mercury	One 500-mL glass	Cool, 4°C	28 days for TCLP extraction, 28 days TCLP extraction to analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
Ignitability, Corrosivity, Reactivity	1 x 8 oz wide mouth glass jar	Cool, 4°C	28 days from collection to analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
Physical Characteristics, Compatibility Testing, General Chemistry	2 x 8 oz wide mouth glass jars	Cool, 4°C	28 days from collection to analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips

(1) Maximum holding times are based from time of sample collection.

TABLE C.8.1

SUMMARY OF ANALYTICAL METHODS
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

Physical Characteristics	
Physical State	Sample inspection
Free Liquids	Sample inspection/Paint filter test (SW-846, Method 9095)
Specific Gravity	Volume and weight measurement
Solids	ASTM-D-3977-80
Ash Content	ASTM E-830-87
BTU	ASTM E-711-87
TOC	EPA SW-846, Method 9060
Total Organic Halides	EPA SW-846, Method 9020
Compatibility Testing	As described in Attachment A of Appendix D
Chemical Composition	
Metals	EPA SW-846, Method 6010/7000 series for TAL (2) metals
Cyanide	EPA SW-846, Methods 9010/9012
Organic	
TCL (3)	
Volatiles	EPA SW-846, Method 8260
Organochlorine Pesticides and PCBs	EPA SW-846, Methods 8081/8082
TCL Semi-volatiles	EPA SW-846, Method 8270
Other Components (General Chemistry)	
Sulfides	EPA SW-846, Method 9030
Phenols	EPA SW-846, Method 8041
Sulfur	ASTM E-775-87
Chlorine	ASTM E-776-87
Hazardous Characteristics	
Reactivity	EPA SW-846, Section 7.3, Chapter 7
Corrosivity/pH	EPA SW-846, Methods 9040/9045
TCLP	40 CFR Part 268, Appendix II
Ignitability	EPA SW-846, Method 1010

Notes:

(1) EPA SW-846, Test Methods for Evaluating Solid Waste, Third Edition, 1986 and subsequent revisions.
(2) TAL = Target Analyte List
(3) TCL = Target Compound List
(4) ASTM - "Annual Book of ASTM Standards", American Society for Testing and Materials, 1991.

TABLE C.10.1

MATRIX SPIKE/MATRIX SPIKE DUPLICATE
RECOVERY CONTROL LIMITS - ORGANICS (1)
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

Matrix Spike Compounds	*Liquid Recovery(2) Control Limits (Percent)*	*Solid Recovery(3) Control Limits (Percent)*
Volatiles:		
1,1-Dichloroethene	61 - 145 (14)	59 - 172 (22)
Trichloroethene	71 - 120 (14)	62 - 137 (24)
Chlorobenzene	75 - 130 (13)	60 - 133 (21)
Toluene	76 - 125 (13)	59 - 139 (21)
Benzene	76 - 127 (11)	66 - 142 (21)
Base/Neutral and Acid Compounds:		
1,2,4-Trichlorobenzene	39 - 98 (28)	38 - 107 (23)
Acenaphthene	46 - 118 (31)	31 - 137 (19)
2,4-Dinitrotoluene	24 - 96 (38)	28 - 89 (47)
Pyrene	26 - 127 (31)	35 - 142 (36)
N-Nitroso-Di-n-Propylamine	41 - 116 (38)	41 - 126 (38)
1,4-Dichlorobenzene	36 - 97 (28)	28 - 104 (27)
Pentachlorophenol	9 - 103 (50)	17 - 109 (47)
Phenol	12 - 89 (42)	26 - 90 (35)
2-Chlorophenol	27 - 123 (40)	25 - 102 (50)
4-Chloro-3-Methylphenol	23 - 97 (42)	26 - 103 (33)
4-Nitrophenol	10 - 80 (50)	11 - 114 (50)
Pesticides/PCBs:		
Lindane	56 - 123 (15)	46 - 127 (50)
Heptachlor	40 - 131 (20)	35 - 130 (31)
Aldrin	40 - 120 (22)	34 - 132 (43)
Dieldrin	52 - 126 (18)	31 - 134 (38)
Endrin	56 - 121 (21)	42 - 139 (45)
4,4-DDT	38 - 127 (27)	23 - 134 (50)

Notes:

(1) Values in parentheses indicate maximum acceptable relative percent differences (RPD) between matrix spike/matrix spike duplicate (MS/MSD) analyses.
(2) Control limits applicable to all liquid matrices.
(3) Control limits applicable to all solid matrices.

TABLE C.10.2

MATRIX SPIKE/LABORATORY DUPLICATE
RECOVERY CONTROL LIMITS - INORGANICS (1)
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

Analyte	*Liquid Recovery(2) Control Limits (Percent)*	*Solid Recovery(3) Control Limits (Percent)*
Aluminum	75 - 125 (20)	75 - 125 (35)
Antimony	75 - 125 (20)	75 - 125 (35)
Arsenic	75 - 125 (20)	75 - 125 (35)
Barium	75 - 125 (20)	75 - 125 (35)
Beryllium	75 - 125 (20)	75 - 125 (35)
Cadmium	75 - 125 (20)	75 - 125 (35)
Calcium	75 - 125 (20)	75 - 125 (35)
Chromium	75 - 125 (20)	75 - 125 (35)
Cobalt	75 - 125 (20)	75 - 125 (35)
Copper	75 - 125 (20)	75 - 125 (35)
Iron	75 - 125 (20)	75 - 125 (35)
Lead	75 - 125 (20)	75 - 125 (35)
Magnesium	75 - 125 (20)	75 - 125 (35)
Manganese	75 - 125 (20)	75 - 125 (35)
Mercury	75 - 125 (20)	75 - 125 (35)
Nickel	75 - 125 (20)	75 - 125 (35)
Potassium	75 - 125 (20)	75 - 125 (35)
Selenium	75 - 125 (20)	75 - 125 (35)
Silver	75 - 125 (20)	75 - 125 (35)
Sodium	75 - 125 (20)	75 - 125 (35)
Thallium	75 - 125 (20)	75 - 125 (35)
Vanadium	75 - 125 (20)	75 - 125 (35)
Zinc	75 - 125 (20)	75 - 125 (35)
Cyanide	75 - 125 (20)	75 - 125 (35)

Notes:

(1) Values in parentheses indicate maximum acceptable relative percent differences (RPD) between laboratory duplicate analyses.
(2) Control limits applicable to all liquid matrices.
(3) Control limits applicable to all solid matrices.

TABLE C.10.3

SURROGATE RECOVERY LIMITS (%)
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

	Liquid (1)	*Solid (2)*
Volatiles		
Toluene-d8	88 - 110	81 - 117
Bromofluorobenzene	86 - 115	74 - 121
1,2-Dichloroethane-d4	76 - 114	70 - 121
Base/Neutral and Acids:		
Nitrobenzene-d5	35 - 114	23 - 120
2-Fluorobiphenyl	43 - 116	30 - 115
Terphenyl-d14	33 - 141	18 - 137
Phenol-d6	10 - 94	24 - 113
2-Fluorophenol	21 - 100	25 - 121
2,4,6-Tribromophenol	10 - 123	19 - 122
Pesticides/PCBs:		
Decachlorobiphenyl (DCB)	30-150 (3)	30-150 (3)
Tetrachloro-m-xylene (TCMX)	30-150 (3)	30-150 (3)

Note:

(1) Control limits applicable to all liquid matrices.
(2) Control limits applicable to all solid matrices.
(3) Recovery limits are advisory only. They should not be used to determine if sample should be reanalyzed.

ATTACHMENT A

COMPATIBILITY TESTING PROCEDURES

ATTACHMENT A

A.1.0 GENERAL LIQUID TESTING

a. Flame Ignitability Test - The first test to be conducted will be an open flame ignitability test. A bunsen burner will be lit and adjusted to a small blue flame for this test. A fire extinguisher will be on hand when conducting this characterization test. The flame ignitability test may be conducted on several samples simultaneously. Two to five milliliter samples will be placed in disposable heat resistant containers. The containers are then placed in a large sand box or water bath and the lit bunsen burner is slowly passed over the unidentified waste. If a flame is observed, then the waste is classified as flammable. A non-flammable classification will be assigned to the waste if the bunsen burner has been passed over the sample three to four times without a flame being observed. The test is qualitative and is not meant to be precise. The lighting, depth of the container, ventilation in the container and degree of contact between the flame and liquid will all affect the test result. (This procedure was taken from the paper, "Compatibility Field Testing Procedures for Unidentified Hazardous Waste" by Rodney D. Turpin, USEPA, Edison, New Jersey, presented at the National Conference on Management of Uncontrolled Hazardous Waste Sites, Washington DC, October 1981.)

b. Water solubility and reactivity - Determination of whether the waste is soluble, insoluble, or reactive with water will be performed by placing several drops of the waste in a 40 mL vial containing three to five mL of distilled water. Should reactions of the waste with the water be observed such as gas generation, heat generation, combustion, etc., the waste will be categorized as water reactive and isolated from other waste materials. There is often some heat of solution or color change when a waste is mixed with water, but a waste which exhibits these mild reactions will not be considered a water-reactive waste.

A waste which is not readily miscible with water is organic in nature and its characteristics will be determined further by Organic Liquid Testing. Some organic solvents such as acetone and alcohols are miscible with water, but the mixing reaction is usually easily detectable. If the waste forms an immiscible layer at the bottom of the vial, the waste may be either a halogenated organic liquid, or a dense petroleum hydrocarbon.

An aqueous waste will form a single phase in the vial. Water-soluble wastes may be either inorganic liquids or non-polar soluble organics and will be further characterized by Inorganic Liquid Testing as presented below.

A.2.0 INORGANIC LIQUID TESTING

a. The presence of soluble volatile organics in the waste will be checked by testing the headspace of the waste with an organic vapor monitor (PID instrument i.e. HNu). Alternatively, a FID instrument (i.e. Foxboro OVA) will be used with a combustible gas meter to determine net organic vapors. Samples which are determined to contain volatile organics in excess of 0.2 meter units will be reclassified as organic liquid and subjected to the testing in Section A.2.1.

b. The presence of soluble organics which are not volatile will be checked by testing the waste for total organic carbon (TOC). TOC will be determined using EPA Method 9060 contained in SW-846 "Test Methods for Evaluating Solid Waste" Third Edition. Samples found to contain a TOC content greater than 1 percent will be reclassified as organic liquid and subjected to the testing in Section A.2.1.

c. Inorganic Oxidizers - Testing for inorganic oxidizers will be done by placing a drop of the waste on a strip of potassium iodide (KI)/starch paper. A purple stain indicates the presence of an oxidizer. The color change occurs at 12.5 parts per million (ppm) of total inorganic oxidizers and peroxides. The stain must appear within two minutes for the waste to be categorized as an inorganic oxidizer. If two minutes have elapsed and no stain has appeared, the result of the test will be considered negative. If the waste is dark and stains the KI/starch paper dark because of its color, the edges of the spot will be checked closely for the purple color. Very strong acids or bases may also stain the paper brown. Should this happen, a strip of the KI/starch paper will be moistened with buffer solution and the test will be repeated. (The composition of the buffer solution and all other solutions are listed in Section A.2.3.) A portion of the sample will also be diluted with the buffer solution, if necessary.

d. Peroxides - Peroxides in the aqueous solution will be detected with peroxide test paper (such as EM Quant Peroxide-Test strips). The pH of one mL of the sample will be adjusted to between pH 2-12 with NaOH or H_2SO_4 solutions, if necessary. The reagent portion of a strip will be immersed into the sample for five seconds. A blue stain must appear within two minutes for the waste to be categorized as containing peroxides. If two minutes have elapsed and no stain has appeared, the result of the test will be considered negative. The test is

sensitive to a few parts per million, and the relative darkness of the blue stain indicates the relative concentration of the peroxides.

e. pH and Subsequent Reactivity Screening - The pH of the waste will be determined with pH paper. Samples with a pH less than or equal to three will be classified as acidic, and samples with a pH greater than three will be classified as neutral or base. The detection limit for pH is one pH unit. The samples will be further tested as follows:

   i) Nitric or Perchloric Acid Testing - The acidic wastes (pH<3) will be tested for nitric (HNO_3) or perchloric acid ($HC1O_4$) with a sulfuric acid/diphenylamine test. Two milliliters of the sample will be pipetted into a vial and 0.5 mL of the diphenylamine solution will be added, followed by an equal amount of H_2SO_4 solution. A deep purple color will indicate the presence of nitrate or chlorate ions.

   ii) Sulfide and Cyanide Testing - The basic liquids (pH >7) will be tested for the presence of sulfide or cyanide ions. To test for sulfide, a drop of the sample will be placed on a strip of lead acetate paper which has been previously moistened with the buffer solution. A black stain indicates the presence of sulfide. If the sulfide test is positive, the sulfide will be removed before the following cyanide test is conducted. This will be accomplished by adding cadmium nitrate to a small amount of the sample and swirling until all of the sulfide has precipitated. Since cadmium nitrate will lower the pH of the sample, a buffer of NaOH will be added as required to avoid the loss of hydrogen cyanide gas.

High chloride ion concentrations may interfere with the cyanide ion detector tube test. Therefore, the waste will be diluted by adding 8 mL of distilled water to a 0.5 mL sample to minimize effects from interfering ions while retaining sensitivity to less than 100 ppm cyanide. After diluting the sample, the top of a cyanide ion detector tube (e.g., Matheson-Kitigawa) will be scored and broken and set in the sample with the red dot up. The liquid will be allowed to rise into the column by capillary action and any color change in the tube will be noted. A deep blue color will indicate the presence of the cyanide ion.

An alternate method for detecting sulfide- or cyanide-containing wastes consists of pumping a known volume of gas through hydrogen sulfide and hydrogen cyanide detector tubes. One or two drops of sulphuric acid solution are added to an equal amount of sample in a vial and the vapor space above the mixture is immediately tested for H_2S and HCN. If both tests are negative, several more drops of sample and acid

solution are added and the test is repeated. The detector tubes may be reused several times if the tests continue negative. Due to the high toxicity of H_2S and HCN, precautions will be taken to avoid breathing any gases which may evolve from the sample. The detection limit for cyanide using a Draeger tube is 2 to 15 milligrams per cubic meter (mg/m^3) or equivalent to 6 to 45 mg of material in a sample, and for sulfide is one to 200 ppm or equivalent to 1.3 to 250 mg of material in a sample.

A.2.1 ORGANIC LIQUID TESTING

a. The headspace above the sample will be tested for volatile organics with an organic vapor monitor (PID instrument, i.e. HNu). Alternatively, a FID instrument (i.e., Foxboro OVA) will be used with a combustible gas meter to determine organic vapors. Headspace readings will be noted for informational purposes.

b. Beilstein's Test - The second flame test is Beilstein's copper wire halogen test. A small coil will be bent in the end of a length of copper wire and held over the peak of the flame until any green flame disappears. Do not allow the wire to melt in the flame. Allow the wire to cool, then dip it in a small amount of the waste and hold it in the edge of the flame again. A green flame indicates the presence of a halogen (chloride, bromine, fluorine, iodine). If the test is to be repeated, the wire must be thoroughly cooled before dipping the coil back into the liquid. The detection limit for the Beilstein's test is 0.1 percent. Very volatile liquids may have a tendency to evaporate in the flame before decomposition can occur, thus causing a negative result. Several compounds have also been found to cause a green flame (e.g. organic acids, copper cyanide, urea, and quinaline and pyridine derivatives).

c. The possible presence of organic oxidizers will be checked for by placing a drop of the waste on a strip of KI/starch paper. A purple stain will indicate the presence of an oxidizer.

d. Organic peroxides will be tested for with the peroxide test paper. After immersing the reagent portion of the strip in the sample for five seconds, the strip will be moistened by breathing several times on the reagent pad. Peroxides will be indicated by a blue stain, as in the inorganic liquid test.

e. A pH determination will be made after mixing 2 mL of the sample with 2 mL of distilled water. Determination of the pH of the water phase will be made with pH test paper.

A2.2 SOLIDS TESTING

a. Color, texture, and approximate density of the waste and any other sample-specific preliminary information will be recorded.

b. An open flame ignitability test will be performed on a BB-sized portion of the waste and all observations recorded.

c. Reactivity: Another BB-sized portion of the sample will be added to a vial containing 10 mL of distilled water.

Reactions will be observed. If no violent reaction is observed, an additional amount of sample equivalent to about one cubic centimeter (cc) will be added to the water. The vial will be swirled to thoroughly mix the waste with the water.

d. The pH of the mixture will be determined. The oxidizer, peroxide, sulfide, and cyanide tests may be conducted on the waste/water mixture as in Inorganic Liquids Testing, above.

A.2.3 PREPARATION OF SOLUTIONS FOR TESTS

a. Buffer Solution: Dissolve 24.3 g $NaC_2H_3O_2 \cdot 3H_2O$ (sodium acetate trihydrate) or 14.6 g anhydrous $NaC_2H_3O_2$ in 40 mL distilled water. Add 48 mL concentrated acetic acid and bring solution to 100 mL with distilled water.

b. Diphenylamine Solution: 1.0 g of diphenylamine in 50 mL methanol.

c. Sulfuric Acid: Four parts concentrated H_2SO_4 to one part water.

d. Sodium Hydroxide Solution: 0.1N sodium hydroxide solution (4.0 grams anhydrous NaOH in one liter of distilled water).

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HEALTH AND SAFETY PLAN

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1.0 INTRODUCTION

1.1 GENERAL

The Health and Safety Plan (HASP) presented herein provides the minimum safety requirements that will be implemented during the Drum Investigation/Removal Work Plan (DIRWP) activities at the Sterling Site 3 (Site) to provide for a safe and minimal risk Plan environment for all on-Site personnel. It also provides for emergency response procedures and corrective procedures based on the results of Site perimeter air monitoring. It is noted that any Contractors will be required to develop a Health and Safety Plan for the Site work that will include, at a minimum, the requirements outlined in this document and 29 CFR 1910.120.

All personnel will receive training specific to this HASP before entering the Site. While on the Site, all personnel will be required to comply with the provisions of the HASP as applicable to their specific Site duties. Written verification of training will be maintained on Site.

1.2 MANAGEMENT AND IMPLEMENTATION

CRA will provide overall project coordination services and field oversight services during the implementation of the DIRWP activities. CRA's Project Manager will provide managerial oversight regarding the Health and Safety Program and will be represented on Site by a designated Field Engineer (Engineer).

The implementation and enforcement of the HASP on a daily basis will be the responsibility of the Contractor who will be selected through a competitive bidding process. The Contractor will be required to assign a Health and Safety Manager to develop and oversee the Health and Safety Plan during all on-Site activities. The Contractor will also be required to assign a Site Safety Officer who will report to the Health and Safety Manager and will be responsible for the management of the HASP on a daily basis.

The Site Safety Officer will report all required air monitoring data and other health and safety related information to the Engineer. 360 North Pastoria Environmental Corporation (NPEC) will be responsible for providing the necessary information for submittal to the NYSDEC as required.

1.3 SITE CHARACTERIZATION AND POTENTIALLY HAZARDOUS COMPOUNDS

Section 1.0 of the Site DIRWP provides a description of the Site and some of the previous activities which have been conducted at the Site. During the IRM Drum Removal activities (November 1989 to March 1991), it was reported that drum contents consisted of organic solids and sludges, organic liquids, spent organic mixtures (i.e., toluene, acetone, alcohols, benzene, diethyl ether, chloroform, and 1,2-dichloroethane), complex organic mixtures, exotic waste (e.g., thionyl chloride) and aqueous wastes/infiltration. It was reported that the volatiles present in the complex organic mixtures included benzene, toluene, methyl thiophene, diethyl ether and xylenes and that portions of the aqueous wastes also included inorganic acids, amines, pyridine and diethyl ether. Material Safety Data Sheets for these chemicals are provided in Attachment E. For those chemicals that Material Safety Data Sheets are not available, information is included from the Groundwater Chemicals Desk Reference[1]. The Site Respiratory Protection Action Levels as presented in Section 6.0 follow the United States Environmental Protection Agency (USEPA) guidelines for levels of unknown organic vapors.

Sections 3.0 to 11.0 of the DIRWP describe in detail all work activities that will take place on Site. Table D.1.1 presents the hazards/risks associated with these activities.

1 Montgomery, J.H., Welkom, L.M., Groundwater Chemicals Desk Reference, Lewis Publishers, Michigan, 1990.

2.0 BASIS

The Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29, Code of Federal Regulations, Parts 1910 and 1926 (29 CFR 1910 and 1926) including the amended sections in 29 CFR 1910.120, "Final Rule on Hazardous Waste Operations and Emergency Response" and current TLVs as provided by the American Conference of Governmental Industrial Hygienists (ACGIH) provide the basis for the safety and health program. Some of the specifications within this Health and Safety Plan are in addition to OSHA regulations and reflect the positions of the United States Environmental Protection Agency (USEPA), the National Institute for Occupational Safety and Health (NIOSH), and the United States Coast Guard (USCG) regarding procedures required to ensure safe operations at hazardous waste disposal sites. Additional safety provisions, as required, have also been included in this document.

The safety and health of the public and on-Site personnel and the protection of the environment will take precedence over schedule considerations for all project work. If emergency shut down of operations is necessary, impacts will be considered only after the cause of the problem is resolved and work is resumed. The Engineer and the Contractor's Site Safety Officer will be responsible for decisions regarding when work will be stopped for health or safety reasons and when it will be restarted.

3.0 HEALTH AND SAFETY MANAGER AND SITE SAFETY OFFICER

The Contractor will provide a designated Site Safety Officer who has knowledge of industrial hygiene. The Site Safety Officer will be on Site on a full-time basis during excavation activities and will report directly to the Health and Safety Manager.

The Health and Safety Manager will:

i) Be responsible for developing the Contractor Health and Safety Plan which will include at a minimum the provisions outlined in this document;

ii) Be responsible for the initial training sessions for all on-Site personnel with regard to this safety plan and other safety requirements to be observed during Site activities, including;

   a) potential hazards,

   b) personal hygiene principles,

   c) personal protective equipment (PPE),

   d) respiratory protection equipment usage and fit testing, and

   e) emergency procedures dealing with fire and medical situations;

iii) Be responsible for implementation of the HASP at the initial period of all Site activities;

iv) Review and modify the HASP, in consultation with the Project Manager, as more information becomes available concerning the hazardous materials involved, review all monitoring reports and respirator inspection logs, provide the initial qualitative respirator fit test, and prepare sample hazardous substance information forms for known hazardous materials at the Site; and

v) Oversee the Site Safety Officer's activities. The Health and Safety Manager will maintain an appropriate level of contact with the Site Safety Officer to ensure that the HASP is properly implemented.

The Site Safety Officer will:

i) Be responsible for daily enforcement and monitoring of the HASP;

ii) Be responsible for assisting the Health and Safety Manager in the initial training of all on-Site personnel with regard to this safety plan and other safety requirements to be observed during Site activities, including;

   a) potential hazards,

   b) personal hygiene principles,

c) personnel protective equipment,

d) respiratory protection equipment usage and fit testing, and

e) emergency procedures dealing with fire and medical situations;

iii) Be responsible for alerting the Engineer prior to the Contractor starting any particularly hazardous work;

iv) Be responsible for the maintenance of separation of any Exclusion Zone and Support Zone areas as described hereafter;

v) Maintenance of the emergency contingency plan;

vi) Coordinate all on-Site air monitoring;

vii) Supervision of decontamination activities;

viii) Suspend work activities as necessary;

ix) Ensure all personnel have proper training, medical surveillance, and respiratory fit testing;

x) Be responsible for Site hazard communication program;

xi) Conduct daily safety meetings;

xii) Ensure drum handling is in accordance with 29 CFR 1910.120(j); and

xiii) Issue confined space entry permits as required.

The Site Safety Officer will be currently certified in first aid and cardiopulmonary resuscitation.

4.0 MEDICAL SURVEILLANCE

In accordance with requirements detailed in 29 CFR 1910.134, and 29 CFR 1910.120, all Site personnel who will be required to work in the Exclusion Zones will receive medical surveillance by a licensed occupational physician or physician's group.

Personnel medical records will be maintained by either the consulting physician or by the Contractor's medical or personnel officer. If the records are kept by the Contractor, they will be filed in locked file cabinets with access limited to the Contractor's designated officer. A record of which tests were performed as part of the medical surveillance program and a copy of the consulting physician's statement regarding the tests and the employee's suitability for work will be kept at the Site. Personnel medical records and the results of the tests performed on each person will not be maintained at the Site. The medical records will be available to the employee or his designated representative upon written request, as outlined in OSHA Regulation 29 CFR 1910.1020.

Personnel involved in work with waste materials during the duration of the project must be in the Contractor's medical surveillance program prior to working on Site. All on-Site Contractor personnel who will be required to work in any Exclusion Zones will have been provided a medical exam within one year prior to commencing work on Site.

The Contractor will be responsible to ensure that the necessary medical examinations are conducted on all on-Site Contractor personnel who will be expected to work in the Exclusion Zones prior to commencing work which requires respiratory protection. The Contractor will provide the medical certificates of approval to the Engineer and will ensure that personnel not obtaining such certificates will not enter or work in the Exclusion Zones. Non-Contractor personnel required to enter or work in the Exclusion Zones will provide proof of medical surveillance prior to their entry into the Contaminant Reduction Zones or Exclusion Zones.

Interim medical surveillance will be completed as required, such as when an individual exhibits poor health or high stress responses due to on-Site activity or when accidental exposure to elevated concentrations of contaminants occur.

Medical surveillance for personnel who will only occasionally enter the Contaminant Reduction Zones or Exclusion Zones will be established in accordance with 29 CFR 1910.120. As stated, medical surveillance will be required for those personnel "who are or may be exposed to hazardous substances or health hazards at or above the established permissible exposure limits for those substances, without regard to the use of respirators, for 30 days or more a year", or "who wear a respirator for 30 days or more

a year". Medical surveillance for these personnel will be established on an individual basis.

5.0 TRAINING

The Contractor will provide and require that all personnel assigned to or entering the Site complete training or refresher sessions. Training and refresher sessions will ensure that all personnel are capable of and familiar with the use of safety, health, respiratory and protective equipment and with the safety and security procedures required for this Site. Training will meet the requirements of 29 CFR 1910.120 and documentation of successful completion of the training must be provided to the Engineer for each worker prior to commencing work on Site. At least one of the Contractor's personnel on Site will have successfully completed supervisor training in accordance with 29 CFR 1910.120 for Hazardous Waste Operations and Emergency Response.

The Contractor's representative will provide and conduct a training program for all Site personnel prior to commencing work within the Exclusion Zones. This training program will address as a minimum the following topics:

i) Drum handling procedures;

ii) Excavation procedures;

iii) Confined Space Entry Procedures if required;

iv) Potential hazards;

v) Biology, chemistry and physics of Site-specific hazardous materials;

vi) Rights and responsibilities of workers under OSHA and related additional legislation of the State of New York;

vii) Task standard safety operating procedures;

viii) Types of monitoring equipment to be used;

ix) Site HASP;

x) Internal and External Communications;

xi) Medical surveillance program;

xii) Personal protective clothing and equipment;

xiii) Respiratory equipment including training and qualitative fit-testing for air purifying respirators and use of self-contained breathing apparatus;

xiv) Air monitoring program;

xv) Decontamination procedures;

xvi) Evacuation, first aid and emergency procedures dealing with fire and medical situations;

xvii) Work zones established at the Site;

xviii) Safe work practices associated with employee's work assignment, including dust control measures, hazardous materials recognition, and use of the buddy system;

xix) Basic operational safety, emphasizing hazards expected on Site;

xx) Prohibitions (general)

(a) facial hair such as beards and long sideburns which interfere with respirator fit; and

xxi) Prohibitions (inside Exclusion and Contaminant Reduction Zones), including:

(a) Contact lenses,

(b) Eating, drinking, smoking, chewing gum in the Exclusion or Contaminant Reduction Zones,

(c) Personal articles, e.g., watches, if not protected by appropriate personal protective equipment, and

(d) Working when ill.

All personnel assigned to the Site will receive safety and health training, and upon completion of training will be recorded on Training Acknowledgment Form which will be submitted to the Engineer. The Training Acknowledgment Form will include provisions for the following information:

i) Employee or visitor's name;

ii) Verification of topics covered, including;

(a) Materials used,

(b) Equipment demonstration,

(c) Hands-on equipment practice for each employee,

(d) Prohibitions covered,

(e) Buddy-System Explanation, and

(f) Standard Operating Procedures; and

iii) Date and Signature.

A sample of a Training Acknowledgment Form is included in Attachment A. All personnel assigned to the project will receive and be required to read the Site Health and Safety Plan. Following review of the Site Health and Safety Plan, all personnel are required to sign the acknowledgment form, a sample of which is presented in Attachment B.

There will be daily safety training sessions conducted by the Site Safety Officer. The purpose of this training is to reinforce the proper procedures, to correct any deficiencies noted in the health and safety program, and to prepare the workers for any change in the health and safety program due to changes in the operations or unanticipated problems. Documentation of this training will be submitted to the Engineer. Documentation will include the topic(s) covered and a signed list of attendees.

The Site Safety Officer will be responsible for ensuring that personnel that do not successfully complete the required training are not permitted to enter the Exclusion and Contaminant Reduction Zones.

Visitors will not be permitted to enter the Exclusion Zone without proof of training, medical surveillance and qualified respirator fit testing.

6.0 RESPIRATOR PROGRAM

All on-Site personnel will receive training in the use of, and be fit tested for a full-facepiece respirator. All on-Site personnel requested to work within the Exclusion Zones will also receive training in supplied air breathing apparatus, and will be required to comply with their employer's specific written respiratory protection program.

Levels of respiratory protection have been chosen to be consistent with the regulations written in OSHA 29 CFR 1910.120 (c)(5)(iii). Level B respiratory protection (supplied air respirators either positive pressure-demand or self contained breathing apparatus) will be worn when handling waste streams which have not been fully characterized. Level C respiratory protection (air purifying respirators) will only be worn after waste streams have been fully characterized and a determination has been made by the Health and Safety Manager that Level C respiratory protection is appropriate. This determination will be based on the potential airborne presence of compounds with the lowest recommended threshold limit value, their concentration levels in on-Site media, and upon the type of work activity being conducted. Table D.12.1 presents the required respiratory protection levels for the specific work activities to be conducted on Site.

Prior to commencing Site activities and regularly during the active operations, both the Contaminant Reduction Zones and the Exclusion Zones will be monitored with appropriate monitoring equipment to determine the presence of any immediate dangers to life and health levels.

Respirator cartridges to be used in the full facepiece air purifying respirators, if it is determined that they may be worn, will be made by the same manufacturer as the facepieces in accordance with OSHA regulations. All air purifying respirators will be provided with a combination cartridge providing protection against organic vapors/acid gas and particulates.

The Site Safety Officer will be responsible for implementing, maintaining and enforcing the respirator program. All respiratory protection devices will be cleaned daily and properly stored.

On-Site personnel unable to pass a respirator fit test will not enter or work in any Exclusion Zones or Contaminant Reduction Zones.

7.0 WORK AREAS

The Contractor will ensure that all personnel entering or exiting the Site will write the following information in an entry/exit log sheet:

i) Date;

ii) Name;

iii) Name of Firm;

iv) Time In;

v) Time Out;

vi) Safety Plan Explained (Note Yes);

vii) Site Visited or Location;

viii) Protective Equipment Level (A, B, C, D);

ix) Respirator/Medical training records and fit test;

x) Daily Safety Meetings; and

xi) Remarks.

The Contractor will clearly lay out and identify work areas in the field and will limit equipment, operations and personnel in the areas as defined below prior to initiation of Site activities.

Exclusion Zone

This will include all areas in which soils or drums are being excavated, staged, sampled or handled, and surface areas adjacent to these areas which may be affected during these operations.

The Exclusion Zone will be clearly demarcated in the field with a Site control fence (temporary snow fence) or flagging tape at the Support Zone.

Access to the Exclusion Zone will be restricted to personnel who are wearing the proper PPE, have received the required medical examination, and have undergone the safety and health training. Eating, drinking, or smoking is prohibited in this area. A log of entry to and exit from any Exclusion Zone will be maintained for the purposes of stress monitoring and determining exposure hours.

Contaminant Reduction Zone

This zone will occur at the interface of any Exclusion Zone and the Support Zone and will provide for the transfer of any construction materials and equipment, the decontamination of off-Site transport vehicles prior to entering the Support Zone, the decontamination of personnel and clothing prior to entering the Support Zone and for the physical segregation of the Support Zone from the Exclusion Zone.

Access to the Contaminant Reduction Zone will be restricted to personnel who are wearing the proper PPE, have undergone the medical examination, and have participated in the training program. Eating, drinking, carrying of tobacco products, or smoking is prohibited in this area.

Support Zone

This area includes the support facilities located within the Site perimeter fencing. The Support Zone will be clearly delineated and procedures will be implemented to prevent active or passive contamination from other work zones. The function of the Support Zone includes:

i) An entry area for personnel, material and equipment to the Exclusion Zone;

ii) An exit area for decontaminated personnel, materials and equipment from the Exclusion Zone;

iii) The housing of Site special services; and

iv) A storage area for clean safety and work equipment.

8.0 COMMUNICATIONS

The Contractor will provide telephone communication for the Site. Emergency numbers including police, fire, ambulance, hospital, poison control center and appropriate regulatory agencies will be prominently posted near each phone. A list of emergency telephone numbers is presented in Attachment C. In an emergency situation, the Site Safety Officer will be notified immediately. The Site Safety Officer will then be responsible for making the necessary contacts with off-Site emergency facilities. An employee alarm system consisting of three short blasts of an air horn will signify evacuation or an emergency. This is further discussed in Section 10.3.

8.1 EMERGENCY HAND SIGNALS

In order to maintain a standard form of communication in the field while wearing PPE, the following hand signals will be used:

Hand gripping throat:	Out of air, can't breathe!
Grip partner's wrist or place both hands around waist:	Leave area immediately, no debate!
Hands on top of head:	Need assistance.
Thumbs up:	OK, I'm all right, I understand.
Thumbs down:	No, negative.

9.0 EMERGENCY AND FIRST AID EQUIPMENT

The safety equipment listed below will be located and maintained within any Contaminant Reduction Zone or within any Exclusion Zone at appropriate locations as directed by the Site Safety Officer. The placement of the equipment will be at the discretion of the Site Safety Officer and will be located close to areas where drums are being handled at the point-of-excavation.

i) emergency eye wash and shower (located in the on-Site groundwater treatment building);

ii) two twenty-pound ABC type dry chemical fire extinguishers;

iii) two Self-Contained Breathing Apparatus (SCBA) units, with a minimum of two spare tanks;

iv) approved industrial First-Aid Kit for a minimum of 10 personnel, complete with buffer solutions for treating acid and caustic burns;

v) stretcher;

vi) fire blankets; and

vii) air horn.

10.0 EMERGENCY RESPONSE PLAN

10.1 PRE-EMERGENCY NOTIFICATION

Prior to site activities, notification will be made to the residents in the immediate area of the Site.

10.2 SITE SECURITY

A six foot chain link fence secures the former landfill with a lockable gate across the Site entrance. Access to the Site will be restricted to project personnel.

During active waste handling, security shall be provided by the Contractor. The Contractor's duties shall include:

i) limit vehicular access to the Site to authorized vehicles and personnel only;

ii) provide initial screening of all Site personnel and visitors. A list of authorized personnel and the name of their employer will be available at the Site;

iii) maintain a security log in which documentation is provided of all Site personnel, visitors and deliveries and any security incidents. This log will include the date, name, address, company, time in and time out for each employee and visitor. If unauthorized personnel are observed on Site and refuse to vacate the premises, appropriate law enforcement officials will be contacted for appropriate legal actions; and

iv) maintain a visitor log at the Site. Visitors will not be allowed to enter without the knowledge of the contractor and approval of the Engineer. All visitors will be required to complete training in accordance with the HASP prior to gaining access to the secured areas of the Site (e.g., excavation areas).

10.3 ON-SITE CONTINGENCY PLAN

If a release of hazardous material occurs on Site, the protocols presented in Section 10.3.1 will be followed and the following actions will immediately be taken:

i) the individual that observes the release will immediately notify the Engineer and Site Safety Officer;

ii) take immediate action to control and contain the release within the Site boundaries;

iii) keep unnecessary personnel away, isolate the area of release, and deny entry;

iv) do not allow anyone to touch released material;

v) stay upwind; keep out of low areas; and

vi) keep combustibles away from the released material.

If human health or the environment are threatened, the Engineer will notify the National Response Center (NRC) (800) 438-2427, the State Emergency Response Commission (SERC) (518-457-4107), and any potentially effected area residents or establishments as soon as possible . The SERC and the NRC will be notified of any release of reportable quantities including all releases which threaten human health or the environment. The NYSDEC will be notified of all releases within 24 hours and will determine if releases other than those noted above require notification to the NRC. See Section 11.0 for the Site's Spill Response Plan.

An employee alarm system to signify a major release or an emergency will consist of three short blasts using an air horn. An air horn will always be maintained at the Site during active work hours and will be immediately available to all personnel involved in Site activities.

Upon implementing the above procedures, the immediate areas of the release, including downwind areas, will be scanned with the organic vapor detector to identify the level of protection required for PPE to clean up the released material. As a minimum, personnel will wear all protective clothing specified in the HASP including supplied air respiratory protection as required. Air monitoring will determine if the level of respiratory protection can be downgraded. The air monitoring action levels as presented in the HASP will be followed during any clean-up of a release.

An assessment will then be made to determine the need to conduct post-cleanup soil sampling and analysis. NYSDEC will be provided with a copy of the assessment report. Collected samples will be analyzed for the waste constituents previously identified on Site. If analytical data are available for the released materials, these data will be used to determine the analytes of concern.

A release report will be prepared by CRA on behalf of NPEC submitted to the NYSDEC summarizing the release and response action.

10.3.1 PERSONNEL EMERGENCY CONTINGENCY PLAN

In the event of serious injury to on-Site personnel or contact with hazardous materials requiring medical attention, the Contractor will ensure that the following protocol will be followed:

i) in the event of an injury or chemical exposure, notify the Site Safety Officer who shall notify the Engineer and the Contractor's Project Manager;

ii) the Site Safety Officer will be responsible for contacting the necessary off-Site emergency facilities, with the Engineer as backup if the Site Safety Officer is unavailable;

iii) decontaminate personnel and administer appropriate first aid as required;

iv) transport personnel to the designated medical facility. The closest medical facility to the Site is the Albany Medical Center. The most direct route to the hospital is presented on Figure D.10.1.

The following directions describe the route to the Albany Medical Center:

- Take Riverside Ave. North to Routes 9 and 20 West
- Cross Hudson River and exit South Pearl Street (2nd exit)
- Turn left onto South Pearl Street
- Turn right onto Madison Avenue (2nd light)
- Turn left onto Eagle Street
- Turn right onto Morton Avenue
- Morton Avenue turns into Holland Avenue
- Follow Holland Avenue until end
- Albany Medical Center is at the end of Holland Avenue, 43 New Scotland Road, Albany, New York 12208.

10.3.2 FIRE EMERGENCIES

Fire fighting equipment (extinguishers) will be maintained in strategic locations within the Site to combat localized fires. The locations will be marked by an appropriate and highly visible sign. The Contractor shall ensure that designated personnel will be available whom are trained in fire fighting procedures and whom will be equipped with

SCBA when involved in fighting fires involving chemical substances which require the use of such respiratory equipment.

In the event of significant release of toxic or hazardous vapors from any source, the source of such vapors will be immediately contained by overpacking or covering with fill. Equipment operators will utilize self contained breathing apparatus during such operations. Alternate plans of contaminant removal will be developed by the Contractor and submitted to the Field Engineer prior to recommencing work in the area.

In the event that an accident or some other incident such as an explosion or an exposure to toxic chemical levels occurs during the course of the project, the Site Safety Officer shall notify the Engineer immediately and undertake corrective actions. The Site Safety Officer shall sound the fire alarm should conditions warrant evacuation of the area of the incident. The Site Safety Officer shall provide a written report, within 24 hours, to the Engineer. The report will include the following items:

a) Name, organization, telephone number, and location of the Contractor,

b) Name and title of the person(s) reporting the incident,

c) Date and time of accident/incident,

d) Location of accident/incident giving pertinent details,

e) Brief summary of accident/incident giving pertinent details including type of operation ongoing at time of accident,

f) Cause of accident/incident, if known,

g) Casualties (fatalities, disabling injuries),

h) Details of any existing chemical hazard of contamination,

i) Estimated property damage, if applicable,

j) Nature of damage and effect on contract schedule,

k) Action taken by the Contractor to ensure safety and security, and

l) Other damage or injuries sustained (public or private).

Following Site mobilization and prior to commencing Site activities, the Site Safety Officer will establish designated meeting places for personnel in the event that on-Site work zone evacuation is required. The Site Safety Officer will select these locations such that they are upwind of work zones based on wind directional monitoring.

10.4 TRANSPORTATION OF SHIPMENTS OFF-SITE

Only authorized transporters, as discussed in Section 10.2.2 of the DIRWP, will be used for the transportation of hazardous waste. If a release of material from a transport vehicle occurs while in transit, the following actions will be taken by the transport operator to reduce potential migration of the waste material.

i) Immediately notify the Contractor, who will in turn notify the NPEC Project Manager (Mr. Clyde Siverd (716) 477-1162), the CRA Project Manager (Mr. Jamie Puskas (519) 884-0510), and the NYSDEC On-Site Coordinator (OSC). In the event of a release of a reportable quantity, the National Response Center (NRC) ((800) 438-2427) will also be notified;

ii) Take immediate measures, within the capabilities of the transport driver, to control the release, if necessary;

iii) Contain and eliminate the release, if possible;

iv) The driver must remain within a safe distance of the vehicle, and will keep unnecessary people away, isolate the area of the release and deny entry to unauthorized personnel;

v) Stay upwind, keeping out of low areas, and do not allow contact with the released material;

vi) Contact the appropriate local authorities (police, fire department, traffic control, etc.) and local hazardous materials response unit; and,

vii) Other actions, as advised by the local spill response authorities.

Upon implementing these procedures, the same action to clean up the release will be implemented as described in Section 11.0.

10.5 HEALTH AND SAFETY PLAN REVIEW

Periodically or as required, the Site management team will review the emergency response plan and modify any section to account for changing Site conditions.

In the event of any Site emergency, a meeting will be held to discuss and critique the emergency response actions which were undertaken. Amendments to the emergency response plan will be made as necessary based on the findings of the meeting.

11.0 SPILL CONTROL AND RESPONSE

11.1 SCOPE

During all active work at the Site involving the transport and handling of excavated drums or other wastes, the Contractor will be required to implement and maintain an on-Site and off-Site Spill Control and Response Plan. This plan, as presented herein, will provide contingency measures for potential releases of material from drummed or other wastes handled on Site.

11.2 MATERIAL HANDLING

a) Bulked Liquids and Solids

All vehicles provided for the handling of bulked liquids (e.g., wastewater) and solids will be required to be in a good state of repair and will be operated by trained operators in a safe manner to prevent spills during handling. Should any tankers be used for hauling bulked liquids, they must be licensed for that purpose and must be inspected to ensure that all valves, manways and other access ports are secured to prevent leaks. Prior to use, the hauler will be required to document that the tanker is clean. Haulage units used for bulked solids will be inspected to ensure that their tailgates are secured and the loads are tarped to avoid spillage or tracking of excavated material.

b) Drummed Waste

All drum handling activities should be conducted in accordance with 29 CFR 1910.120(j).

The handling and transport of drummed waste will be, at all times, conducted in a controlled and safe manner which will minimize damage to structurally sound drums, repacks or overpacks. Section 4.2 of the DIRWP addresses drum handling procedures and equipment to be used which provides protection for the handling of explosive and/or shock sensitive waste.

Extreme care will be exercised in opening drums or other sealed containers in which the contents may be harmful to sampling personnel. When practical, a drum will not be moved or opened unless the drum appears to be structurally sound.

Drums will be opened in such a manner that excess interior pressure, as evidenced by bulging or swelling, has been safely relieved. If pressure cannot be relieved from a remote location, appropriate shielding will be placed between sampling personnel and the drums to reduce the risks of injury.

Prior to transferring drums to the appropriate staging facility all drums will be overpacked into DOT approved 85-gallon salvage drums. All drums that cannot be moved without rupture, leakage or spillage will be emptied into a DOT approved container salvage drum using a portable hand pump (for liquid wastes) or a hand shovel (for solids and sludges). Drums shall be moved by grappler, non-metallic slings, within a backhoe bucket or front-end loader or by other means that will minimize damage to containers and release of contents therefrom. A minimum inventory of 10 additional overpack units, in addition to those required to overpack the drums, will be provided on Site adjacent to the staging area and each active excavation area.

c) Equipment

The following equipment will be available on Site and used for any unexpected spills:

i) sand, fill or other non-combustible absorbent;

ii) 85-gallon DOT approved overpack drums (two adjacent to staging area and each active excavation area);

iii) non-toothed front end loader and/or backhoe; and

iv) shovels.

Note: Non-sparking tools may be required for potential LEL situations.

Hand tools which are used will generally be discarded with the waste material unless it is determined appropriate to decontaminate the tools. If tools are decontaminated, they will receive a detergent wash in addition to steam cleaning or hot water washing.

11.3 SPILL PREVENTION AND RESPONSE

The handling and transport of drummed waste will be, at all times, conducted in a controlled and safe manner which will minimize damage to the containers and prevent release of the contents. All intact drums with contents will be overpacked prior to removal to the appropriate staging facility, thereby mitigating the potential of leakage

during movement to the staging facility. Additional overpack units will be provided at the excavation area for use in the event of leakage or spillage.

In the event that a drum or container of liquid is spilled outside of the excavation areas, the drum handling team will immediately respond to the spill. The spilled liquids will be confined to the immediate area of the spill and the liquids will be pumped, with the use of a portable pump, into a repack drum. The spilled liquids will be confined by diking around the spill with native material or with an inert absorbent. Any residual liquids which cannot be pumped will be absorbed with a sufficient quantity of inert absorbent to ensure that no free liquids remain. If the spill occurred on soil, the visibly affected soil will be treated as contaminated material based on a visual determination of spill contamination. This material will be considered grossly contaminated soil and will be staged accordingly. Spills that occur outside of an area of excavation will be marked and reported to the NYSDEC.

Liquids spilled within excavations will be pumped, with the use of a portable hand pump, into a repack drum. Soil/fill adjacent to the spill area will be placed to absorb any residual liquid. Materials underlying the spill zone will be treated as contaminated materials based on a visual determination of spill contamination. This material will be excavated and staged in the stockpile of grossly contaminated soils , as discussed in Section 4.2.4 of the DIRWP.

In the event that a spill comes into contact with standing water, the effected water will be pumped from the excavation, containerized, and disposed/treated in accordance with applicable regulations. Absorbent material will be available during excavation of buried drums and handling of waste for use in the event of a liquid spill.

12.0 PERSONAL SAFETY AND RELATED EQUIPMENT

The Contractor will ensure that all on-Site personnel are equipped with the proper personal safety equipment and protective clothing appropriate for the hazardous material being handled and the nature of work being completed. The Contractor will ensure that all safety equipment and protective clothing is kept clean and well maintained. The PPE required for various work activities is summarized on Table D.12.1 and described in the following sections. Respiratory protection will be in accordance with Section 6.0.

12.1 NON-HAZARDOUS WORK ACTIVITIES

Safety equipment and apparel required for non-hazardous work activities consists of the following standard issue, Level D PPE:

i) hardhats;
ii) safety shoes or boots;
iii) eye protection;
iv) hearing protection if applicable;
v) workgloves;
vi) coveralls and outerwear; and
vii) safety harnesses and other equipment, as required.

Non-hazardous work activities are defined as those activities which would result in neither dermal nor inhalation exposure of workers to hazardous substances. The primary hazard to workers are those associated with heavy construction activities, i.e., moving machinery.

Non-hazardous work activities include:

i) All Site preparation activities;
ii) Geophysical surveying;
iii) Moving overpacked drums; and
v) Off-Site shipment of all waste material.

12.2 GENERAL EXCLUSION ZONE ACTIVITIES

The hazards presented to workers conducting general Exclusion Zone activities will include potential inhalation and dermal contact with Site substances in addition to general construction related hazards. There may also be a cut and puncture hazard should metallic debris be encountered. The use of respiratory protection will also increase the potential for "slip and trip" type accidents to occur. General Exclusion Zone activities include:

i) Test Pit Investigations;

ii) Drum Excavation and Removal;

iii) Drum Sampling and Soil Sampling Activities; and

iv) Decontamination Activities.

All excavation activities will be conducted in accordance with OSHA excavation regulations (29 CFR Part 1926 Subpart P .650 - .652) to ensure worker safety during excavation activities.

Safety equipment and apparel required for general exclusion zone work will consist mainly of Level B protection which includes Level D wear supplemented by the following:

i) Disposable outerwear, (e.g., Saranex® coveralls), the zipper of the outerwear will also be taped;

ii) Rubber overshoes or overboots taped to disposable outerwear;

iii) outer nitrile gloves (e.g., Edmont 37-165) taped to disposable outerwear and inner surgical nitrile gloves; and

iv) Supplied air respirator (MSHA/NIOSH approved) consisting of a full facepiece positive pressure-demand, self contained breathing apparatus (SCBA) or positive pressure airline respirators equipped with a 5-minute escape pack. Breathing air will be certified grade "D".

If Site conditions change and the waste streams become fully characterized, the Site Safety Officer may determine that Level C protection will be adequate for Site activities. Soil sampling activities and decontamination activities may be conducted in Level C protection as long as organic vapor readings taken at the time of sampling show less than 5 ppm in breathing zones. In these cases Level C protection will include Level D protection supplemented by the following:

i) Disposable outerwear, (e.g., Saranex® coveralls). The zipper of the outerwear will also be taped;

ii) Rubber overshoes or overboots taped to disposable outerwear;

iii) outer nitrile gloves (e.g., Edmont 37-165) taped to disposable outerwear and inner surgical nitrile gloves; and

iv) full-facepiece air purifying respirator equipped with a combination cartridge that provides protection for organic vapors/acid gas with a P100 particulate cartridge.

Table D.12.1 provides the required level of protection for the specific work activities being conducted at this Site.

Additional protective equipment usage guidelines to be implemented include:

i) Contact lenses will not be permitted;

ii) All disposable or reusable gloves worn on the Site will be nitrile rubber/elastic gloves or cotton gloves (for operators) with nitrile gloves worn underneath. All reusable gloves will be checked daily for punctures or tearing prior to donning;

iii) During periods of respirator usage in contaminated areas, respirator filters will be changed daily or upon breakthrough, whichever occurs first;

iv) Footwear used on Site will be work shoes or boots, and will be covered by rubber overshoes when entering or working in the Exclusion Zone or Contaminant Reduction Zone;

v) On-Site personnel unable to pass a respirator fit test will not enter or work in the Exclusion Zone or Contaminant Reduction Zone;

vi) All on-Site personnel will wear an approved hardhat. The Site Safety Officer will determine when the hard hat protection requirement may be waived;

vii) All reusable PPE worn on Site will be decontaminated at the end of each work day. The Site Safety Officer will be responsible for ensuring individuals decontaminate PPE before reuse;

viii) Duct tape will be used to ensure that disposable coveralls and gloves are tightly secured with the outerwear outside of the gloves when personnel are working within contaminated zones; and

ix) Off-Site transport drivers will not be permitted out of their vehicles when in any Exclusion and Contaminant Reduction Zones.

13.0 PROCEDURES FOR DONNING AND DOFFING OF PROTECTIVE CLOTHING AND EQUIPMENT

Donning:

i) Personally inspect all equipment to be worn by wearer;

ii) Adjust hard hat for proper fit;

iii) While standing or sitting, step into legs of suit; ensure proper placement of legs and feet within suit, then gather suit around the waist;

iv) Put on boots; tape leg cuff of suit over the tops of the boots using duct tape;

v) Don respirator and adjust it;

vi) Put sleeves of suit over arms;

vii) Put on inner gloves;

viii) Put on hard hat;

ix) Secure the suit by closing all fasteners. Tape over fasteners if protective flap is not already provided;

x) Put on outer gloves; tape cuff of sleeve to tops of gloves; and

xi) Have an assistant check to determine if all equipment is secure and functioning normally and that there are no other problems.

Doffing:

i) Decontaminate the wearer of equipment first. Boots will be washed off in a boot wash with a soapy water solution;

ii) Remove any extraneous or disposable clothing, boots, outer gloves, hard hat, and tape;

iii) Remove arms, one at a time, from suit. Be careful not to have any contact between the outer surface of the suit and the wearer's body. Keep the inner gloves on;

iv) While sitting, remove both legs from suit;

v) Remove respirator. Wash respirator in disinfecting solution. Suspend respirator to dry and replace cartridges if wearing air purifying respirators. (Cartridges are to be replaced upon breakthrough or at the beginning of each day.);

vi) Remove inner gloves by rolling them off the hand, inside out; and

vii) Remove inner clothing, and thoroughly wash the body (Necessary prior to eating and drinking and at end of work day).

14.0 HEAT STRESS/COLD STRESS

14.1 HEAT STRESS

Heat stress is one of the most common hazards encountered at a Site, and there are a number of factors which have an effect in determining the amount of heat stress experienced by an individual worker. These factors include environmental conditions, type of clothing worn, workload, and individual characteristics. Since heat stress is a common hazard and has the potential to become a serious illness, the Contractor will develop a program to protect its employees which meets the following requirements.

All employees will be trained in the following:

i) Individual factors which influence an individual's susceptibility to heat;

ii) Environmental characteristics such as temperature, humidity, wind speed, and cloud cover;

iii) Body response to heat;

iv) Effect of personal protective equipment and workload;

v) The various types of heat disorders and their associated symptoms; and

vi) Heat stress program - acclimatization, monitoring, work/rest regimen, and fluid intake (balanced electrolytic fluids).

Training for the heat stress program will be included at the time of the initial training.

Drinking water will be supplied to workers on a regular basis as required to prevent dehydration.

14.2 COLD STRESS

If work is performed during cold months, workers may be exposed to cold stress during the response program. The Contractor will provide appropriate cold weather clothing and heated shelter for all workers and will monitor for cold stress. Workers who are exposed to temperatures below -10°F with wind speeds greater than 5 mph will be medically certified as suitable for such exposure. All workers certified for exposure will adhere to the work warm-up schedule as specified in the current ACGIH standards as outlined in the booklet entitled "Threshold Limit Values and Biological Exposure Indices". A copy of the ACGIH standard will be available on Site for reference if it is anticipated that implementation of the work warm-up schedule will be required.

All workers who may be subjected to cold stress will receive training during the initial Site training session in the following:

i) Environmental characteristics such as temperature, humidity, wind speed, and cloud cover;

ii) Body response to cold;

iii) The various types of cold stress and their associated symptoms; and

iv) Cold stress program.

15.0 PERSONAL HYGIENE PROTOCOLS

The Contractor will be responsible for, and ensure that all Contractor personnel performing or supervising work activities within the Exclusion Zone, or exposed or subject to exposure to vapors, liquids, or solids containing Site constituents, observe and adhere to the personal hygiene-related provisions of this section. On-Site personnel found to be disregarding the personal hygiene-related provisions of this plan will, at the request of the Engineer or Site Safety Officer, be barred from the Site.

The Contractor will ensure that the following equipment/facilities are available for the personal hygiene of all on-Site personnel:

i) Suitable disposable outerwear (e.g., Saranex® suits, inner and outer gloves, and respirator cartridges), gloves, footwear, and respiratory protection on a daily basis for the use of on-Site personnel;

ii) Contained storage and disposal for used disposable outerwear;

iii) Personnel hygiene facility complete with change area, showers, toilets and washbasins with contained storage for all wash waters;

iv) Lunch area.

The Contractor will also enforce the following regulations for personnel working within the Exclusion Zone:

i) On-Site personnel will wear disposable outerwear and gloves at all times whenever entering or working in the Exclusion Zone or Contaminant Reduction Zone;

ii) Used disposable outerwear will not be reused if deemed to be unsuitable to provide the necessary protection, and when removed, will be placed inside disposable containers provided for that purpose;

iii) Smoking will be prohibited except in a designated smoking area;

iv) Eating and drinking (i.e., gatorade or water) will be prohibited except in the designated lunch or break area;

v) Disposable outerwear will be removed prior to entering the lunch area, and prior to cleansing hands, face, neck, and other exposed areas; and

vi) On-Site personnel will thoroughly cleanse their hands and other exposed areas before entering the smoking or lunch area.

15.1 GENERAL SITE SANITATION

General Site sanitation will be implemented pursuant to 29 CFR 1910.120 (n).

16.0 EQUIPMENT AND PERSONNEL DECONTAMINATION

16.1 PERSONNEL DECONTAMINATION PROCEDURES

Any Site personnel entering and working within the Exclusion Zone will be required to follow the personnel decontamination procedures presented below.

Personnel decontamination will consist of:

i) Contaminant Reduction Zone - boot and glove wash with detergent, tape removal, and outer glove removal; removal of boots, gloves, disposable suit, respirator, hard hat, and inner gloves. Personnel decontamination will be conducted at the entrance to the Support Zone away from the equipment decontamination area. Protective clothing which is discarded will be collected and disposed of. Typical personnel decontamination procedures are presented on Figure D.16.1; and

ii) Support Zone - redress area.

All personnel will have removed their protective clothing prior to entering the wash area. Personnel will wash their hands and face in the wash area before entering the lunch and break areas to eat, drink or smoke. At the end of their work shift, personnel will wash and redress in the wash area prior to leaving the Site.

16.2 EQUIPMENT DECONTAMINATION PROCEDURES

All equipment used within the Exclusion Zones and which comes in contact with potentially hazardous materials will be decontaminated on the existing decontamination pad. Decontamination procedures shall include: removing soil/mud from machines (note that a brush may be required to scrape areas not coming clean); water rinsing using a solution of water and Alconox; and a final water rinse with a high pressure low volume steam cleaning unit. Personnel shall wear, at a minimum, Level C protection when decontaminating equipment. Any changes in the level of PPE would be assessed in the field by the Site Safety Officer. Runoff will be collected and transferred to the on-Site wastewater storage container for future disposal. Following decontamination and prior to leaving the decontamination pad, the Engineer will inspect the equipment and may require additional cleaning, as deemed necessary. This inspection shall be included in the Site log. The Site Safety Officer is ultimately responsible for ensuring that the equipment has been sufficiently decontaminated prior to leaving the Site.

16.3 SAMPLING EQUIPMENT DECONTAMINATION

All sampling equipment used to collect samples for chemical analysis will be decontaminated. Decontamination will be conducted in accordance with the protocols presented in Section 7.0 of the SAP. Spent cleaning solvents will be collected in a drum for future disposal.

17.0 AIR MONITORING

17.1 GENERAL

During the progress of Site activities, the Contractor will complete real-time air monitoring for on-Site air quality. Real-time air monitoring will be conducted for explosive gases, oxygen levels, and total volatile organic vapors. The Contractor's Site Safety Officer will review all of the air data collected during the course of the project on an ongoing basis and in consultation with the Engineer, modify those work practices as necessary.

17.2 BACKGROUND MONITORING

Background monitoring for total organic vapors using real-time monitoring will be conducted prior to initiating Site activities and throughout the period of Site activities. Any departures from general background during this period will be reported to the Engineer who will, in conjunction with the Site Safety Officer, determine the cause of the deviation and need to adjust Site operations.

17.3 REAL-TIME AIR MONITORING

Real-time air monitoring with appropriate instruments that have been properly calibrated will be conducted by the Contractor in accordance with the requirements of this section of the HASP or as needed. Monitoring will be conducted within the Exclusion Zone, at two Exclusion Zone perimeter locations downwind of excavation or drum handling activities and at one Exclusion Zone perimeter location which is upwind of the activities.

If actual field operations reveal that hourly sampling of the downwind Exclusion Zone perimeter locations is not practical or necessary, adjustments may be made after consultation between the Site Safety Officer and the Engineer. Any such modifications shall be memorialized in writing.

If, during the real-time monitoring, an unexplained organic vapor meter reading of greater than 1 ppm above background ("background" shall mean the readings obtained at an upwind location which is not being impacted by Site activities) is sustained for a duration of fifteen minutes or odors are detected at a downwind Exclusion Zone perimeter monitoring location, the Contractor shall review and modify work procedures

at the Site to minimize the potential for air emission levels greater than 1 ppm above the background at the Exclusion Zone. These modifications could include modifying the Exclusion Zone boundaries; reducing the area of open excavation; and/or reducing the rate at which materials are excavated. If these actions are insufficient to control emissions, additional engineering controls such as foam, water, and/or enclosures would be considered. These additional engineering controls are beyond the current scope of work and would have to be further evaluated if deemed necessary.

In addition to the Exclusion Zone perimeter monitoring, the Contractor shall monitor the immediate area of active work at a frequency of once per half hour or as deemed necessary by the Site Safety Officer. In addition, monitoring will be conducted for explosive gases, and oxygen levels in the Exclusion Zone on an as needed basis. Table D.17.1 presents air monitoring action levels.

17.4 PERSONAL MONITORING

In addition to performing real time monitoring for total volatile organics, personal monitoring will be conducted for those employees with the highest potential for exposure to Site contaminants. It is expected that personnel involved in drum excavations and drum sampling, if required, will be the individual(s) on which personal sampling will be performed. The frequency of sampling to document worker exposure will be determined by the Site Safety Officer.

The analytical results of the waste characterization samples collected from drum contents during the IRM Drum Removal activities indicate that the primary chemicals of concern with the greatest potential to become airborne are the volatile organic compounds: xylene, toluene, benzene, acetone, diethyl ether, chloroform, 1,2-dichloroethene (Total), ethylbenzene, tetrachloroethane, trichloroethene, 1,1,1-trichloroethane, 1,2-dichloroethane, and methyl thiophene. Although concentrations of several semi-volatile organic compounds were detected in the post-excavation soil samples and composite soil/debris samples; these compounds have a much lower potential to become airborne and, therefore, will not be monitored. At a minimum, personal monitoring for xylene, toluene and benzene will be conducted during drum excavation and sampling activities utilizing either air sampling pumps with charcoal adsorber tubes and/or passive dosimeters. If charcoal tubes are used, the National Institute for Occupational Safety and Health (NIOSH) Method 1501 will be employed.

The Contractor's health and safety plan will specify the sampling methodology, frequency, and procedures to be used for conducting the personal monitoring. The Contractor will work with an American Industrial Hygiene Association (AIHA) approved laboratory.

The results of the personal monitoring program will be provided to the personnel that were monitored, and the Engineer.

17.5 WIND DIRECTIONAL MONITORING

The Contractor will furnish and maintain a wind circulation sock at the drum staging area to provide information to assist in the determination of the direction of any potential emissions migrating from the Site. Perimeter air monitoring locations may be adjusted based upon the wind directional monitoring.

17.6 ANALYSIS CALIBRATION AND DATA REPORTING

Calibrations of all monitoring equipment will be completed by the Contractor on a daily basis both at the start and finish of the day. This will be recorded in a calibration log.

The Engineer will be immediately advised when results indicate:

- required modifications to existing Site protocols;
- excessive exposure to employees; and
- possibility of excessive contamination having occurred in off-Site regions.

Results will be reported verbally to the Engineer immediately if they require a decision on Site operation or daily when no excursions are reported. Written data sheets detailing monitoring results will be presented to the Engineer the following day. The air monitoring report forms will include the following information:

i) Site Location/Date

ii) Work Process/Operation Name

iii) Sampling Method Used

iv) Instrument Calibration Record at Sample Location

v) Temperature, Pressure, Humidity at Sample Location

vi) Area Sampling Location Diagram

vii) Area Sample Description/Location

viii) Field Notes

- Description of Operations and Complaints/Symptoms
- Chemicals/Materials/Equipment in Use
- Engineering/Administration Controls in Effect
- Personal Protective Equipment in Use
- Sampling Observations/Comments

18.0 CONTAMINANT MIGRATION CONTROL

All vehicles and equipment used in the Exclusion Zone will undergo decontamination procedures in the Contaminant Reduction Zone prior to leaving the Site. The Contractor's Site Safety Officer will certify that each piece of equipment has been decontaminated prior to removal from Site.

Decontamination procedures are discussed in Section 16.0 and will be performed on the existing equipment decontamination pad, within the Contaminant Reduction Zone.

Personnel engaged in vehicle decontamination will wear protective equipment including appropriate disposable clothing and respiratory protection.

19.0 PARTICULATE EMISSION CONTROL

During all Site activities, the Contractor will implement and enforce a dust control program to minimize the generation and off-Site migration of fugitive particulate emissions.

All roadways, designated work areas and other sources of dust generation will be controlled by application of water and/or calcium chloride as determined necessary by the Engineer in consultation with the Site Safety Officer.

20.0 SAFETY MEETINGS

The Site Safety Officer will conduct daily safety meetings which will be mandatory for all Site personnel. The meetings will provide refresher courses for existing equipment and protocols, and will examine new Site conditions as they are encountered.

Additional safety meetings will be held on an as required basis, for example if the work environment changes.

Should any unforeseen or Site-peculiar safety related factor, hazard, or condition become evident during the performance of work at this Site, the Contractor will bring such to the attention of the Engineer in writing as quickly as possible. In the interim, the Contractor will take prudent action to establish and maintain safe working conditions and to safeguard employees, the public, and the environment.

No visitors or personnel will be allowed to enter the Exclusion Zone or Contaminant Reduction Zone unless they have the prior approval of the Site Safety Officer and the Engineer.

21.0 CONFINED SPACE ENTRY PROCEDURE

A confined space provides the potential for unusually high concentrations of contaminants, explosive atmospheres, oxygen deficient atmospheres, limited visibility and restricted movement. This Section establishes requirements for safe entry into, continued work in, and safe exit from confined spaces. Additional information regarding confined space entry can be found in 29 CFR 1926.21, 29 CFR 1910.146 and NIOSH 80-106. At this Site, confined spaces may be encountered during drum removal activities. The Contractor's Standard Operating Procedure along with their permit will be used for actual Site work. The following sections present minimum guidelines for conducting confined space work.

21.1 DEFINITIONS

Confined Space: A space or work area not designed or intended for normal human occupancy, having limited means of egress and poor natural ventilation; and/or any structure, including buildings or rooms, which have limited means of egress.

Confined Space Entry Permit (CSEP): A document to be initiated by the supervisor of personnel who are to enter into or work in a confined space. The CSEP will be completed by the personnel involved in the entry and approved by the Site Safety Officer before personnel will be permitted to enter the confined space. The CSEP shall be valid only for the performance of the work identified on the permit and for the location and time specified on the permit. The beginning of a new shift with change of personnel will require the issuance of a new CSEP. A copy of a CSEP is provided in Attachment D.

Confined Space Observer: An individual assigned to monitor the activities of personnel working within a confined space. The confined space observer monitors and provides external assistance to those inside the confined space. The confined space observer summons rescue personnel in the event of emergency and assists the rescue team. Duties of a confined space observer are further discussed in Section 21.4(i).

21.2 GENERAL PROVISIONS

The following general provisions will apply to confined space entry:

i) confined spaces shall be identified with a posted sign which reads: Caution - Confined Space;

ii) only personnel trained and knowledgeable of the requirements of these confined space entry procedures will be authorized to enter a confined space or be a confined space observer;

iii) a CSEP must be issued prior to the performance of any work within a confined space. The CSEP will become a part of the permanent and official health and safety record for the response action at the Site;

iv) natural ventilation shall be provided for the confined space prior to initial entry and for the duration of the CSEP. Positive/forced mechanical ventilation may be required. However, care should be taken to not spread contamination outside of the enclosed area;

v) if flammable liquids are anticipated to be within the confined space, explosion proof equipment will be used. All equipment shall be positively grounded;

vi) the contents of any confined space shall, where necessary and where possible, be removed prior to entry. All sources of ignition must be disconnected and/or removed prior to entry;

vii) hand tools used in confined spaces shall be in good repair, explosion proof and spark proof, and selected according to intended use. Where possible, pneumatic power tools are to be used;

viii) hand-held lights and other illumination utilized in confined spaces shall be equipped with guards to prevent contact with the bulb and must be explosion proof;

ix) compressed gas cylinders, except cylinders used for self-contained breathing apparatus, shall not be taken into confined spaces. Gas hoses shall be removed from the space and the supply turned off at the cylinder valve when personnel exit from the confined space;

x) if a confined space requires respiratory equipment or where rescue may be difficult, body harnesses, extraction equipment and lifelines will be used. The outside observer shall be provided with the same equipment as those working within the confined space;

xi) a ladder and extraction device is required in all confined spaces deeper than the employee's shoulders. The ladder shall be secured and not removed until all employees have exited the confined space;

xii) only SCBA or NIOSH approved airline respirators equipped with a 5-minute emergency air supply (egress bottle) shall be used in untested confined spaces or

in any confined space with conditions determined immediately dangerous to life and health;

xiii) where air-moving equipment is used to provide ventilation, chemicals shall be removed from the vicinity to prevent their introduction into the confined space;

xiv) vehicles shall not be left running near confined space work or near air-moving equipment being used for confined space ventilation;

xv) smoking in confined spaces will be prohibited at all times; and

xvi) any deviation from these confined space entry procedures requires the prior permission of the Site Safety Officer.

21.3 PROCEDURE FOR CONFINED SPACE ENTRY

The Site Safety Officer and confined space entry personnel shall adhere to the following confined space entry procedures:

i) evaluate the job to be done and identify the potential hazards before a job in a confined space is scheduled;

ii) if possible, ensure removal of any standing fluids that may produce toxic or air displacing gases, vapors or dust;

iii) initiate a CSEP in concurrence with the Engineer or designated alternative;

iv) ensure that any hot work (welding, burning, open flames or spark producing operation) that is to be performed in the confined space has been approved by the Engineer and is indicated on the CSEP;

v) ensure that the confined space is ventilated before starting work in the confined space and for the duration of the time that the work is to be performed in the confined space;

vi) ensure that the personnel who enter the confined space and the confined space observer helper are familiar with the contents and requirements of this instruction and the CSEP;

vii) ensure remote atmospheric testing of the confined space prior to and during employee entry and before validation/revalidation of a CSEP to ensure the following requirements:

   a) oxygen content,

   b) no concentration of combustible gas in the space. Sampling will be done throughout the confined space and specifically at the lowest point in the space,

c) the absence of other atmospheric contaminants if the space has previously contained toxic, corrosive or irritant material, and

viii) designate whether hot or cold work will be allowed. If all tests are satisfactory, complete the CSEP listing any safety precautions, protective equipment or other requirements; and

ix) ensure that a copy of the CSEP is posted at the work Site, a copy is filed with the work supervisor and a copy is furnished to the Engineer.

The CSEP shall be considered void if work in the confined space does not start within one hour after the tests in Item vii) above are performed or if significant changes within the confined space atmosphere or job scope occurs.

The CSEP posted at the work Site shall be removed at the completion of the job or the end of the shift, whichever is first.

21.4 CONFINED SPACE OBSERVER

The duties of the confined space observer are as follows:

i) while personnel are inside the confined space, a confined space observer will monitor the activities and provide external assistance to those in the confined space. The observer will not have other duties which may take his attention away from the work or require him to leave the vicinity of the confined space at any time while personnel are in the confined space;

ii) the confined space observer shall maintain at least voice contact with all personnel in the confined space. Visual contact is preferred, if possible;

iii) the confined space observer shall be instructed by his supervisor or the Site Safety Officer in the method for contacting rescue personnel in the event of an emergency;

iv) if irregularities within the confined space are detected by the observer, personnel within the confined space will be ordered to exit;

v) in the event of an emergency, the confined space observer must not enter the confined space prior to contacting and receiving assistance from a helper. Prior to this time, he should attempt to remove personnel with the lifeline and to perform all other rescue functions from outside the space; and

vi) a helper shall be designated to provide assistance to the confined space observer in case the observer must enter the confined space to retrieve personnel.

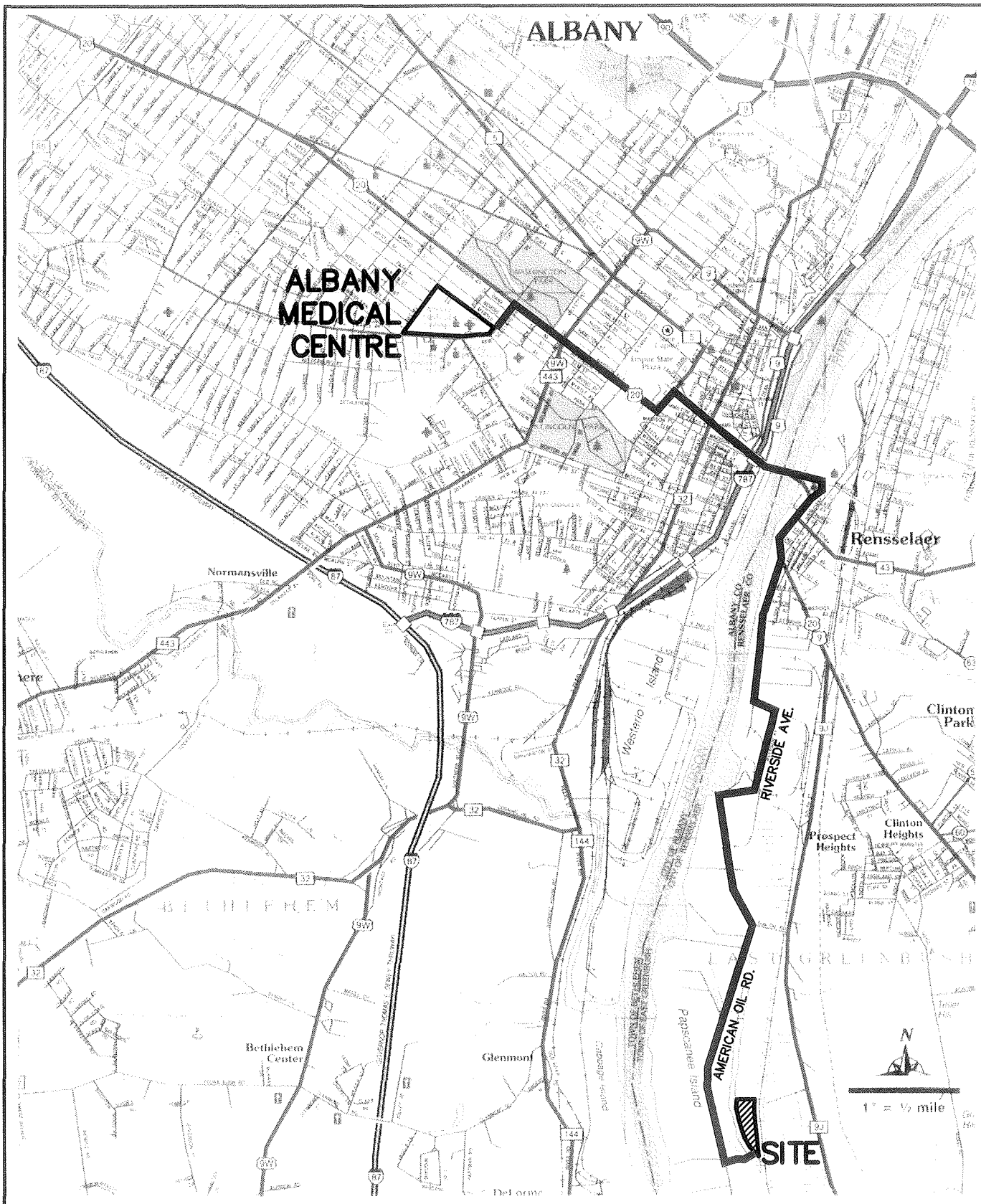

figure D.10.1

HOSPITAL ROUTE
STERLING SITE 3
East Greenbush, New York

SOURCE:
1990 DELORME MAPPING COMPANY
UPSTATE NEW YORK
CITY STREET MAPS

CRA

07830--90(021)GN--WA005 JUL 22/99

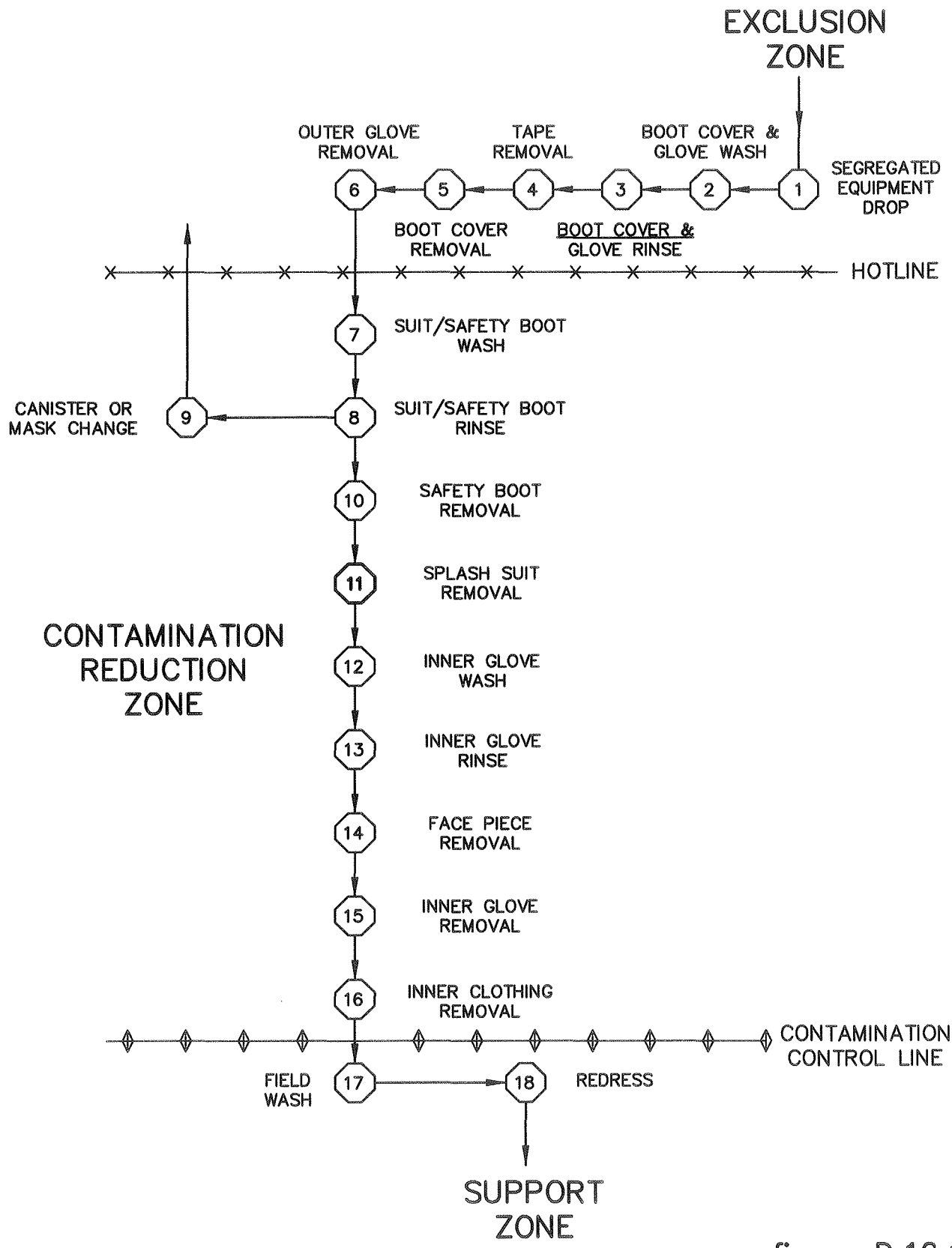

figure D.16.1

TYPICAL PERSONNEL DECONTAMINATION PROCEDURES
STERLING SITE 3
East Greenbush, New York

CRA

07830-90(021)GN-WA008 JUL 22/99

TABLE D.1.1

HAZARD/RISK ANALYSIS FOR THE
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

Work Activity	*Anticipated Hazard/Risk*	*Hazard Control*
Site Preparation Activities (Mobilization) and Demobilization Activities	• slip/trip/fall hazards • potential back injuries from lifting and moving supplies and equipment • potential bites from insects, bees, wasps, and snakes	• Level D PPE • participate in all required training programs
Site Clearing Activities and Geophysical Survey	• slip/trip/fall hazards • potential back injuries from lifting and moving supplies, equipment and debris • potential bites from insects, bees, wasps, and snakes • hazards presented by the use of specialized equipment (chainsaws) • direct contact with waste materials or potentially contaminated soils • potential heat or cold stress	• Level D and/or Level C PPE as determined by the Site Safety Officer • participate in all required training programs • only essential personnel in the work area • adhere to all Site procedures including personnel decontamination • review the standard operating procedure for chainsaws • use the "buddy system" • keep first aid equipment readily available
Test Pit Investigations, Soil and Drum Excavation Waste Sampling Activities (soil and drums)	• slip/trip/fall hazards • potential back injuries from lifting and moving supplies, equipment and drums • potential bites from insects, bees, wasps, and snakes • hazards presented by the use of heavy equipment (i.e. being struck by equipment, excessive noise and fumes) and drum removal equipment	• Level B PPE or Level C PPE as determined by the Site Safety Officer (i.e. confirmatory soil sampling) • participate in all required training programs • only essential personnel in the work area • adhere to all Site procedures including equipment and personnel decontamination

TABLE D.1.1

HAZARD/RISK ANALYSIS FOR THE DRUM INVESTIGATION/REMOVAL WORK PLAN STERLING SITE 3 EAST GREENBUSH, NEW YORK

Work Activity	*Anticipated Hazard/Risk*	*Hazard Control*
Test Pit Investigations, Soil and Drum Excavation Waste Sampling Activities (soil and drums)	• direct contact with drums containing unknown wastes and potentially contaminated soils and groundwater • potential heat or cold stress • pinch points on hands while moving drums • hazards presented by confined space entry • potential fire or explosion hazards	• review the standard operation procedure for any heavy equipment operation, drum excavation and confined space entry procedures • use non-sparking, non-metallic slings when moving drums • use the "buddy system" • keep first aid equipment readily available • use proper confined space entry permit
Site Restoration Activities and Moving and Loading Overpacked Drums	• slip/trip/fall hazards • potential back injuries from moving drums • potential leg injuries from falling drums • potential bites from insects, bees, wasps, and snakes • hazards presented by heavy equipment and backing vehicles • potential heat or cold stress • pinch points on hands from moving drums • potential dust generation creating fugitive emissions • potential heat or cold stress	• Level D PPE • participate in all required training programs • only essential personnel in the work area • adhere to all Site procedures • review standard operating procedures for any heavy equipment operation or drum loading equipment • make sure backup alarms are functioning • keep first aid equipment readily available

TABLE D.1.1

HAZARD/RISK ANALYSIS FOR THE
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

Work Activity	*Anticipated Hazard/Risk*	*Hazard Control*
Decontamination Activities	• slip/trip/fall hazards • potential back injuries from moving supplies or equipment • potential heat or cold stress • direct contact with decontamination solvents and Site contaminants • potential hazards from operating specialized decontamination equipment (i.e. steam cleaner may cause burns)	• Level C PPE • participate in all required training programs • only essential personnel in the work area • adhere to all Site procedures including personnel decontamination • review standard operating procedures for use of decontamination equipment • keep first aid equipment readily available

TABLE D.12.1

SUMMARY OF PERSONAL PROTECTIVE EQUIPMENT
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

	Work Activity	*Personal Protective Equipment Required*
1)	Site Preparation Activities (e.g. geophysical surveying).	Level D or Level C (if air monitoring indicates the need)
2)	Non-Hazardous Work Activities (no dermal or inhalation exposure to waste materials e.g. handling of sealed drums, and off-Site shipment of all waste material).	Level D
3)	Test Pit Excavations.	Level B if drums are encounted or if organic vapor levels are greater than 5 ppm in worker breathing zones, otherwise Level C
4)	Drum Excavation and Removal.	Level B
5)	Sampling of Uncharacterized Drums of Waste.	Level B
6)	Sampling of Characterized Waste Drums.	Level B or Level C as determined by the Site Safety Officer
7)	Sampling of Soils.	Level C or Level B if organic vapor levels are greater than 5 ppm in worker breathing zones
8)	Decontamination Activities.	Level C or Level B if organic vapor levels are greater than 5 ppm in worker breathing zones

TABLE D.17.1

AIR MONITORING AND AIR MONITORING ACTION LEVELS
DRUM INVESTIGATION/REMOVAL WORK PLAN
STERLING SITE 3
EAST GREENBUSH, NEW YORK

Monitoring Device	*Action Level*	*Action*
Combustible Gas Indicator	>1% LEL 1-20% LEL (for a non confined space work)	Limit ignition sources work with caution be prepared to cease operations
	>20% LEL (for a non confined space work)	Cease operations and move to a safe place. Notify the Site Safety Officer. Do not continue working until conditions are constantly below 20% LEL
Oxygen Meter	<19.5%	Workers must be in supplied air respirators
	>23.5%	Shut down activities. Determine the source and take corrective actions. Notify the Site Safety Officer.
Photoionization or Flame Ionization Detector	>5 ppm sustained at downwind perimeter of the Exclusion Zone	Shut down activities. Implement engineering controls.
Radiation Survey Meter	> 2 mR/hr	Shut down activities. Evacuate area. Notify the Engineer, Site Safety Officer and Health and Safety Manager so the situation may be addressed.

ATTACHMENT A

TRAINING ACKNOWLEDGEMENT FORM

TRAINING ACKNOWLEDGEMENT FORM

NAME: _____

ADDRESS: _____

SOCIAL SECURITY: _____

EMPLOYER: _____

I have completed and understand the applicable training program, for work to be carried out during site activities at the Sterling Site 3, East Greenbush, New York, including the following topics:

a. Received appropriate OSHA Hazardous Waste and Emergency Response Training,
b. Work Rules and Safety Requirements,
c. Personal Protection Equipment,
d. Potentially Hazardous Chemicals,
e. Emergency Equipment,
f. Reporting Injuries and Illnesses,
g. Emergency Procedures,
h. Job Assignments,
i. Personal hygiene,
j. Medical Tests,
k. Motor Tests, and
l. Standard Operating Procedures.

I further confirm that a respirator qualitative fit test was performed and that I have been issued a respirator of the same type.

By signing this form, I relieve NPEC and its members and their officers, employees and agents of the liability of consequences related to potential hazards associated with site entry and work.

Site Person

Signature: _____ Date: _____

I certify that this Site Person has received adequate safety training and instruction and that this person is proficient in the use of protective clothing and equipment and knowledgeable in all aspects of this Health and Safety Plan.

Safety Officer

Signature: _____ Date: _____

ATTACHMENT B

HEALTH AND SAFETY PLAN ACKNOWLEDGEMENT FORM

HEALTH AND SAFETY PLAN
ACKNOWLEDGEMENT FORM

I have received and read the Site Health and Safety Plan for the Drum Removal Investigation Work Plan for Sterling Site 3, East Greenbush, New York. I agree to abide by these safety rules, regulations, and guidelines while working on site; and understand that any violation of these rules will result in my removal from the work site.

Signature: _____ Date: _____

Print Name: _____

ATTACHMENT C

EMERGENCY TELEPHONE NUMBERS

EMERGENCY CONTACTS

Emergency	Organization/Agency	Emergency #
General	1. NPEC Project Administrator (Joe Gabriel)	(716) 588-4369
	2. NPEC Project Manager (Clyde Siverd)	(716) 477-1162
	3. NYSDEC Project Manager (David Tromp)	(518)-457-5637
	4. CRA Project Manager (Jamie Puskas)	(519) 884-0510
Injury	1. Ambulance (Town of East Greenbush)	(518) 479-1212
	2. Albany Medical Center	(518) 262-3125
Poison	1. Poison Control Center	(800) 962-1253
Fire/ Explosion	1. Fire Emergency (Town of East Greenbush)	(518) 479-1212
Hazardous Material Spill or Release	1. USEPA National Response Center	(800) 438-2427
	2. New York State Police	(315) 457-2600
	3. New York State Department of Environmental Conservation (Albany)	(800) 457-7362
	4. New York State Department of Health (Syracuse)	(315) 428-4802
Natural	1. General Emergency	(518) 479-1212
	2. New York State Police	(315) 457-2600

Note:

Prior to initiation of project activities phone numbers will be verified.

ATTACHMENT D

CONFINED SPACE ENTRY PERMIT

CONFINED SPACE ENTRY PERMIT

SITE NAME/LOCATION/REF. NO.: _____

WORK ACTIVITY: _____

Duration: _____ Issue Date: _____ Time: _____ Filled Out by: _____

POTENTIAL HAZARDS:
(System Generated)

(Work Generated)

CONFINED SPACE ENTRY PERMIT

AIR MONITORING: PRE-ENTRY_____ PERIODIC_____CONTINUOUS_____

DATE/TIME	*BY (INIT)*	*%O_2*	*ppm CO*	*% LEL*	*OTHER TEST TYPE*	*RESULT*

ISOLATION:

Purging Required: YES | | NO | | PURGING CONFIRMED:

Safety Tags Required: YES | | NO | |

VENTILATION REQUIRED: YES | | NO | |

CONTINUOUS _____ OTHER _____

EMERGENCY RESCUE EQUIPMENT REQUIRED:

_____Communications Device
_____First Aid Kit
_____Stretcher/Backboard
_____Fire Extinguisher
_____SCBA
_____Other_____

_____Winch/Hoist
_____Harness with Lifeline (type)
_____PPE (type)
_____Lighting (type)

CONFINED SPACE ENTRY PERMIT

PERSONAL PROTECTIVE EQUIPMENT REQUIRED:

_____	Hardhat	_____	Respiratory Protection (type)
_____	Safety Glasses		
_____	Face Shield	_____	Coveralls
_____	Ear Plugs/Muff		Chemical Suits
_____	Emergency Escape Pack	_____	Rain Suits
_____	Lanyards	_____	Lifelines
_____	Gloves (type)_____		
_____	Harnesses (type)_____		
_____	Other_____		

ADDITIONAL WORK INSTRUCTIONS:

EMERGENCY CONTACT PHONE NO._____

PERSONS ENTERING CONFINED SPACE (PRINT NAME)

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

STANDBY PERSON REQUIRED: YES:_____ NO:_____ (PRINT NAMES)

_____	_____

CONFINED SPACE ENTRY PERMIT

I have reviewed and met the requirements of this permit and expect that this work shall be done safely. Entrants have been instructed on the proper confined space entry procedures, requirements and conditions.

ENTRY AUTHORIZED BY:_____ DATE:_____

All work under this permit has been completed and all materials and entrants have been withdrawn from the confined space.

_____ _____

Attendant or Entrant Date

ATTACHMENT E

MATERIAL SAFETY DATA SHEETS

Please reduce your browser font size for better viewing and printing.

MSDS Material Safety Data Sheet

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

MALLINCKRODT J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

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

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

ETHYL ETHER

MSDS Number: E2340 --- *Effective Date: 10/15/97*

1. Product Identification

Synonyms: Ether; ether,anhydrous; Diethyl ether; 1,1'Oxybisethane;ethyl oxide; diethyl oxide
CAS No.: 60-29-7
Molecular Weight: 74.12
Chemical Formula: C2H5OC2H5
Product Codes:
J.T. Baker: 5487, 9244, 9248, 9250, 9251
Mallinckrodt: 0847, 0848, 0852

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Diethyl Ether	60-29-7	100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.

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

Health Rating: 2 - Moderate
Flammability Rating: 4 - Extreme (Flammable)
Reactivity Rating: 2 - Moderate
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Irritant. General anesthesia by inhalation can occur. Continued exposure may lead to respiratory failure or death. Early symptoms include irritation of nose and throat, vomiting, and irregular respiration, followed by dizziness, drowsiness, and unconsciousness.
Ingestion:
Irritating to the mucous membranes. Ingestion of 1 or 2 ounces may be fatal. Because of volatility the stomach becomes distended, which may cause belching. Other symptoms can include vomiting, unconsciousness, and coma.
Skin Contact:
Irritating to the skin and mucous membranes by drying effect. Can cause dermatitis on prolonged exposure. May be absorbed through skin.
Eye Contact:
May cause irritation, redness and pain. Prolonged exposures to high concentrations of vapor can cause eye damage.
Chronic Exposure:
Repeated exposures may be habit forming. Prolonged exposures may result in headache, drowsiness, excitation, and psychic disturbances. Teratogenic effects are possible.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired liver, kidney or respiratory function may be more susceptible to the effects of this substance. Alcoholic beverage consumption can enhance the toxic effects of this substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:
Remove any contaminated clothing. Wash skin with soap or mild detergent and water for

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

5. Fire Fighting Measures

Fire:
Flash point: -45C (-49F) CC
Autoignition temperature: 160C (320F)
Flammable limits in air % by volume:
lel: 1.9; uel: 36.0
Dangerous highly flammable liquid.
Explosion:
Containers may explode when involved in a fire. Above flash point, vapor-air mixtures are explosive within flammable limits noted above. May form explosive peroxides on long standing or after exposure to air or light. May explode when brought in contact with nitric acid. Sensitivity to mechanical impact: Yes, if peroxides are formed. Sensitive to static discharge.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Treat as a flammable gas in a fire situation. Water spray may be used to keep fire exposed containers cool. Water is ineffective as an extinguishing agent.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. This highly flammable liquid must be kept from sparks, open flame, hot surfaces, and all sources of heat and ignition. Vapors can flow along surfaces to distant ignition source and flash back.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB(tm) solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Outside or detached storage is preferred. Inside storage should be in a standard flammable liquids storage room or cabinet. Separate from oxidizing materials. Storage and use areas should be No Smoking areas. Bond and ground containers when transferring liquid. Isolate from other combustible material. Protect from direct sunlight. Protect against static electricity and lightning for large quantity storage rooms, protect with automatic sprinkler systems and total flooding carbon dioxide systems. The reactivity hazard may be increased on longstanding due to peroxide formation. Ether is subject to peroxide formation in opened containers and should be protected from exposure to air. When low peroxide ether is required, use only material from an unopened can. Do not allow to evaporate to near dryness. Addition of water or appropriate reducing agents will lessen peroxide formation. Any ether remaining in opened containers that has not been consumed/used after 2-3 days, should be discarded. Store At A Temperature Not Exceeding 30C (86F). DO NOT OPEN Unless Contents Are At Room Temperature (72F) or Below For At Least 24 Hours. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
400 ppm (TWA)

-ACGIH Threshold Limit Value (TLV):
400 ppm (TWA)
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face organic vapor respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator.
WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres. An organic vapor respirator is predicted to have a short service life (less than 30 minutes at concentrations of ten times the TLV/PEL) when used with this material.

DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

****

Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

International Chemical Safety Cards

DIETHYL ETHER

ICSC: 0355

DIETHYL ETHER
Ethyl ether
Ethyl oxide
Ether
$C_4H_{10}O$
Molecular mass: 74.1

CAS # 60-29-7
RTECS # KI5775000
ICSC # 0355
UN # 1155
EC # 603-022-00-4

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Extremely flammable.	NO open flames, NO sparks, and NO smoking. NO contact with hot surfaces.	AFFF. Alcohol-resistant foam. Powder. Carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE			
• **INHALATION**	Drowsiness. Headache. Unconsciousness. Vomiting.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
• **SKIN**	Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
• **EYES**	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**	Dizziness. Drowsiness. Vomiting.	Do not eat, drink, or smoke during work.	Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Consult an expert! Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place (extra personal	Fireproof. Separated from strong oxidants. Cool. Dry. Keep in the dark. Store only if stabilized.	Airtight. F+ symbol R: 12-19 S: 9-16-29-33 UN Hazard Class: 3

protection: A/P2 filter respirator for organic vapour and harmful dust).		UN Packing Group: I

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0355 — Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

DIETHYL ETHER

ICSC: 0355

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
VERY VOLATILE, HYGROSCOPIC, COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
The substance can form explosive peroxides under the influence of light and air. Reacts violently with oxidants causing fire and explosion hazard.

OCCUPATIONAL EXPOSURE LIMITS (OELs):
TLV: 400 ppm; 1210 mg/m^3 (as TWA); 500 ppm; 1520 mg/m^3 (STEL) (ACGIH 1993-1994).
PDK: 300 mg/m^3 (USSR 1988).
MAK: 400 ppm; 1200 mg/m^3; (1992).

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

INHALATION RISK:
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance irritates the eyes and the respiratory tract. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system , resulting in narcosis.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the central nervous system. Caution, exposures may become addictive!

PHYSICAL PROPERTIES

Boiling point: 35°C
Melting point: -116°C
Relative density (water = 1): 0.7
Solubility in water, g/100 ml at 20°C: 6.9
Vapour pressure, kPa at 20°C: 58.6
Relative vapour density (air = 1): 2.6
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.9
Flash point: -45°C
Auto-ignition temperature: 180°C
Explosive limits, vol% in air: 1.7-49
Octanol/water partition coefficient as log Pow: 0.89

ENVIRONMENTAL DATA

NOTES

Check for peroxides prior to distillation; render harmless if positive.

Transport Emergency Card: TEC (R)-72
NFPA Code: H 2; F 4; R 1;

ADDITIONAL INFORMATION

ICSC: 0355	DIETHYL ETHER

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IMPORTANT LEGAL NOTICE:	Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

Please reduce your browser font size for better viewing and printing.

MSDS Material Safety Data Sheet

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

MALLINCKRODT J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

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

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

1,1,2,2-TETRACHLOROETHANE

MSDS Number: T0760 --- *Effective Date: 09/08/97*

1. Product Identification

Synonyms: Ethane, 1,1,2,2-tetrachloro-; s-tetrachloroethane; acetylene tetrachloride
CAS No.: 79-34-5
Molecular Weight: 167.87
Chemical Formula: C2H2Cl4
Product Codes:
J.T. Baker: V398
Mallinckrodt: 1932

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
1,1,2,2-Tetrachloroethane	79-34-5	100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. AFFECTS LIVER, KIDNEYS, CENTRAL NERVOUS SYSTEM AND GASTROINTESTINAL TRACT. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT.

Potential Health Effects

Generally considered the most toxic of the common chlorinated hydrocarbons.

Inhalation:
Highly toxic. Strong irritant of the mucous membranes and upper respiratory tract. Initial symptoms may include irritation of the nose and throat, salivation. Continued exposure may produce restlessness, dizziness, nausea, vomiting and narcosis. Symptoms may progress to a more serious illness with jaundice, liver tenderness, lung edema, and possibly convulsions and coma before death.
Ingestion:
Highly toxic via ingestion. Symptoms parallel those from inhalation. Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.
Skin Contact:
Causes irritation to skin. Symptoms include redness, itching, and pain. May be absorbed through the skin with possible systemic effects.
Eye Contact:
Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.
Chronic Exposure:
Chronic exposure can produce the same life threatening health effects noted for inhalation exposure above. Chronic exposure may also affect liver, gastrointestinal tract and blood-forming organs.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin, eye or central nervous system disorders, or impaired liver, kidney, or pulmonary function may be more susceptible to the effects of this substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician immediately.
Eye Contact:
Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Call a physician immediately.

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5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

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7. Handling and Storage

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

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit
5 ppm (TWA) skin

-ACGIH Threshold Limit Value (TLV):
1 ppm (TWA) skin
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for

details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. This substance has poor warning properties.

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

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Other Control Measures:
There is insufficient data in the published literature to assign complete numerical SAF-T-DATA* ratings and laboratory protective equipment for this product. Special precautions must be used in storage, use and handling. Protective equipment for laboratory bench use should be chosen using professional judgment based on the size and type of reaction or test to be conducted and the available ventilation, with overriding consideration to minimize contact with the chemical.

9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.

Odor:
Chloroform-like odor.

Solubility:
Slight, 0.3 g/100g water @ 25C (77F)

Specific Gravity:
1.59 @ 20C

pH:
No information found.

% Volatiles by volume @ 21C (70F):
100

Boiling Point:
147C (297F)

Melting Point:
-43C (-45F)

Vapor Density (Air=1):
5.8

Vapor Pressure (mm Hg):
8 @ 20C (68F)

Evaporation Rate (BuAc=1):
0.65

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Unusual exposure to light in the presence of air may form small amounts of phosgene.
Hazardous Decomposition Products:
May produce carbon monoxide, carbon dioxide, hydrogen chloride and phosgene when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Reacts with chemically active metals, fuming sulfuric acid and strong caustics. Attacks most plastics and rubber.
Conditions to Avoid:
No information found.

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11. Toxicological Information

Oral rat LD50: 250 mg/kg; investigated as a tumorigen, mutagen.

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

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
1,1,2,2-Tetrachloroethane (79-34-5)	No	No	3

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12. Ecological Information

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the soil, this material may evaporate to a moderate extent. When released to water, this material is expected to quickly evaporate. When released into water, this material is expected to have a half-life between 10 and 30 days. This material has an experimentally-determined bioconcentration factor (BCF) of less than 100. This material is not expected to significantly bioaccumulate. When released into the air, this material is not expected to react with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of greater than 30 days.
Environmental Toxicity:
This material may be toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l. The EC50/48-hour values for daphnia are between 1 and 10 mg/l.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of

this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: TETRACHLOROETHANE
Hazard Class: 6.1
UN/NA: UN1702
Packing Group: II
Information reported for product/size: 1KG

International (Water, I.M.O.)

Proper Shipping Name: 1,1,2,2-TETRACHLOROETHANE
Hazard Class: 6.1
UN/NA: UN1702
Packing Group: II
Information reported for product/size: 1KG

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------

Ingredient	TSCA	EC	Japan	Australia
1,1,2,2-Tetrachloroethane (79-34-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
1,1,2,2-Tetrachloroethane (79-34-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\---------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
1,1,2,2-Tetrachloroethane (79-34-5)	No	No	Yes	No

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

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
1,1,2,2-Tetrachloroethane (79-34-5)	100	U209	No

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

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

Australian Hazchem Code: 2XE
Poison Schedule: No information found.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. AFFECTS LIVER, KIDNEYS, CENTRAL NERVOUS SYSTEM AND GASTROINTESTINAL TRACT. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT.
Label Precautions:
No SAF-T-DATA Ratings have been developed for this product. Read and follow all warnings, precautions, instructions and other safety and handling information on the label and MSDS.
Do not breathe vapor.
Do not get in eyes, on skin, or on clothing.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician immediately.
Product Use:
Laboratory Reagent.
Revision Information:

Disclaimer:
****

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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

AIROSOL -- 1,1,1-TRICHLOROETHANE - 1,1,1-TRICHLOROETHANE,TECHNICAL
MATERIAL SAFETY DATA SHEET
NSN: 6810009306311
Manufacturer's CAGE: 14676
Part No. Indicator: A
Part Number/Trade Name: 1,1,1-TRICHLOROETHANE

General Information

Item Name: 1,1,1-TRICHLOROETHANE,TECHNICAL
Company's Name: AIROSOL COMPANY,INC
Company's Street: 252 NORTH 11TH STREET
Company's P. O. Box: 120
Company's City: NEODESHA
Company's State: KS
Company's Country: US
Company's Zip Code: 66757
Company's Emerg Ph #: 316-325-2666
Company's Info Ph #: 316-325-2666
Record No. For Safety Entry: 009
Tot Safety Entries This Stk#: 018
Status: SE
Date MSDS Prepared: 21FEB90
Safety Data Review Date: 14SEP90
Supply Item Manager: GSA
MSDS Serial Number: BFXFF
Specification Number: O-T-620
Spec Type, Grade, Class: TYPE III
Hazard Characteristic Code: J7
Unit Of Issue: CN
Unit Of Issue Container Qty: 12 FL OZ
Type Of Container: AEROSOL CAN

Ingredients/Identity Information

Proprietary: NO
Ingredient: METHYL CHLOROFORM (1,1,1-TRICHLOROEHANE) (SARA III)
Ingredient Sequence Number: 01
Percent: >95
NIOSH (RTECS) Number: KJ2975000
CAS Number: 71-55-6
OSHA PEL: 350 PPM/450 STEL
ACGIH TLV: 350 PPM/450STEL;9192
Other Recommended Limit: NONE SPECIFIED

Proprietary: NO
Ingredient: PROPELLANT (TYPE NOT SPECIFIED)
Ingredient Sequence Number: 02
Percent: UNKNOWN
NIOSH (RTECS) Number: 1000095PT
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE SPECIFIED

Physical/Chemical Characteristics

Appearance And Odor: CLEAR, COLORLESS, VOLITILE LIQUID, SLIGHTLY SWEET ODOR
Boiling Point: 165F,74C
Melting Point: <0F,<-18C
Vapor Pressure (MM Hg/70 F): UNKNOWN
Vapor Density (Air=1): 4.55
Specific Gravity: 1.306

Decomposition Temperature: UNKNOWN
Evaporation Rate And Ref: 6.0 (BUTYL ACETATE = 1)
Solubility In Water: NEGLIGIBLE
Percent Volatiles By Volume: 100
Corrosion Rate (IPY): UNKNOWN

Fire and Explosion Hazard Data

Flash Point: NON-FLAMMABLE
Flash Point Method: TCC
Lower Explosive Limit: 7.5
Upper Explosive Limit: 12.5
Extinguishing Media: PRODUCT IS NON FLAMMABLE. EXTINGUISH FIRE WITH MEDIA APPROPRIATE FOR SOURCE OF FIRE.
Special Fire Fighting Proc: FIRE FIGHTERS SHOULD USE NIOSH APPROVED SCBA & FULL PROTECTIVE EQUIPMENT WHEN FIGHTING CHEMICAL FIRE. USE WATER SPRAY TO COOL NEARBY CONTAINERS EXPOSED TO FIRE.
Unusual Fire And Expl Hazrds: CONTENTS UNDER PRESSURE! EXPOSURE TO TEMPERATURES OVER 130 F MAY RESULT IN RUPTURE OF THE CONTAINER.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): HIGH TEMPERATURES, AND OPEN FLAMES
Materials To Avoid: STRONG OXIDIZING AGENTS,STRONG BASES,REDUCING AGENTS, ALUMINUM AND OTHER ACTIVE METALS.
Hazardous Decomp Products: WHEN INVOLVED IN FIRE, PRODUCT EMITS HIGHLY TOXIC AND IRRITATING FUMES OF HYDROGEN CHLORIDE AND PHOSGENE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT APPLICABLE

Health Hazard Data

LD50-LC50 Mixture: ORAL LD50 (RAT) = 10,300 MG/KG
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: PRODUCT IS IRRITATING TO BODY TISSUES, AND IS A CENTRAL NERVOUS SYSTEM DEPRESSANT, CAUSING NAUSEA AND DIZZINESS. CHRONIC OVER EXPOSURE MAY CAUSE DERMATITIS, LIVER AND/OR KIDNEY DAMAGE.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: THE PRODUCT CONTAINS NO INGREDIENT THAT IS LISTED BY IARC, NTP OR OSHA AS A CARCINOGEN.
Signs/Symptoms Of Overexp: HEADACHE, DIZZINESS, DROWSINESS, NAUSEA, TINGLING OR NUMBNESS OF THE EXTREMITIES, SENSES OF FULLNESS IN THE HEAD, SENSE OF WARMTH, STUPOR OR DULLNESS, LETHARGY AND DRUNKENNESS. VERY HIGH CONCENTRATIONS MAY LEAD TO UNCONSCIOUSNESS OR EVEN DEATH IN CONFINED OR POORLY VENTILATED AREAS.
Med Cond Aggravated By Exp: NONE GIVEN BY MANUMACTURER.
Emergency/First Aid Proc: EYE:FLUSH W/WATER 15 MIN, HOLD LIDS OPEN. SKIN:WASH WITH SOAP & WATER. REMOVE CONTAMINATED CLOTHING AND LAUNDER BEFORE REUSE. INHALED:REMOVE TO FRESH AIR. RESTORE BREATHING IF NECESSARY. INGESTED:DO NOT INDUCE VOMITING. GIVE 2 LARGE GLASSES OF MILK OR WATER AND GET IMMEDIATE MEDICAL CARE. GIVE NOTHING BY MOUTH IF UNCONSCIOUS. IF IRRITATION PERSISTS OR IS SEVERE,SEE A DOCTOR.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: SMALL SPILL: WIPE UP WITH RAGS OR TOWELS. VENTILATE AREA. RESIDUE WILL EVAPORATE QUICKLY. DO NOT FLUSH TO SEWER OR WATERWAY.
Neutralizing Agent: NONE

Waste Disposal Method: DISPOSE I/A/W ALL FEDERAL, STATE AND LOCAL REGULATIONS. DO NOT INCINERATE CONTAINERS.
Precautions-Handling/Storing: STORE IN A COOL, DRY, WELL-VENTILATED LOCATION, UNDER 130F AND AWAY FROM ANY AREA WHERE THE FIRE HAZARD MAY BE ACUTE.
Other Precautions: VAPORS ARE HEAVIER THAN AIR AND WILL COLLECT IN LOW AREAS. THIS MATERIAL OR ITS VAPORS WHEN IN CONTACT WITH FLAMES, HOT GLOWING SURFACES OR ELECTRIC ARCS CAN DECOMPOSE TO FORM HYDROGEN CHLORIDE GAS AND TRACES OF PHOSGENE.

Control Measures

Respiratory Protection: USE NIOSH/MSHA APPROVED AIR SUPPLIED RESPIRATOR OR RESPIRATOR FOR ORGANIC VAPOR IF EXPOSURE IS ABOVE THE TLV/PEL. IF EXPOSED ABOVE 1000 PPM USE ONLY A SUPPLIED AIR RESPIRATOR. SEE 29 CFR 1910.134 FOR REGULATIONS PERTAINING TO RESPIRATOR USE
Ventilation: NORMAL ROOM VENTILATION IS SUFFICIENT. SUPPLEMENT WITH LOCAL EXHAUST IF PEL/TLV IS EXCEEDED.
Protective Gloves: NEOPRENE, PVA GLOVES RECOMMENDED.
Eye Protection: CHEMICAL SAFETY GOGGLES & FACE SHIELD.
Other Protective Equipment: APRON AND WORK CLOTHING TO MINIMIZE EXPOSURE. EYE WASH STATION & SAFETY SHOWER RECOMMENDED.
Work Hygienic Practices: USE GOOD CHEMICAL HYGIENE PRACTICE. AVOID UNNECESSARY CONTACT.
Suppl. Safety & Health Data: TARGET ORGANS ARE SKIN, CNS, CVS, AND EYES.

Transportation Data

Trans Data Review Date: 97132
DOT PSN Code: DTJ
DOT Symbol: D
DOT Proper Shipping Name: CONSUMER COMMODITY
DOT Class: ORM-D
DOT Label: NONE
IMO PSN Code: AKH
IMO Proper Shipping Name: AEROSOLS/AEROSOL PRODUCT
IMO Regulations Page Number: SEE 9022
IMO UN Number: 1950
IMO UN Class: 9
IMO Subsidiary Risk Label: -
IATA PSN Code: AOF
IATA UN ID Number: 1950
IATA Proper Shipping Name: AEROSOLS, 26, *
IATA UN Class: 2.2
IATA Subsidiary Risk Class: 6.1
IATA Label: NON-FLAMMABLE GAS & TOXIC
AFI PSN Code: AOF
AFI Symbols: *
AFI Prop. Shipping Name: AEROSOLS, NON-FLAMMABLE,N.O.S., (EACH NOT EXCEEDING 1 L CAPACITY) CONTAINING SUBSTANCES IN DIVISION 6.1, PACKING GROUP III
AFI Class: 2.2
AFI ID Number: UN1950
AFI Label: 6.1
AFI Basic Pac Ref: A6.3
N.O.S. Shipping Name: 1,1,1-TRICHLOROETHANE
Additional Trans Data: HE SPECIFICATION FOR THIS PRODUCT IS FEDERAL SPECIFICATION OT620 TYPE III

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 13SEP90
MFR Label Number: NONE
Label Status: F
Common Name: 1,1,1-TRRICHLOROETHANE
Chronic Hazard: NO
Signal Word: CAUTION!
Acute Health Hazard-None: X
Contact Hazard-Slight: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: PRODUCT IS IRRITATING TO BODY TISSUES, AND IS A CENTRAL NERVOUS SYSTEM DEPRESSANT, CAUSING NAUSEA AND DIZZINESS. CHRONIC OVER EXPOSURE MAY CAUSE DERMATITIS, LIVER AND/OR KIDNEY DAMAGE. STORE IN A COOL, DRY, WELL-VENTILATED LOCATION, UNDER 130F AND AWAY FROM ANY AREA WHERE THE FIRE HAZARD MAY BE ACUTE.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: AIROSOL COMPANY INC.
Label Street: 252 NORTH 11TH STREET
Label P.O. Box: 120
Label City: NEODESHA
Label State: KS
Label Zip Code: 66757
Label Country: US
Label Emergency Number: 316-325-2666
Year Procured: 1990

CHEM SERVICE -- TRICHLOROETHENE, 0-664
MATERIAL SAFETY DATA SHEET
NSN: 681000N054678
Manufacturer's CAGE: 8Y898
Part No. Indicator: A
Part Number/Trade Name: TRICHLOROETHENE, 0-664

General Information

Company's Name: CHEM SERVICE INC
Company's P. O. Box: 3108
Company's City: WEST CHESTER
Company's State: PA
Company's Country: US
Company's Zip Code: 19381
Company's Emerg Ph #: 215-692-3026
Company's Info Ph #: 215-692-3026
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 07JAN93
Safety Data Review Date: 03NOV94
MSDS Serial Number: BVYRM
Hazard Characteristic Code: NK

Ingredients/Identity Information

Proprietary: NO
Ingredient: ETHYLENE, TRICHLORO-; (TRICHLOROETHYLENE) (SARA III)
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: KX4550000
CAS Number: 79-01-6
OSHA PEL: 100 PPM
ACGIH TLV: 50 PPM;100 PPM STEL

Proprietary: NO
Ingredient: SUPP DATA: BRTHG ADMIN ARTF RESPS.IF PATIENT IS IN CARD ARREST ADMIN CPR. CONTINUE LIFE SUPPORTING MEASURES UNTIL(ING 3)
Ingredient Sequence Number: 02
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Proprietary: NO
Ingredient: ING 2: MEDICAL ASSISTANCE HAS ARRIVED. INGESTION: CALL MD IMMEDIATELY (FP N).
Ingredient Sequence Number: 03
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Proprietary: NO
Ingredient: EYE PROTECTION: FULL LENGTH FACESHIELD (FP N).
Ingredient Sequence Number: 04
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID.
Boiling Point: 189F,87C
Melting Point: -125F,-87C

Vapor Pressure (MM Hg/70 F): 58 @ 20C
Specific Gravity: 1.462
Solubility In Water: INSOLUBLE

Fire and Explosion Hazard Data

Flash Point: NON-FLAMMABLE
Lower Explosive Limit: 11%
Upper Explosive Limit: 41%
Extinguishing Media: CARBON DIOXIDE, DRY CHEMICAL POWDER OR SPRAY.
Special Fire Fighting Proc: WEAR NIOSH/MSHA APPROVED PRESSURE DEMAND SCBA AND FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE HCL AND PHOSGENE (FP N).

Reactivity Data

Stability: YES
Cond To Avoid (Stability): NONE SPECIFIED BY MANUFACTURER.
Materials To Avoid: STRONG BASES, STRONG OXIDIZING AGENTS.
Hazardous Decomp Products: DECOMPOSITION LIBERATES TOXIC FUMES. DECOMPOSITION PRODUCTS ARE CORROSIVE. HCL, PHOSGENE (FP N).
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT.

Health Hazard Data

LD50-LC50 Mixture: LD50 (ORAL,RAT): 4920 MG/KG.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: CONT LENSES SHOULD NOT BE WORN IN LAB. ALL CHEMS SHOULD BE CONSIDERED HAZ-AVOID DIRECT PHYS CONT! SUSPECTED CARCIN-MAY PRDCE CANCER. MAY BE HARMFUL IF ABSORB THRU SKIN. MAY BE HARMFUL IF INHALED. MAY BE HARMFUL IF SWALLOWED. LACHRYMATOR-CAUSES SEV EYE IRRIT. VAPS &/OR DIRECT EYE CONT CAN CAUSE SEV EYE (EFTS OF OVEREXP)
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT.
Signs/Symptoms Of Overexp: HLTH HAZ: BURNS. CAN CAUSE EYE IRRIT. CAN CAUSE SKIN IRRIT. CAN CAUSE SKIN BURNS. CAN CAUSE SEV SKIN BURNS. EXPOS CAN CAUSE LIVER DMG. EXPOS CAN CAUSE KIDNEY DMG. CAN CAUSE GI DISTURB. CAN BE IRRIT TO MUC MEMBS. PRLNGD EXPOS MAY CAUSE NAUS/HDCH/DIZZ &/OR EYE DMG.CAN CAUSE SENSIT BY SKIN CONT. CHLOROCARBON MATLS(SUPDAT)
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: AN ANTIDOTE IS SUBSTANCE INTENDED TO COUNTERACT EFT OF POIS. IT SHOULD BE ADMIN ONLY BY PHYS/TRAINED EMER PERS. MED ADVICE CAN BE OBTAINED FROM POIS CNTRL CNTR. EYE: FLUSH CONTINUOUSLY W/ WATER FOR AT LST 15-20 MINS. SKIN: FLUSH W/WATER FOR 15-20 MINS. IF NOT BURNS HAVE OCCURED-USE SOAP & WATER TO CLEANSE SKIN. INHAL: REMOVE PATIENT TO FRESH AIR. ADMIN OXYGEN IF PATIENT IS HAVING DFCLTY (SUPDAT)

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EVACUATE AREA. WEAR APPROPRIATE OSHA REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE OR SIMILAR MATERIAL. SWEEP UP AND PLACE IN AN APPROPRIATE CONTAINER. HOLD FOR DISPOSAL. WASH CONTAMINATED SURFACES TO REMOVE ANY RESIDUES.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER. DISPOSE OF IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS (FP N).
Precautions-Handling/Storing: AVOID CONTACT WITH SKIN, EYES AND CLOTHING.

KEEP TIGHTLY CLOSED IN COOL DRY PLACE. STORE ONLY WITH COMPATIBLE CHEMICALS.
Other Precautions: NO SMOKING IN AREA OF USE. DO NOT USE IN GENERAL VICINITY OF ARC WELDING, OPEN FLAMES OR HOT SURFACES. HEAT AND/OR UV RADIATION MAY CAUSE FORMATION OF HCL AND/OR PHOSGENE (FP N).

Control Measures

Respiratory Protection: WEAR NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN (FP N).
Ventilation: CHEMICAL SHOULD BE HANDLED ONLY IN HOOD.
Protective Gloves: IMPERVIOUS GLOVES (FP N).
Eye Protection: ANSI APPRVD CHEM WORKERS GOGG & (ING 4)
Other Protective Equipment: USE APPROPRIATE OSHA/MSHA APPROVED SAFETY EQUIPMENT.EMER EYEWASH & DELUGE SHOWER WHICH MEET ANSI DESIGN STANDARDS(FP N).
Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.
Suppl. Safety & Health Data: EFTS OF OVEREXP: HAVE PRDCED SENSIT OF MYOCARDIUM TO EPINEPHRINE IN LAB ANIMALS & COULD HAVE SIMILAR EFT IN HUMANS. ADRENOMIMETICS (E.G., EPINEPHRINE) MAY BE CONTRAINDICATED EXCEPT FOR LIFE-SUSTAINING USES IN HUMANS ACUTELY/CHRONICALLY EXPOS TO CHLOROCARBONS (FP N). FIRST AID PROC: BRTHG. IF PATIENT HAS STOPPED (ING 2)

Transportation Data

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 03NOV94
Label Date: 26OCT94
Label Status: G
Common Name: TRICHLOROETHENE, 0-664
Chronic Hazard: YES
Signal Word: DANGER!
Acute Health Hazard-Moderate: X
Contact Hazard-Severe: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: ACUTE: INHALATION OF VAPORS MAY CONTRIBUTE TO THE OCCURRENCE OF IRREGULAR HEARTBEAT (FP N). MAY BE HARMFUL IF ABSORB THRU SEVERE BURNS/IRRITATION MAY CAUSE LIVER/KIDNEY DAMAGE, GASTROINTESTINAL DISTURBANCE. MAY CAUSE MUCOUS MEMBRANE IRRITATION. CHRONIC: NAUSEA, HEADACHE, DIZZINESS AND/OR EYE DAMAGE.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: CHEM SERVICE INC
Label P.O. Box: 3108
Label City: WEST CHESTER
Label State: PA
Label Zip Code: 19381
Label Country: US
Label Emergency Number: 215-692-3026

CHEM SERVICE -- 0-770, ETHYLBENZENE
MATERIAL SAFETY DATA SHEET
NSN: 681000N033034
Manufacturer's CAGE: 8Y898
Part No. Indicator: A
Part Number/Trade Name: 0-770, ETHYLBENZENE

General Information

Company's Name: CHEM SERVICE INC
Company's Street: 660 TOWER LANE
Company's P. O. Box: 3108
Company's City: WEST CHESTER
Company's State: PA
Company's Country: US
Company's Zip Code: 19381-3108
Company's Emerg Ph #: 215-692-3026
Company's Info Ph #: 215-692-3026
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 002
Status: SMJ
Date MSDS Prepared: 16MAR92
Safety Data Review Date: 28AUG95
MSDS Serial Number: BPLSP
Hazard Characteristic Code: F3

Ingredients/Identity Information

Proprietary: NO
Ingredient: BENZENE, ETHYL-;(ETHYLBENZENE)
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: DA0700000
CAS Number: 100-41-4
OSHA PEL: 100 PPM, 125 STEL
ACGIH TLV: 100 PPM, 125 STEL

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID WITH AN AROMATIC ODOR
Boiling Point: 277F,136C
Melting Point: -139F,-95C
Vapor Pressure (MM Hg/70 F): 7.1 @20C
Vapor Density (Air=1): 0.887
Solubility In Water: INSOLUBLE

Fire and Explosion Hazard Data

Flash Point: 71.6F,22C
Lower Explosive Limit: 1%
Upper Explosive Limit: 6.7%
Extinguishing Media: CARBON DIOXIDE, DRY CHEMICAL POWDER OR SPRAY.
Special Fire Fighting Proc: WEAR NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: NONE SPECIFIED BY MANUFACTURER.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): NONE SPECIFIED BY MANUFACTURER.
Materials To Avoid: STRONG OXIDIZING AGENTS.
Hazardous Decomp Products: EMITS TOXIC FUMES UNDER FIRE CONDITIONS.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT.

Health Hazard Data

LD50-LC50 Mixture: LD50:(ORAL RAT):3500 MG/KG.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: CAN CAUSE SKIN AND EYE IRRITATION. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. MAY BE HARMFUL IF INHALED. MAY BE HARMFUL IF SWALLOWED. CAN BE IRRITATING TO MUCOUS MEMBRANES. PROLONGED EXPOSURE MAY CAUSE NAUSEA, HEADACHE, DIZZINESS AND/OR EYE DAMAGE. CAN CAUSE NERVOUS SYSTEM INJURY. DUST &/OR VAPORS (EFTS OF OVEREXP)
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT.
Signs/Symptoms Of Overexp: HLTH HAZ:CAN CAUSE IRRITATION TO RESPIRATORY TRACT.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: EYE:FLUSH CONTINUOUSLY WITH WATER FOR 15-20 MINUTES. SKIN:FLUSH WITH WATER FOR 15-20 MINUTES. IF NO BURNS HAVE OCCURED-USE SOAP & WATER TO CLEANSE SKIN. INHAL:MOVE TO FRESH AIR. GIVE OXYGEN IF PATIENT IS HAVING DIFFICULTY BREATHING. IF PATIENT STOPPED BREATHING, GIVE ARTF RESP. IF PATIENT IS IN CARDIAC ARREST GIVE CPR. CONTINUE LIFE SUPPORTING MEASURES UNTIL MD ARRIVES. INGEST:CALL MD IMMED(FP N)

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EVACUATE AREA. WEAR APPROPRIATE OSHA REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE OR SIMILAR MATERIAL. SWEEP UP AND PLACE IN AN APPROPRIATE CONTAINER. HOLD FOR DISPOSAL. WASH CONTAMINATED SURFACES TO REMOVE ANY RESIDUES.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER. DISPOSAL MUST BE IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS (FP N).
Precautions-Handling/Storing: KEEP TIGHTLY CLOSED IN A COOL, DRY PLACE. STORE ONLY WITH COMPATIBLE MATERIALS.
Other Precautions: AVOID CONTACT WITH SKIN, EYES AND CLOTHNG. ALL CHEMICALS SHOULD BE CONSIDERED HAZARDOUS-AVOID DIRECT PHYSICAL CONTACT.

Control Measures

Respiratory Protection: NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSRRE OF CONCERN (FP N).
Ventilation: THIS CHEMICAL SHOULD ONLY BE HANDLED IN A HOOD.
Protective Gloves: IMPERVIOUS GLOVES (FP N).
Eye Protection: CHEMICAL WORKERS GOGGLES (FP N).
Other Protective Equipment: NONE SPECIFIED BY MANUFACTURER.
Work Hygienic Practices: CONTACT LENSES SHOULD NOT BE WORN.
Suppl. Safety & Health Data: NONE SPECIFIED BY MANUFACTURER.

Transportation Data

Trans Data Review Date: 92363
DOT PSN Code: FYP
DOT Proper Shipping Name: ETHYLBENZENE
DOT Class: 3
DOT ID Number: UN1175
DOT Pack Group: II
DOT Label: FLAMMABLE LIQUID
IMO PSN Code: GQL
IMO Proper Shipping Name: ETHYLBENZENE
IMO Regulations Page Number: 3222

IMO UN Number: 1175
IMO UN Class: 3.2
IMO Subsidiary Risk Label: -
IATA PSN Code: LCB
IATA UN ID Number: 1175
IATA Proper Shipping Name: ETHYLBENZENE
IATA UN Class: 3
IATA Label: FLAMMABLE LIQUID
AFI PSN Code: LCB
AFI Prop. Shipping Name: ETHYLBENZENE
AFI Class: 3
AFI ID Number: UN1175
AFI Pack Group: II
AFI Basic Pac Ref: 7-7

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Disposal Data

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Label Data

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Label Required: YES
Technical Review Date: 22JUL92
Label Date: 22JUL92
Label Status: G
Common Name: 0-770, ETHYLBENZENE
Chronic Hazard: NO
Signal Word: DANGER!
Acute Health Hazard-Moderate: X
Contact Hazard-Moderate: X
Fire Hazard-Severe: X
Reactivity Hazard-None: X
Special Hazard Precautions: FLAMMABLE-POISON! STORE IN A COOL, DRY PLACE. ACUTE:CAN CAUSE SKIN/EYE IRRITATION. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. MAY BE HARMFUL IF INHALED/SWALLOWED. CAN BE IRRITATING TO MUCOUS MEMBRANES. PROLONGED EXPOSURE MAY CAUSE NAUSEA, HEADACHE, DIZZINESS AND/OR EYE DAMAGE. CAN CAUSE NERVOUS SYSTEM INJURY. DUST AND/OR VAPORS CAN CAUSE IRRITATION TO RESPIRATORY TRACT. CHRONIC:NONE LISTED BY MANUFACTURER.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: CHEM SERVICE INC
Label Street: 660 TOWER LANE
Label P.O. Box: 3108
Label City: WEST CHESTER
Label State: PA
Label Zip Code: 19381-3108
Label Country: US
Label Emergency Number: 215-692-3026

CHEM SERVICE -- F30 TRANS-1,2-DICHLOROETHENE
MATERIAL SAFETY DATA SHEET
NSN: 655000F037529
Manufacturer's CAGE: 8Y898
Part No. Indicator: A
Part Number/Trade Name: F30 TRANS-1,2-DICHLOROETHENE

General Information

Company's Name: CHEM SERVICE INC
Company's Street: 660 TOWER LN
Company's P. O. Box: 3108
Company's City: WEST CHESTER
Company's State: PA
Company's Country: US
Company's Zip Code: 19381-3108
Company's Emerg Ph #: 215-692-3026/800-452-9994
Company's Info Ph #: 215-692-3026/800-452-9994
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SE
Date MSDS Prepared: 28APR92
Safety Data Review Date: 15DEC94
Preparer's Company: CHEM SERVICE INC
Preparer's St Or P. O. Box: 660 TOWER LN
Preparer's City: WEST CHESTER
Preparer's State: PA
Preparer's Zip Code: 19381-3108
MSDS Serial Number: BWJGZ

Ingredients/Identity Information

Proprietary: NO
Ingredient: TRANS-1,2-DICHLOROETHYLENE, TRANS-1,2-DICHLOROETHENE
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: KV9400000
CAS Number: 156-60-5
OSHA PEL: 200 PPM
ACGIH TLV: 200 PPM

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID W/FRUITY/PLEASANT ODOR.
Boiling Point: 118.4F
Melting Point: -58F
Solubility In Water: SLIGHT

Fire and Explosion Hazard Data

Flash Point: 39.2F
Lower Explosive Limit: 9.7
Upper Explosive Limit: 12.8
Extinguishing Media: CO2, DRY CHEMICAL POWDER/SPRAY.
Unusual Fire And Expl Hazrds: FLAMMABLE CHEMICAL.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): AIR, HEAT, MOISTURE, LIGHT.
Materials To Avoid: STRONG OXIDIZING AGENTS.
Hazardous Decomp Products: TOXIC FUMES/CO/CO2/HYDROGEN CHLORIDE GAS.
DECOMPOSITION PRODUCTS ARE CORROSIVE.
Hazardous Poly Occur: NO

Health Hazard Data

LD50-LC50 Mixture: ORAL LD50 (RAT/MOUSE): 7536 MG/KG
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: INHALATION: HARMFUL/RESPIRATORY TRACT IRRITATION. SKIN: HARMFUL IF ABSORBED/IRRITATION. EXPOSURE CAN CAUSE CNS DEPRESSION.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NONE
Signs/Symptoms Of Overexp: IRRITATION.
Emergency/First Aid Proc: EYES: FLUSH CONTINUOUSLY W/WATER FOR 15-20 MINS. SKIN: FLUSH W/WATER FOR 15-20 MINS. IF NOT BURNED, WASH W/SOAP & WATER TO CLEANSE. INHALATION: REMOVE TO FRESH AIR. GIVE CPR/OXYGEN IF NEEDED. KEEP WARM & QUIET. INGESTION: DON'T GIVE LIQUIDS/INDUCE VOMITING IF UNCONSCIOUS/CONVULSIVE. IF VOMITING OCCURS, WATCH CLOSELY TO AVOID AIRWAY OBSTRUCTION. OBTAIN MEDICAL ATTENTION IN ALL CASES.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EVACUATE AREA. WEAR APPRORPRIATE OSHA REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE/SIMILAR MATERIAL. SWEEP UP & PLACE IN APPROPRIATE CONTAINER/HOLD FOR DISPOSAL. WASH CONTAMINATED SURFACES TO REMOVE ANY RESIDUES.
Waste Disposal Method: BURN IN A CHEMICAL INCINERATOR EQUIPPED W/AN AFTERBURNER & SCRUBBER IAW/FEDERAL, STATE & LOCAL REGULATIONS.
Precautions-Handling/Storing: STORE IN A COOL DRY PLACE ONLY W/COMPATIBLE CHEMICALS. KEEP TIGHTLY CLOSED. STORE UNDER REFRIGERATION. FOR LABORATORY USE ONLY.
Other Precautions: AVOID CONTACT W/SKIN, EYES & CLOTHING. DON'T BREATH VAPORS. CONTACT LENSES SHOULDN'T BE WORN IN THE LABORATORY. ALL CHEMICALS SHOULD BE CONSIDERED HAZARDOUS. AVOID DIRECT PHYSICAL CONTACT.

Control Measures

Respiratory Protection: WEAR APPROPRIATE OSHA/MSHA APPROVED SAFETY EQUIPMENT.
Ventilation: CHEMICAL SHOULD BE HANDLED ONLY IN A HOOD.
Eye Protection: EYE SHIELDS
Work Hygienic Practices: REMOVE/LAUNDER CONTAMINATED CLOTHING BEFORE REUSE. READILY ABSORBED & RETAINED ON CLOTHING & SHOES.

Transportation Data

Disposal Data

Label Data

Label Required: YES
Label Status: G
Common Name: F30 TRANS-1,2-DICHLOROETHENE
Special Hazard Precautions: INHALATION: HARMFUL/RESPIRATORY TRACT IRRITATION. SKIN: HARMFUL IF ABSORBED/IRRITATION. EXPOSURE CAN CAUSE CNS DEPRESSION. IRRITATION.
Label Name: CHEM SERVICE INC
Label Street: 660 TOWER LN
Label P.O. Box: 3108
Label City: WEST CHESTER

Label State: PA
Label Zip Code: 19381-3108
Label Country: US
Label Emergency Number: 215-692-3026/800-452-9994

CHEM SERVICE -- 0-659 CIS 1,2-DICHLOROETHENE - LABORATORY STANDARD
MATERIAL SAFETY DATA SHEET
NSN: 655000F037480
Manufacturer's CAGE: 8Y898
Part No. Indicator: A
Part Number/Trade Name: 0-659 CIS 1,2-DICHLOROETHENE

General Information

Item Name: LABORATORY STANDARD
Company's Name: CHEM SERVICE INC
Company's Street: 660 TOWER LN
Company's P. O. Box: 3108
Company's City: WEST CHESTER
Company's State: PA
Company's Country: US
Company's Zip Code: 19381-3108
Company's Emerg Ph #: 215-692-3026/800-452-9994
Company's Info Ph #: 215-692-3026/800-452-9994
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SE
Date MSDS Prepared: 02JUN92
Safety Data Review Date: 06DEC94
Preparer's Company: CHEM SERVICE INC
Preparer's St Or P. O. Box: 660 TOWER LN
Preparer's City: WEST CHESTER
Preparer's State: PA
Preparer's Zip Code: 19381-3108
MSDS Serial Number: BWJDT

Ingredients/Identity Information

Proprietary: NO
Ingredient: DICHLOROETHENE
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: KV9420000
CAS Number: 156-59-2

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID
Boiling Point: 140F
Melting Point: -112F
Solubility In Water: INSOLUBLE

Fire and Explosion Hazard Data

Flash Point: 42.8F
Extinguishing Media: CO2, DRY CHEMICAL POWDER/SPRAY.
Unusual Fire And Expl Hazrds: FLAMMABLE CHEMICAL. VAPORS MAY TRAVEL CONSIDERABLE DISTANCE TO IGNITION SOURCE & FLASH BACK. DECOMPOSITION PRODUCTS ARE CORROSIVE.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): MOISTURE, AIR, LIGHT, HEAT & OTHER IGNITION SOURCES.
Materials To Avoid: STRONG OXIDIZING AGENTS, MAGNESIUM, ALUMINUM.
Hazardous Decomp Products: TOXIC FUMES
Hazardous Poly Occur: NO

Health Hazard Data

Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: SKIN: MAY BE HARMFUL IF ABSORBED. CAN CAUSE IRRITATION. INHALATION: MAY BE HARMFUL. DUST &/VAPORS CAN CAUSE RESPIRATORY TRACT IRRITATION. CAN BE IRRITATING TO MUCOUS MEMBRANCES. INGESTION: MAY BE HARMFUL. EYES: IRRITATION. EXPOSURE CAN CAUSE LIVER DAMAGE. NARCOTIC AT HIGH CONCENTRATIONS.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NONE
Signs/Symptoms Of Overexp: IRRITATION, NARCOTIC.
Emergency/First Aid Proc: EYES: FLUSH CONTINUOUSLY W/WATER FOR 15-20 MINS. SKIN: FLUSH W/WATER FOR 15-20 MINS. IF NOT BURNED, WASH W/SOAP & WATER TO CLEANSE. INHALATION: REMOVE TO FRESH AIR. GIVE CPR/OXYGEN IF NEEDED & CONTINUE LIFE SUPPORT UNTIL MEDICAL ASSISTANCE ARRIVES. INGESTION: RINSE MOUTH OUT W/WATER, IF CONSCIOUS. OBTAIN MEDICAL ATTENTION IN ALL CASES.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EVACUATE AREA. WEAR APPRORPRIATE OSHA REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE/SIMILAR MATERIAL. SWEEP UP & PLACE IN APPROPRIATE CONTAINER/HOLD FOR DISPOSAL. WASH CONTAMINATED SURFACES TO REMOVE ANY RESIDUES.
Waste Disposal Method: BURN IN A CHEMICAL INCINERATOR EQUIPPED W/AN AFTERBURNER & SCRUBBER IAW/FEDERAL, STATE & LOCAL REGULATIONS.
Precautions-Handling/Storing: STORE IN A COOL DRY PLACE ONLY W/COMPATIBLE CHEMICALS. KEEP TIGHTLY CLOSED. STORE UNDER REFRIGERATION.
Other Precautions: AVOID CONTACT W/SKIN, EYES & CLOTHING. DON'T BREATH VAPORS. CONTACT LENSES SHOULDN'T BE WORN IN THE LABORATORY. ALL CHEMICALS SHOULD BE CONSIDERED HAZARDOUS. AVOID DIRECT PHYSICAL CONTACT.

Control Measures

Respiratory Protection: WEAR APPROPRIATE OSHA/MSHA APPROVED SAFETY EQUIPMENT.
Ventilation: CHEMICAL SHOULD BE HANDLED ONLY IN A HOOD.
Eye Protection: EYE SHIELDS

Transportation Data

Disposal Data

Label Data

Label Required: YES
Label Status: G
Common Name: 0-659 CIS 1,2-DICHLOROETHENE
Special Hazard Precautions: SKIN: MAY BE HARMFUL IF ABSORBED. CAN CAUSE IRRITATION. INHALATION: MAY BE HARMFUL. DUST &/VAPORS CAN CAUSE RESPIRATORY TRACT IRRITATION. CAN BE IRRITATING TO MUCOUS MEMBRANCES. INGESTION: MAY BE HARMFUL. EYES: IRRITATION. EXPOSURE CAN CAUSE LIVER DAMAGE. NARCOTIC AT HIGH CONCENTRATIONS. IRRITATION, NARCOTIC.
Label Name: CHEM SERVICE INC
Label Street: 660 TOWER LN
Label P.O. Box: 3108
Label City: WEST CHESTER
Label State: PA
Label Zip Code: 19381-3108

Label Country: US
Label Emergency Number: 215-692-3026/800-452-9994

C D N ISOTOPES -- 1,2-DICHLOROETHANE, C-2582
MATERIAL SAFETY DATA SHEET
NSN: 681000N068884
Manufacturer's CAGE: CDNST
Part No. Indicator: A
Part Number/Trade Name: 1,2-DICHLOROETHANE, C-2582

General Information

Company's Name: C/D/N ISOTOPES INC
Company's Street: 88 LEACOCK ST
Company's City: POINT-CLAIRE, QUEBEC
Company's Zip Code: H9R 1H1
Company's Emerg Ph #: 800-565-4696; 514-697-6254
Company's Info Ph #: 800-565-4696; 514-697-6254
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 10AUG94
Safety Data Review Date: 22JAN96
MSDS Serial Number: CBJQR

Ingredients/Identity Information

Proprietary: NO
Ingredient: ETHANE, 1,2-DICHLORO-; (ETHYLENE DICHLORIDE) (C*2H*4CL*2) (SARA 313) (CERCLA)
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: KI0525000
CAS Number: 107-06-2
OSHA PEL: 50 PPM
ACGIH TLV: 10 PPM

Proprietary: NO
Ingredient: 1,2-DICHLOROETHANE-D4; (C*2D*4CL*2)
Ingredient Sequence Number: 02
NIOSH (RTECS) Number: 1011751DC
CAS Number: 17060-07-0
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID WITH A PLEASANT CHLOROFORM LIKE ODOR.
Boiling Point: 181F,83C
Melting Point: 95.0F,35.0C
Vapor Pressure (MM Hg/70 F): 87
Vapor Density (Air=1): 3.35
Specific Gravity: 1.2 (H*2O=1)
Percent Volatiles By Volume: 100

Fire and Explosion Hazard Data

Flash Point: 55.4F,13.0C
Flash Point Method: CC
Lower Explosive Limit: 6%
Upper Explosive Limit: 15.9%
Extinguishing Media: CARBON DIOXIDE, DRY CHEMICAL POWDER, FOAM.
Special Fire Fighting Proc: WEAR NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: FLAMMABLE, TOXIC PHOSGENE AND HCL FUMES ON DECOMPOSITION. CANCER SUSPECT.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): NONE SPECIFIED BY MANUFACTURER.
Materials To Avoid: ALKALI METALS, REDUCING AGENTS, BASES (HYDROXIDES, AMINES).
Hazardous Decomp Products: CO/CO*2, PHOSGENE AND HCL FUMES ON COMBUSTION.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

Health Hazard Data

LD50-LC50 Mixture: LD50(ORAL,RAT):670 MG/KG
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: IRRITATION, NARCOSIS, NAUSEA, CORNEAL CLOUDING, LIVER AND KIDNEY DAMAGE, CNS DEPRESSION. CANCER AND MUTAGEN INDICATION.
Carcinogenicity - NTP: YES
Carcinogenicity - IARC: YES
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: ETHYLENE DICHLORIDE:IARC MONOGRAPHS, SUPP, VOL 7, PG 56, 1987:GROUP 2B. NTP 7TH ANNUAL RPT ON CARCINS, 1994:(SUPP DATA)
Signs/Symptoms Of Overexp: SEE HEALTH HAZARDS.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: EYES:IMMEDIATELY FLUSH W/POTABLE WATER FOR A MINIMUM OF 15 MINUTES, SEEK ASSISTANCE FROM MD (FP N). SKIN:WASH WITH WATER. INGESTION:MEDICAL ASSISTANCE FOR GASTRIC LAVAGE. INHALATION:REMOVE TO FRESH AIR. ARTIFICIAL RESPIRATION OR OXYGEN, IF NECESSARY.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: PROVIDE ADEQUATE IGNITION-PROOF VENTILATION. REMOVE ALL HEAT AND IGNITION SOURCES. ABSORB ON VERMICULITE AND TRANSFER TO A CLOSED CONTAINER. WEAR A NIOSH/MSHA APPROVED SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY RUBBER GLOVES.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISPOSAL MUST BE I/A/W FEDERAL, STATE & LOCAL REGULATIONS (FP N). VIA LICENSED DISPOSAL COMPANY. DISPOSE OF ACCORDING TO FEDERAL AND LOCAL REGULATIONS.
Precautions-Handling/Storing: CANCER SUSPECT. ADEQUATE VENTILATION. PROTECT FROM LIGHT AND MOISTURE. GROUND METAL CONTAINERS WHEN TRANSFERRING LIQUID.
Other Precautions: WEAR A NIOSH/MSHA APPROVED SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY RUBBER GLOVES.

Control Measures

Respiratory Protection: NIOSH/MSHA APPROVED SELF-CONTAINED BREATHING APPARATUS.
Ventilation: FUMEHOOD TO MEET TLV REQUIREMENTS.
Protective Gloves: CHEMICAL & SOLVENT RESISTANT GLOVES.
Eye Protection: ANSI APPROVED CHEM WORKERS GOGGS (FP N).
Other Protective Equipment: ANSI APPROVED EMERGENCY EYE WASH AND DELUGE SHOWER (FP N). PROTECTIVE CLOTHING AND RUBBER BOOTS.
Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.
Suppl. Safety & Health Data: EXPLAN OF CARCIN:ANTICIPATED TO BE CARCINOGEN. ANIMAL:GASTROINTESTINAL, SKIN, LUNGS.

Transportation Data

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Disposal Data

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Label Data

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Label Required: YES
Technical Review Date: 22JAN96
Label Status: G
Common Name: 1,2-DICHLOROETHANE, C-2582
Chronic Hazard: YES
Signal Word: DANGER!
Acute Health Hazard-Severe: X
Contact Hazard-Moderate: X
Fire Hazard-Severe: X
Reactivity Hazard-Slight: X
Special Hazard Precautions: EXTREMELY FLAMMABLE. DECOMPOSITION PRODUCTS MAY BE HAZARDOUS. ACUTE:IRRITATION, NARCOSIS, NAUSEA, CORNEAL CLOUDING, LIVER AND KIDNEY DAMAGE, CNS DEPRESSION. CHRONIC:CANCER HAZARD. CONTAINS ETHYLENE DICHLORIDE WHICH IS LISTED AS AN ANIMAL GASTROINTESTINAL, SKIN AND LUNG CARCINOGEN (FP N). MUTAGEN INDICATION.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: C/D/N ISOTOPES INC
Label Street: 88 LEACOCK ST
Label City: POINT-CLAIRE, QUEBEC
Label Zip Code: H9R 1H1
Label Emergency Number: 800-565-4696; 514-697-6254

Please reduce your browser font size for better viewing and printing.

MSDS Material Safety Data Sheet

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

MALLINCKRODT J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

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

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

CHLOROFORM

MSDS Number: C2915 --- *Effective Date: 09/08/97*

1. Product Identification

Synonyms: Trichloromethane; Methyl trichloride; Methane trichloride
CAS No.: 67-66-3
Molecular Weight: 119.38
Chemical Formula: CHCl3
Product Codes:
J.T. Baker: 9174, 9175, 9180, 9181, 9182, 9183, 9186, 9257
Mallinckrodt: 1473, 2175, 4432, 4434, 4439, 4440, 4441, 4443, 4444, H407, V551

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Chloroform	67-66-3	98 - 100%	Yes
Ethyl Alcohol	64-17-5	0 - 1%	Yes

3. Hazards Identification

Emergency Overview

DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY AFFECT CENTRAL NERVOUS SYSTEM, CARDIOVASCULAR SYSTEM, LIVER AND KIDNEYS. SUSPECT CANCER

HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.

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

Health Rating: 3 - Severe (Cancer Causing)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:
Acts as a relatively potent anesthetic. Irritates respiratory tract and causes central nervous system effects, including headache, drowsiness, dizziness. Exposure to higher concentrations may result in unconsciousness and even death. May cause liver injury and blood disorders. Prolonged exposure may lead to death due to irregular heart beat and kidney and liver disorders.
Ingestion:
Causes severe burning in mouth and throat, pain in the chest and vomiting. Large quantities may cause symptoms similar to inhalation.
Skin Contact:
Causes skin irritation resulting in redness and pain. Removes natural oils. May be absorbed through skin.
Eye Contact:
Vapors causes pain and irritation to eyes. Splashes may cause severe irritation and possible eye damage.
Chronic Exposure:
Prolonged or repeated exposure to vapors may cause damage to the nervous system, the heart and the liver and kidneys. Contact with liquid has defatting effect and may cause chronic irritation of skin with cracking and drying, and corresponding dermatitis. Chloroform is a suspected human carcinogen.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never

give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:
Because kidney and liver effects may be delayed, keep victim under observation for 24 to 48 hr. Administration of fluids may help to prevent kidney failure. Obtain blood glucose, urinalysis, liver function tests, chest x-ray, and monitor cardiac function and fluid/electrolyte status. Monitor liver and kidney function for 4 to 5 days after exposure. Disulfiram, its metabolites, and a high carbohydrate diet appear to protect somewhat against chloroform toxicity. Do not give adrenalin! Tests may show increased bilirubin, ketosis, lowered blood prothombin, and fibrogen.

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5. Fire Fighting Measures

Fire:
Slight fire hazard when exposed to high heat; otherwise, practically not flammable.
Explosion:
Sealed containers may rupture when heated.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB(tm) solvent adsorbent is recommended for spills of this product.

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7. Handling and Storage

Keep in a tightly closed light-resistant container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Chloroform odor threshold: 250 mg/m3. The odor threshold only serves as a warning of exposure; not smelling it does not mean you are not being exposed.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Chloroform:
-OSHA Permissible Exposure Limit (PEL):
50 ppm (TWA) Ceiling
-ACGIH Threshold Limit Value (TLV):
10 ppm (TWA), Listed as A3 animal carcinogen
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. This substance has poor warning properties.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.

Odor:
Characteristic ethereal odor.
Solubility:
0.8g/100g water @ 20C (68F).
Specific Gravity:
1.48 @ 20C/4C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
62C (144F)
Melting Point:
-63.5C (-83F)
Vapor Density (Air=1):
4.1
Vapor Pressure (mm Hg):
160 @ 20C (68F)
Evaporation Rate (BuAc=1):
11.6

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. pH decreases on prolonged exposure to light and air due to formation of HCl.
Hazardous Decomposition Products:
May produce carbon monoxide, carbon dioxide, hydrogen chloride and phosgene when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong caustics and chemically active metals such as aluminum, magnesium powder, sodium, or potassium; acetone, fluorine, methanol, sodium methoxide, dinitrogen tetroxide, tert-butoxide, triisopropylphosphine.
Conditions to Avoid:
Light, heat, air and incompatibles.

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11. Toxicological Information

Toxicological Data:
Chloroform: oral rat LD50: 908 mg/kg; skin rabbit LD50: > 20 gm/kg; inhalation rat LC50: 47702 mg/m3/4H; irritation data: skin rabbit 10 mg/24H open mild; eye rabbit: 20 mg/24H moderate; investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
Birth defects have been seen in rats and mice exposed by inhalation of chloroform at

concentrations greater than 100 ppm in air. Ingestion of chloroform by pregnant laboratory animals has resulted in fetotoxicity but not birth defects, and only at levels causing severe maternal effects.

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

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Chloroform (67-66-3)	No	Yes	2B
Ethyl Alcohol (64-17-5)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material may be moderately degraded by photolysis. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition. When released into the air, this material is expected to have a half-life of greater than 30 days.
Environmental Toxicity:
This material is not expected to be toxic to aquatic life. The LC50/96-hour values for fish are over 100 mg/l.

13. Disposal Considerations

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

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: RQ, CHLOROFORM
Hazard Class: 6.1
UN/NA: UN1888
Packing Group: III

Information reported for product/size: 24.5L

International (Water, I.M.O.)

Proper Shipping Name: CHLOROFORM
Hazard Class: 6.1
UN/NA: UN1888
Packing Group: III
Information reported for product/size: 24.5L

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Chloroform (67-66-3)	Yes	Yes	Yes	Yes
Ethyl Alcohol (64-17-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Chloroform (67-66-3)	Yes	Yes	No	Yes
Ethyl Alcohol (64-17-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Chloroform (67-66-3)	10	10000	Yes	No
Ethyl Alcohol (64-17-5)	No	No	No	No

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

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Chloroform (67-66-3)	10	U044	No
Ethyl Alcohol (64-17-5)	No	No	No

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

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

Australian Hazchem Code: 2Z
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: 2 Flammability: 0 Reactivity: 0
Label Hazard Warning:
DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY AFFECT CENTRAL NERVOUS SYSTEM, CARDIOVASCULAR SYSTEM, LIVER AND KIDNEYS. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.
Label Precautions:
Do not breathe vapor.
Do not get in eyes, on skin, or on clothing.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:

Disclaimer:
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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

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MSDS Material Safety Data Sheet

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

MALLINCKRODT J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

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

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

ACETONE

MSDS Number: A0446 --- *Effective Date: 04/09/98*

1. Product Identification

Synonyms: Dimethylketone; 2-propanone; dimethylketal
CAS No.: 67-64-1
Molecular Weight: 58.08
Chemical Formula: (CH3)2CO
Product Codes:
J.T. Baker: 5356, 5580, 5805, 9001, 9002, 9003, 9004, 9005, 9006, 9007, 9008, 9009, 9010, 9015, 9125, 9254, A134
Mallinckrodt: 0018, 2432, 2435, 2437, 2438, 2440, 2443, 2445, 2850, H451, H580

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Acetone	67-64-1	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.

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

Health Rating: 1 - Slight
Flammability Rating: 4 - Extreme (Flammable)
Reactivity Rating: 2 - Moderate
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of vapors irritates the respiratory tract. May cause coughing, dizziness, dullness, and headache. Higher concentrations can produce central nervous system depression, narcosis, and unconsciousness.
Ingestion:
Swallowing small amounts is not likely to produce harmful effects. Ingestion of larger amounts may produce abdominal pain, nausea and vomiting. Aspiration into lungs can produce severe lung damage and is a medical emergency. Other symptoms are expected to parallel inhalation.
Skin Contact:
Irritating due to defatting action on skin. Causes redness, pain, drying and cracking of the skin.
Eye Contact:
Vapors are irritating to the eyes. Splashes may cause severe irritation, with stinging, tearing, redness and pain.
Chronic Exposure:
Prolonged or repeated skin contact may produce severe irritation or dermatitis.
Aggravation of Pre-existing Conditions:
Use of alcoholic beverages enhances toxic effects. Exposure may increase the toxic potential of chlorinated hydrocarbons, such as chloroform, trichloroethane.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse.

Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention.

5. Fire Fighting Measures

Fire:
Flash point: -20C (-4F) CC
Autoignition temperature: 465C (869F)
Flammable limits in air % by volume:
lel: 2.5; uel: 12.8
Extremely Flammable Liquid and Vapor! Vapor may cause flash fire.
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Vapors can flow along surfaces to distant ignition source and flash back. Contact with strong oxidizers may cause fire. Sealed containers may rupture when heated. This material may produce a floating fire hazard. Sensitive to static discharge.
Fire Extinguishing Media:
Dry chemical, alcohol foam or carbon dioxide. Water may be ineffective. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB(tm) solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Acetone:
-OSHA Permissible Exposure Limit (PEL):
1000 ppm (TWA)

-ACGIH Threshold Limit Value (TLV):
500 ppm (TWA), 750 ppm (STEL) A4 - not classifiable as a human carcinogen
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face organic vapor respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator.
WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Clear, colorless, volatile liquid.

Odor:
Fragrant, mint-like
Solubility:
Miscible in all proportions in water.
Specific Gravity:
0.79 @ 20C/4C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
56.5C (133F) @ 760 mm Hg
Melting Point:
-95C (-139F)
Vapor Density (Air=1):
2.0
Vapor Pressure (mm Hg):
400 @ 39.5C (104F)
Evaporation Rate (BuAc=1):
ca. 7.7

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Concentrated nitric and sulfuric acid mixtures, oxidizing materials, chloroform, alkalis, chlorine compounds, acids, potassium t-butoxide.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

Oral rat LD50: 5800 mg/kg; Inhalation rat LC50: 50,100mg/m3; Irritation eye rabbit, Standard Draize, 20 mg severe; investigated as a tumorigen, mutagen, reproductive effector.

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

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Acetone (67-64-1)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into water, this material is expected to readily biodegrade. When released to water, this material is expected to quickly evaporate. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material may be moderately degraded by photolysis. When released into the air, this material is expected to be readily removed from the atmosphere by wet deposition.
Environmental Toxicity:
This material is not expected to be toxic to aquatic life. The LC50/96-hour values for fish are over 100 mg/l.

13. Disposal Considerations

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

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: ACETONE
Hazard Class: 3
UN/NA: UN1090
Packing Group: II
Information reported for product/size: 350LB

International (Water, I.M.O.)

Proper Shipping Name: ACETONE
Hazard Class: 3.1
UN/NA: UN1090
Packing Group: II
Information reported for product/size: 350LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Acetone (67-64-1)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Acetone (67-64-1)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Acetone (67-64-1)	No	No	Yes	No

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

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Acetone (67-64-1)	5000	U002	No

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

Australian Hazchem Code: 2[Y]E
Poison Schedule: No information found.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **1** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.
Label Precautions:
Keep away from heat, sparks and flame.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.

Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
Label First Aid:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.
Disclaimer:
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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

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MSDS Material Safety Data Sheet

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

MALLINCKRODT J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

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

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

PYRIDINE

MSDS Number: P7456 --- *Effective Date: 12/08/96*

1. Product Identification

Synonyms: Azabenzene
CAS No.: 110-86-1
Molecular Weight: 79.10
Chemical Formula: C5H5N
Product Codes: J.T. Baker: 3348, 9105, 9393 Mallinckrodt: 7180, 7181

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Pyridine	110-86-1	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. FLAMMABLE LIQUID AND VAPOR. CAUSES SEVERE IRRITATION TO EYES, SKIN AND RESPIRATORY TRACT.

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

Health Rating: 2 - Moderate
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation causes severe irritation to the respiratory tract. Symptoms of overexposure include headache, dizziness, nausea, shortness of breath, coughing, insomnia, diarrhea, gastrointestinal disturbances, and back pain with urinary frequency. Liver and kidney damage may occur. May be fatal.

Ingestion:
Toxic effects parallel those of inhalation. Oral doses of several ounces have been fatal to humans.

Skin Contact:
Causes severe irritation, possibly burns, to the skin. Symptoms include redness and severe pain. Absorption through the skin may occur, resulting in toxic effects similar to inhalation. May act as a photosensitizer.

Eye Contact:
Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.

Chronic Exposure:
Liver and kidney damage has been reported.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin, eye or central nervous system disorders, or impaired liver, kidney, or pulmonary function may be more susceptible to the effects of this substance.

4. First Aid Measures

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

Ingestion:
If swallowed, give large quantities of water to drink and get medical attention

immediately. Never give anything by mouth to an unconscious person.

Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

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

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5. Fire Fighting Measures

Fire:
Flash point: 20C (68F) CC Autoignition temperature: 482C (900F) Flammable limits in air % by volume: lel: 1.8; uel: 12.4 Flammable Liquid Contact with strong oxidizers may cause fire.

Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Vapors can flow along surfaces to distant ignition source and flash back. Sensitive to static discharge.

Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool. Water may be ineffective.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures.

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6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802. J. T. Baker SOLUSORB(tm) solvent adsorbent is

recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL): 5 ppm (TWA) -ACGIH Threshold Limit Value (TLV): 5 ppm (TWA) -NIOSH Recommended Exposure Limit (REL): 5 ppm (Ceiling)

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

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a full facepiece respirator with organic vapor cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

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

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless to yellow liquid.

Odor:
Penetrating, sickening.

Solubility:
Miscible in water.

Specific Gravity:
0.98 @ 25C/4C

pH:
8.5

% Volatiles by volume @ 21C (70F):
100

Boiling Point:
115.3C (239F)

Melting Point:
-42C (-44F)

Vapor Density (Air=1):
2.72

Vapor Pressure (mm Hg):
18 @ 20C (68F)

Evaporation Rate (BuAc=1):
No information found.

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Heat will contribute to instability.

Hazardous Decomposition Products:
May form cyanide fumes and oxides of carbon and nitrogen if heated to decomposition.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
Heat, flame, maleic anhydride, perchromates, strong acids, strong oxidizers. Will attack some forms of plastics, rubber, and coatings.

Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Oral rat LD50: 891 mg/kg; inhalation rat LC50: 28500 mg/m3/1-hour; skin rabbit LD50: 1121 mg/kg; Irritation data: skin rabbit, open Draize, 10 mg/24H mild; eye rabbit, standard Draize, 2 mg severe. Investigated as a tumorigen and mutagen.

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

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Pyridine (110-86-1)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to have a half-life between 1 and 10 days. When released into water, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition.

Environmental Toxicity:
The LC50/96-hour values for fish are between 10 and 100 mg/l. The LC50/96-hour values for fish are over 100 mg/l.

13. Disposal Considerations

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

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: PYRIDINE
Hazard Class: 3
UN/NA: UN1282
Packing Group: II
Information reported for product/size: 441LB

International (Water, I.M.O.)

Proper Shipping Name: PYRIDINE
Hazard Class: 3.2
UN/NA: UN1282
Packing Group: II
Information reported for product/size: 441LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Pyridine (110-86-1)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Pyridine (110-86-1)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Pyridine (110-86-1)	No	No	Yes	No

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

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Pyridine (110-86-1)	1000	U196	No

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

Australian Hazchem Code: 2WE
Poison Schedule: No information found.

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

16. Other Information

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

Label Hazard Warning:
DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. FLAMMABLE LIQUID AND VAPOR. CAUSES SEVERE IRRITATION TO EYES, SKIN AND RESPIRATORY TRACT.

Label Precautions:
Keep away from heat, sparks and flame. Keep container closed. Use only with adequate ventilation. Avoid breathing vapor. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

Label First Aid:
If swallowed, give large amounts of water to drink. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.

Product Use:
Laboratory Reagent.

Revision Information:
Pure. New 16 section MSDS format, all sections have been revised.

Disclaimer:
****
Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT

TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

****

Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

EMERGENCY OVERVIEW: Warning! Flammable. Causes eye irritation. Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis. Inhalation causes headaches, dizziness, drowsiness, nausea, and respiratory irritation. If swallowed, causes headaches, dizziness, drowsiness and nausea, and may lead to unconsciousness. Harmful or fatal if liquid is aspirated into lungs. Danger! Contains Benzene. Cancer hazard. Can cause blood disorders. Harmful when absorbed through the skin.

POTENTIAL HEALTH EFFECTS:

EYE CONTACT: Causes mild eye irritation.

SKIN CONTACT: Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis. Harmful when absorbed through the skin. Cancer hazard. Can cause blood disorders.

INHALATION: Inhalation causes headaches, dizziness, drowsiness, nausea, and respiratory irritation. See "Toxicological Information" section (Section 11.0).

INGESTION: If swallowed, causes headaches, dizziness, drowsiness and nausea, and may lead to unconsciousness. Harmful or fatal if liquid is aspirated into lungs.

HMIS CODE: (Health:2) (Flammability:3) (Reactivity:0)

NFPA CODE: (Health:2) (Flammability:3) (Reactivity:0)

4.0 FIRST AID MEASURES

EYE: Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

SKIN: Wash exposed skin with soap and water. Remove contaminated clothing and thoroughly clean and dry before reuse.

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

INGESTION: If swallowed, drink plenty of water, do NOT induce vomiting. Get immediate medical attention.

5.0 FIRE FIGHTING MEASURES

FLASHPOINT: 40°F(4°C)

UEL: 6.8%

LEL: 1.3%

AUTOIGNITION TEMPERATURE: 997°F (536°C)

FLAMMABILITY CLASSIFICATION: Flammable Liquid.

EXTINGUISHING MEDIA: Agents approved for Class B hazards (e.g., dry chemical, carbon dioxide, foam, steam) or water fog.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Flammable liquid. Vapor may explode if ignited in enclosed area.

FIRE-FIGHTING EQUIPMENT: Firefighters should wear full bunker gear, including a positive pressure self-contained breathing apparatus.

PRECAUTIONS: Keep away from sources of ignition (e.g., heat and open flames). Use with adequate ventilation. Keep container closed.

HAZARDOUS COMBUSTION PRODUCTS: Incomplete burning can produce carbon monoxide and/or carbon dioxide and other harmful products.

6.0 ACCIDENTAL RELEASE MEASURES

Remove or shut off all sources of ignition. Remove mechanically or contain on an absorbent material such as dry sand or earth. Keep out of sewers and waterways.

7.0 HANDLING AND STORAGE

HANDLING: Do not breathe vapors. Do not get in eyes. Do not get on skin or clothing.

STORAGE: Store in flammable liquids storage area. Store away from heat, ignition sources, and open flame in accordance with applicable regulations. Keep container closed.

8.0 EXPOSURE CONTROLS / PERSONAL PROTECTION

EYE: Do not get in eyes. Wear chemical goggles.

SKIN: Avoid skin contact. Wear protective clothing and gloves.

INHALATION: Do not breathe mist or vapor. Use with adequate ventilation. If ventilation is inadequate, use NIOSH certified respirator that will protect against organic vapor and dust/mist.

addition, the International Agency for Research on Cancer (IARC) and OSHA consider benzene to be a human carcinogen. Chronic exposures to benzene at levels of 100 ppm and below have been reported to cause adverse blood effects including anemia. Benzene exposure can occur by inhalation and absorption through the skin.

Inhalation and forced feeding studies of benzene in laboratory animals have produced a carcinogenic response in a variety of organs, including possibly leukemia, other adverse effects on the blood, chromosomal changes and some effects on the immune system. Exposure to benzene at levels up to 300 ppm did not produce birth defects in animal studies; however, exposure to the higher dosage levels (greater than 100 ppm) resulted in a reduction of body weight of the rat pups (fetotoxicity). Changes in the testes have been observed in mice exposed to benzene at 300 ppm, but reproductive performance was not altered in rats exposed to benzene at the same level.

This product contains xylene. Xylene is readily absorbed through the skin. It is also absorbed when inhaled or ingested. Overexposure to xylene can cause eye and respiratory irritation, drowsiness, headache, fatigue, irritability, and gastrointestinal disturbances. Some liver damage and lung inflammation were seen in chronic studies in guinea pigs but not in rats. In rat reproduction studies, xylenes did not produce birth defects but were toxic to the embryo when toxicity to the mother was produced. In a mouse study, xylenes caused birth defects at doses that threatened the life of the mother. The doses which produced these effects were greatly in excess of the TLV. Rat oral LD50: 4300 mg/kg; rat inhalation LC50: 5000 ppm/4 hours.

Aspiration of this product into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this product. Do not siphon by mouth.

12.0 ECOLOGICAL INFORMATION

Ecological testing has not been conducted on this product.

13.0 DISPOSAL INFORMATION

Disposal must be in accordance with applicable federal, state, or local regulations. Residues and spilled material are hazardous waste due to ignitability. Incineration at an EPA-permitted hazardous waste management facility as required by law. Do not landfill.

14.0 TRANSPORTATION INFORMATION

U.S. DEPT OF TRANSPORTATION

Shipping Name	Toluene
Hazard Class	3
Identification Number	UN1294
Packing Group	II
RQ	RQ

INTERNATIONAL INFORMATION:

Sea (IMO/IMDG)

Shipping Name Not determined.

Air (ICAO/IATA)

Shipping Name Not determined.

European Road/Rail (ADR/RID)

Shipping Name Not determined.

Canadian Transportation of Dangerous Goods

Shipping Name Not determined.

15.0 REGULATORY INFORMATION

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR Part 302.4): This product is reportable under 40 CFR Part 302.4 because it contains the following substance(s):

Component/CAS Number	Weight %	Component Reportable Quantity (RQ)
Benzene 71-43-2	2	10 lbs.
Ethylbenzene 100-41-4	2	1,000 lbs.
Xylenes	2	100 lbs.
Toluene 108-88-3	80	1,000 lbs.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR Part 355): This product is not regulated under Section 302 of SARA and 40 CFR Part 355.

SARA TITLE III SECTIONS 311/312 HAZARDOUS CATEGORIZATION (40 CFR Part 370): This product is defined as hazardous by OSHA under 29 CFR Part 1910.1200(d).

SARA TITLE III SECTION 313 (40 CFR Part 372): This product contains the following substance(s), which is on the Toxic Chemicals List in 40 CFR Part 372:

Component/CAS Number	Weight Percent
Benzene 71-43-2	2
Ethylbenzene 100-41-4	2
Xylenes	2
Toluene 108-88-3	80

U.S. INVENTORY (TSCA): Listed on inventory.

OSHA HAZARD COMMUNICATION STANDARD: Flammable liquid. CNS Effects.

EC INVENTORY (EINECS/ELINCS): In compliance.

JAPAN INVENTORY (MITI): Not determined.

AUSTRALIA INVENTORY (AICS): Not determined.

KOREA INVENTORY (ECL): Not determined.

CANADA INVENTORY (DSL): Not determined.

PHILIPPINE INVENTORY (PICCS): Not determined.

16.0 OTHER INFORMATION

Prepared by:

Environment, Health and Safety Department

Issued: April 14, 1997

Supersedes: April 10, 1997

This material Safety Data Sheet conforms to the requirements of ANSI Z400.1.

This material safety data sheet and the information it contains is offered to you in good faith as accurate. We have reviewed any information contained in this data sheet which we received from sources outside our company. We believe that information to be correct but cannot guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. No statement made in this data sheet shall be

construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents. No warranty is made, either express or implied.

MATERIAL SAFETY DATA SHEET

BENZENE (AMOCO/TOTAL)

MSDS No. 11697000 ANSI/ENGLISH

1.0 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: BENZENE (AMOCO/TOTAL)

MANUFACTURER/SUPPLIER:

Amoco Oil Company
200 East Randolph Drive
Chicago, Illinois 60601 U.S.A.

EMERGENCY HEALTH INFORMATION:
1 (800) 447-8735

EMERGENCY SPILL INFORMATION:
1 (800) 424-9300 CHEMTREC (USA)

OTHER PRODUCT SAFETY INFORMATION:
(312) 856-3907

2.0 COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS#	Range % by Wt.
Benzene	71-43-2	99.80
Toluene	108-88-3	0.20

(See Section 8.0, "Exposure Controls/Personal Protection", for exposure guidelines)

3.0 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Danger! Extremely flammable. Causes eye and skin irritation. Inhalation causes headaches, dizziness, drowsiness, and nausea, and may lead to unconsciousness. Harmful or fatal if liquid is aspirated into lungs. Danger! Contains Benzene. Cancer hazard. Can cause blood disorders. Harmful when absorbed through the skin.

POTENTIAL HEALTH EFFECTS:

EYE CONTACT: Causes mild eye irritation.

SKIN CONTACT: Causes mild skin irritation. Causes skin irritation on prolonged or repeated contact. Harmful when absorbed through the skin.

INHALATION: Cancer hazard. Can cause blood disorders. Inhalation causes headaches, dizziness, drowsiness, and nausea, and may lead to unconsciousness. See "Toxicological Information" section (Section 11.0).

INGESTION: Harmful or fatal if liquid is aspirated into lungs. See "Toxicological Information" section (Section 11.0).

HMIS CODE: (Health:2) (Flammability:3) (Reactivity:0)

NFPA CODE: (Health:2) (Flammability:3) (Reactivity:0)

4.0 FIRST AID MEASURES

EYE: Flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation persists.

SKIN: Wash exposed skin with soap and water. Remove contaminated clothing, including shoes, and thoroughly clean and dry before reuse. Get medical attention if irritation develops.

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

INGESTION: If swallowed, drink plenty of water, do NOT induce vomiting. Get immediate medical attention.

5.0 FIRE FIGHTING MEASURES

FLASHPOINT: 12°F(-11°C)

UEL: 8.0%

LEL: 1.5%

AUTOIGNITION TEMPERATURE: 928°F (498°C)

FLAMMABILITY CLASSIFICATION: Extremely Flammable Liquid.

EXTINGUISHING MEDIA: Agents approved for Class B hazards (e.g., dry chemical, carbon dioxide, foam, steam) or water fog.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Extremely flammable liquid. Vapor may explode if ignited in enclosed area.

FIRE-FIGHTING EQUIPMENT: Firefighters should wear full bunker gear, including a positive pressure self-contained breathing apparatus.

PRECAUTIONS: Keep away from sources of ignition (e.g., heat and open flames). Keep container closed. Use with adequate ventilation.

HAZARDOUS COMBUSTION PRODUCTS: Incomplete burning can produce carbon monoxide and/or carbon dioxide and other harmful products.

6.0 ACCIDENTAL RELEASE MEASURES

Remove or shut off all sources of ignition. Remove mechanically or contain on an absorbent material such as dry sand or earth. Increase ventilation if possible. Wear respirator and spray with water to disperse vapors. Keep out of sewers and waterways.

7.0 HANDLING AND STORAGE

HANDLING: Use with adequate ventilation. Do not breathe vapors. Keep away from ignition sources (e.g., heat, sparks, or open flames). Ground and bond containers when transferring materials. Wash thoroughly after handling. After this container has been emptied, it may contain flammable vapors; observe all warnings and precautions listed for this product.

STORAGE: Store in flammable liquids storage area. Store away from heat, ignition sources, and open flame in accordance with applicable regulations. Keep container closed. Outside storage is recommended.

8.0 EXPOSURE CONTROLS / PERSONAL PROTECTION

EYE: Do not get in eyes. Wear eye protection.

SKIN: Do not get on skin or clothing. Wear protective clothing and gloves.

INHALATION: Do not breathe mist or vapor. If heated and ventilation is inadequate, use supplied-air respirator approved by NIOSH/MSHA.

ENGINEERING CONTROLS: Control airborne concentrations below the exposure guidelines.

EXPOSURE GUIDELINES:

Component	CAS#	Exposure Limits
Benzene	71-43-2	OSHA PEL: 1 ppm OSHA STEL: 5 ppm ACGIH TLV-TWA: 10 ppm
Toluene	108-88-3	OSHA PEL: 100 ppm (1989); 200 ppm (1971) OSHA STEL: 150 ppm (1989); Not established. (1971) OSHA Ceiling: 300 ppm (1971) ACGIH TLV-TWA: 50 ppm (skin)

9.0 CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE AND ODOR: Liquid. Colorless. Sweet odor.

pH: Not determined.

VAPOR PRESSURE: 74.6 mm Hg at 20 °C

VAPOR DENSITY: Not determined.

BOILING POINT: 176°F(80°C)

MELTING POINT: 42°F(6°C)

SOLUBILITY IN WATER: Slight, 0.1 to 1.0%.

SPECIFIC GRAVITY (WATER=1): 0.88

10.0 STABILITY AND REACTIVITY

STABILITY: Stable.

CONDITIONS TO AVOID: Keep away from ignition sources (e.g. heat, sparks, and open flames).

MATERIALS TO AVOID: Avoid chlorine, fluorine, and other strong oxidizers.

HAZARDOUS DECOMPOSITION: None identified.

HAZARDOUS POLYMERIZATION: Will not occur.

11.0 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY DATA:

EYE IRRITATION: Testing not conducted. See Other Toxicity Data.

SKIN IRRITATION: Testing not conducted. See Other Toxicity Data.

DERMAL LD50: Testing not conducted. See Other Toxicity Data.

ORAL LD50: 3.8 g/kg (rat).

INHALATION LC50: 10000 ppm (rat)

OTHER TOXICITY DATA: Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, or excitation. Exposure to very high levels can result in unconsciousness and death.

Long-term overexposure to benzene has been associated with certain types of leukemia in humans. In addition, the International Agency for Research on Cancer (IARC) and OSHA consider benzene to be a human carcinogen. Chronic exposures to benzene at levels of 100 ppm and below have been reported to cause adverse blood effects including anemia. Benzene exposure can occur by inhalation and absorption through the skin.

Inhalation and forced feeding studies of benzene in laboratory animals have produced a carcinogenic response in a variety of organs, including possibly leukemia, other adverse effects on the blood, chromosomal changes and some effects on the immune system. Exposure to benzene at levels up to 300 ppm did not produce birth defects in animal studies; however, exposure to the higher dosage levels (greater than 100 ppm) resulted in a reduction of body weight of the rat pups (fetotoxicity). Changes in the testes have been observed in mice exposed to benzene at 300 ppm, but reproductive performance was not altered in rats exposed to benzene at the same level.

Aspiration of this product into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this product. Do not siphon by mouth.

12.0 ECOLOGICAL INFORMATION

Ecological testing has not been conducted on this product.

13.0 DISPOSAL INFORMATION

Disposal must be in accordance with applicable federal, state, or local regulations. Enclosed-controlled incineration is recommended unless directed otherwise by applicable ordinances. Residues and spilled material are hazardous waste due to ignitability.

14.0 TRANSPORTATION INFORMATION

U.S. DEPT OF TRANSPORTATION

Shipping Name	Benzene
Hazard Class	3
Identification Number	UN1114
Packing Group	II
RQ	RQ

INTERNATIONAL INFORMATION:

Sea (IMO/IMDG)

Shipping Name Not determined.

Air (ICAO/IATA)

Shipping Name Not determined.

European Road/Rail (ADR/RID)

Shipping Name Not determined.

Canadian Transportation of Dangerous Goods

Shipping Name Not determined.

15.0 REGULATORY INFORMATION

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR Part 302.4): This product is reportable under 40 CFR Part 302.4 because it contains the following substance(s):

Component/CAS Number	Weight %	Component Reportable Quantity (RQ)
Benzene 71-43-2	99.80	10 lbs.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR Part 355): This product is not regulated under Section 302 of SARA and 40 CFR Part 355.

SARA TITLE III SECTIONS 311/312 HAZARDOUS CATEGORIZATION (40 CFR Part 370): This product is defined as hazardous by OSHA under 29 CFR Part 1910.1200(d).

SARA TITLE III SECTION 313 (40 CFR Part 372): This product contains the following substance(s), which is on the Toxic Chemicals List in 40 CFR Part 372:

Component/CAS Number	Weight Percent
Benzene 71-43-2	99.80

U.S. INVENTORY (TSCA): Listed on inventory.

OSHA HAZARD COMMUNICATION STANDARD: Flammable liquid. Carcinogen. Irritant. CNS Effects. Target organ effects.

EC INVENTORY (EINECS/ELINCS): In compliance.

JAPAN INVENTORY (MITI): Not determined.

AUSTRALIA INVENTORY (AICS): Not determined.

KOREA INVENTORY (ECL): Not determined.

CANADA INVENTORY (DSL): Not determined.

PHILIPPINE INVENTORY (PICCS): Not determined.

16.0 OTHER INFORMATION

Prepared by:

Environment, Health and Safety Department

Issued: November 14, 1995

This material Safety Data Sheet conforms to the requirements of ANSI Z400.1.

This material safety data sheet and the information it contains is offered to you in good faith as accurate. We have reviewed any information contained in this data sheet which we received from sources outside our company. We believe that information to be correct but cannot guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. No statement made in this data sheet shall be construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents. No warranty is made, either express or implied.

MSDS for THIOPHENE Page 1

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1 - PRODUCT IDENTIFICATION

PRODUCT NAME: THIOPHENE
FORMULA: C4H4S
FORMULA WT: 84.14
CAS NO.: 00110-02-1
NIOSH/RTECS NO.: XM7350000
COMMON SYNONYMS: THIOFURAN; THIOFURAM
PRODUCT CODES: V838
EFFECTIVE: 11/06/85
REVISION #01

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH	-	2	MODERATE
FLAMMABILITY	-	3	SEVERE (FLAMMABLE)
REACTIVITY	-	2	MODERATE
CONTACT	-	2	MODERATE

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

PRECAUTIONARY LABEL STATEMENTS

WARNING
FLAMMABLE
HARMFUL IF SWALLOWED
CAUSES IRRITATION

KEEP AWAY FROM HEAT, SPARKS, FLAME. DO NOT GET IN EYES, ON SKIN, ON CLOTHING. AVOID BREATHING VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE, USE WATER SPRAY, ALCOHOL FOAM, DRY CHEMICAL, OR CARBON DIOXIDE. FLUSH SPILL AREA WITH WATER SPRAY.

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

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2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
THIOPHENE	90-100	110-02-1

---

3 - PHYSICAL DATA

BOILING POINT: 84 C (183 F) VAPOR PRESSURE(MM HG): 40

MSDS for THIOPHENE Page 2

MELTING POINT: -38 C (-36 F) VAPOR DENSITY(AIR=1): 2.9

SPECIFIC GRAVITY: 1.06 (H2O=1) EVAPORATION RATE: N/A (BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME: 99

APPEARANCE & ODOR: PALE YELLOW LIQUID WITH SLIGHT AROMATIC ODOR OF BENZENE.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP -1 C (30 F) NFPA 704M RATING: 2-3-0

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA
USE ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE.
(WATER MAY BE INEFFECTIVE.)

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS
CONTACT WITH STRONG OXIDIZERS MAY CAUSE FIRE OR EXPLOSION.

TOXIC GASES PRODUCED
OXIDES OF SULFUR

5 - HEALTH HAZARD DATA

TOXICITY: LD50 (IPR-MOUSE)(MG/KG) - 100

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE
CONTACT WITH SKIN OR EYES MAY CAUSE IRRITATION.

TARGET ORGANS
NONE IDENTIFIED

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED

ROUTES OF ENTRY
NONE INDICATED

EMERGENCY AND FIRST AID PROCEDURES
CALL A PHYSICIAN.

IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING.
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. FLUSH SKIN WITH WATER.

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, FLAME, OTHER SOURCES OF IGNITION

INCOMPATIBLES: NITRATES, STRONG OXIDIZING AGENTS

DECOMPOSITION PRODUCTS: OXIDES OF SULFUR

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. SHUT OFF IGNITION SOURCES; NO FLARES, SMOKING OR FLAMES IN AREA. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. TAKE UP WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE INTO CONTAINER FOR LATER DISPOSAL. FLUSH AREA WITH WATER.

J. T. BAKER SOLUSORB(R) SOLVENT ADSORBENT IS RECOMMENDED FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D001 (IGNITABLE WASTE)

8 - PROTECTIVE EQUIPMENT

VENTILATION: USE ADEQUATE GENERAL OR LOCAL EXHAUST VENTILATION TO KEEP VAPOR AND MIST LEVELS AS LOW AS POSSIBLE.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION CONDITIONS EXIST. IF AIRBORNE CONCENTRATION IS HIGH, A CHEMICAL CARTRIDGE RESPIRATOR WITH ACID/ ORGANIC CARTRIDGE IS RECOMMENDED. IF CONCENTRATION EXCEEDS CAPACITY OF CARTRIDGE RESPIRATOR, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES AND FACE SHIELD, UNIFORM, PROTECTIVE SUIT, PROPER GLOVES ARE RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

SPECIAL PRECAUTIONS
KEEP CONTAINER TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED, FLAMMABLE LIQUID STORAGE AREA OR CABINET.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	FLAMMABLE LIQUID, N.O.S. (THIOPHENE)
HAZARD CLASS	FLAMMABLE LIQUID
UN/NA	UN1993
LABELS	FLAMMABLE LIQUID

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	THIOPENE
HAZARD CLASS	3.2
UN/NA	UN2414
LABELS	FLAMMABLE LIQUID

04 332 16 ACTE

Material Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List) DETERGENT 8	Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that

Section I

Manufacturer's Name	Emergency Telephone Number
ALCONOX, INC.	(212) 473-1300
Address (Number, Street, City, State, and ZIP Code)	**Telephone Number for Information**
215 PARK AVENUE SOUTH	(212) 473-1300
NEW YORK, N.Y. 10003	**Date Prepared** JULY 1, 1989
	Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
ETHYLENE GLYCOL MONOBUTYL ETHER	50 PPM	25 PPM		
DIPROPYLENE GLYCOL METHYL ETHER	100 PPM	100 PPM		

NO OTHER INGREDIENTS IN DETERGENT 8 APPEARED ON THE OSHA STANDARD 29 CFR 1910 SUBPART Z.

Section III — Physical/Chemical Characteristics

Boiling Point	235°F	Specific Gravity (H_2O = 1)	.994
Vapor Pressure (mm Hg.)	NO DATA	Melting Point	N.A.
Vapor Density (AIR = 1)	NO DATA	Evaporation Rate (Butyl Acetate = 1)	NO DATA

Solubility in Water COMPLETE

Appearance and Odor CLEAR LIQUID-SLIGHT AMMONIA ODOR

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL
191°F (OPEN CUP)		NO DATA	NO DATA

Extinguishing Media ALCOHOL FOAM, CO_2, DRY CHEMICAL, WATER FOG

Special Fire Fighting Procedures FOR FIRES INVOLVING THIS MATERIAL DO NOT ENTER WITHOUT PROTECTIVE EQUIPMENT AND SELF CONTAINED BREATHING APPARATUS.

Unusual Fire and Explosion Hazards NONE

Section V — Reactivity Data

Stability	Unstable		Conditions to Avoid NONE
	Stable	XX	

Incompatibility (*Materials to Avoid*) STRONG ACIDS, OXIDIZERS

Hazardous Decomposition or Byproducts THERMAL DECOMPOSITION MAY RELEASE NITROUS OXIDES

Hazardous Polymerization	May Occur		Conditions to Avoid NONE
	Will Not Occur	XX	

Section VI — Health Hazard Data

Route(s) of Entry: Inhalation? YES Skin? YES Ingestion? YES

Health Hazards (*Acute and Chronic*) INHALATION OF VAPORS MAY PROVE LOCALLY IRRITATING. SKIN CONTACT MAY PROVE LOCALLY IRRITATING. INGESTION MAY CAUSE DISCOMFORT AND/OR NAUSEA.

Carcinogenicity: NTP? NO IARC Monographs? NO OSHA Regulated? NO

Signs and Symptoms of Exposure INHALATION MAY CAUSE DROWSINESS IN POORLY VENTILLATED AREAS. SKIN CONTACT MAY PROVE LOCALLY IRRITATING.

Medical Conditions Generally Aggravated by Exposure PREEXISTING SKIN DISORDERS MAY BE AGGRAVATED UPON EXPOSURE.

Emergency and First Aid Procedures EYES-FLUSH WITH PLENTY OF WATER FOR 15 MINUTES.SEEK MEDICAL ATTENTION. SKIN-FLUSH WITH PLENTY OF WATER. INGESTION-GIVE WATER.DO NOT INDUCE VOMITING.IF VOMITING OCCURS READMINISTER FLUIDS. SEE A PHYSICIAN.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken In Case Material Is Released or Spilled USE ABSORBENT MATERIAL AND REMOVE WITH A SHOVEL RINSE REMAINDER TO SEWER. MATERIAL IS COMPLETEL BIODEGRADABLE.

Waste Disposal Method SMALL QUANTITIES MAY BE DISPOSED OF IN SEWER. LARGE QUANTITIES SHOULD BE DISPOSED OF ACCORDING TO LOCAL REQUIREMENTS FOR ALKALINE LIQUID.

Precautions to Be Taken In Handling and Storing NO SPECIAL PRECAUTIONS IN STORING. OPEN CONTAINER SLOWLY TO RELEASE PRESSURE BUILD-UP.

Other Precautions USE PROTECTIVE EQUIPMENT WHEN HANDLING UNDILUTE MATERIAL. AVOID SPLASHING AND SPRAYING UNDILUTE MATE

Section VIII — Control Measures

Respiratory Protection (*Specify Type*) NOT REQUIRED

Ventilation	Local Exhaust	NORMAL	Special	N.A.
	Mechanical (*General*)	N.A.	Other	N.A.
Protective Gloves		REQUIRED	Eye Protection	RECOMMENDED

Other Protective Clothing or Equipment EYE WASH STATION SHOULD BE AVAILABLE.

Work/Hygienic Practices USE GOOD INDUSTRIAL HYGIENE AND SAFETY PRACTICES EMPLOYED WITH ANY INDUSTRIAL CHEMICAL

• U.S.G.P.O.: 1986-491-529/45775

Liqui-Nox ®

MATERIAL SAFETY DATA SHEET

Alconox, Inc.
9 East 40th Street, Suite 200
New York, NY 10016

I. IDENTIFICATION

Product Name (as appears on label)	LIQUI-NOX
CAS Registry Number:	Not Applicable
Effective Date:	January 1, 1998
Chemical Family:	Anionic Liquid Detergent

II. HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

There are no hazardous ingredients in LIQUI-NOX™ as defined by the OSHA Standard and Hazardous Substance List 29 CFR 1910 Subpart Z.

III. PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point (F):	214°F
Vapor Pressure (mm Hg):	No Data
Vapor Density (AIR=1):	No Data
Specific Gravity (Water=1):	1.075
Melting Point:	Not Applicable
Evaporation Rate (Butyl Acetate=1):	Slower
Solubility in Water:	Completely soluble in all proportions.
Appearance:	Yellow liquid, nearly odorless

IV. FIRE AND EXPLOSION DATA

Flash Point:	None (Cleveland Open Cup)
Flammable Limits:	LEL: No Data UEL: No Data
Extinguishing Media:	Water, dry chemical, CO_2, foam
Special Firefighting Procedures:	Self-contained positive pressure breathing apparatus and protective clothing should be worn when fighting fires involving chemicals.
Unusual Fire and Explosion Hazards:	None

V. REACTIVITY DATA

Stability:	Stable
Conditions To Avoid:	None
Incompatibility (Materials To Avoid):	Oxidizing agents.
Hazardous Decomposition or Byproducts:	May release SO_2 on burning

VI. HEALTH HAZARD DATA

Route(s) of Entry:	Inhalation? No Skin? Yes Ingestion? Yes
Health Hazards (Acute and Chronic):	Skin contact may prove locally irritating, causing drying and/or chapping. Ingestion may cause discomfort and/or diarrhea.
Carcinogenicity:	NTP? No IARC Monographs? No OSHA Regulated? No
Signs and Symptoms of Exposure:	Prolonged skin contact may cause drying and/or chapping.

Medical Conditions Generally Aggravated by Exposure:	Not established. Unnecessary exposure to this product or any industrial chemical should be avoided.
Emergency and First Aid Procedures:	Eyes: Immediately flush eyes with water for at least 15 minutes. Call a physician. Skin: Flush with plenty of water. Ingestion: Drink large quantities of water or milk. Do not induce vomiting. If vomiting occurs readminister fluids. See a physician for discomfort.

VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken if Material is Released or Spilled:	Material foams profusely. For small spills recover as much as possible with absorbent material and flush remainder to sewer. Material is biodegradable.
Waste Disposal Method:	Small quantities may be disposed of in sewer. Large quantities should be disposed of in accordance with local ordinances for detergent products.
Precautions to be Taken in Storing and Handling:	No special precautions in storing. Use protective equipment when handling undilute material.
Other Precautions:	No special requirements other than the good industrial hygiene and safety practices employed with any industrial chemical.

VIII. CONTROL MEASURES

Respiratory Protection (Specify Type):	Not Required
Ventilation:	Local Exhaust-Normal Special-Not Required Mechanical-Not Required Other-Not Required
Protective Gloves:	Impervious gloves are recommended.
Eye Protection:	Goggles and/or splash shields are recommended.

Other Protective Clothing or Equipment:	Not required
Work/Hygienic Practices:	No special practices required

THE INFORMATION HEREIN IS GIVEN IN GOOD FAITH BUT NO WARRANTY IS EXPRESSED OR IMPLIED.

APPENDIX E

SEDIMENT/EROSION CONTROL MEASURES

STANDARD AND SPECIFICATIONS FOR STRAW BALE DIKE

Definition

A temporary barrier of straw or similar material used to intercept sediment laden runoff from small drainage areas of disturbed soil.

Purpose

The purpose of a bale dike is to reduce runoff velocity and effect deposition of the transported sediment load. Straw bale dikes have an estimated design life of three (3) months.

Conditions Where Practice Applies

The straw bale dike is used where:

1. No other practice is feasible.
2. There is no concentration of water in a channel or other drainage way above the barrier.
3. Erosion would occur in the form of sheet erosion.
4. Length of slope above the straw bale dike does not exceed these limits.

Constructed Slope	Percent Slope	Slope Length (ft.)
2:1	50	25
2 -1/2:1	40	50
3:1	33	75
3-1/2:1	30	100
4:1	25	125

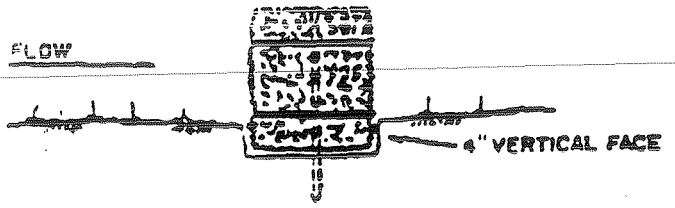
Where slope gradient changes through the drainage area, steepness refers to the steepest slope section contributing to the straw bale dike.

The practice may also be used for a single family lot if the slope is less than 15 percent. The contributing drainage area in this instance shall be less than one acre and the length of slope above the dike shall be less than 200 feet.

Design Criteria

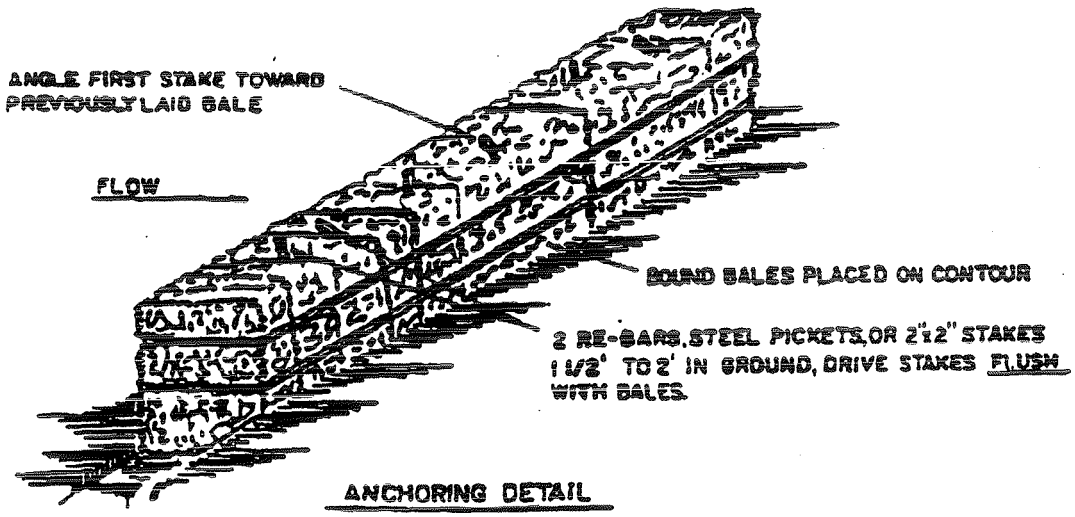
A design is not required. All bales shall be placed on the contour with cut edge of bale adhering to the ground. See Figure 5A.8 on page 5A.18 or details.

Figure 5A.8
Straw Bale Dike Details



BEDDING DETAIL

DRAINAGE AREA NO MORE THAN 1/4 ac. PER 100 FEET OF STRAW BALE DIKE FOR SLOPES LESS THAN 25%



ANCHORING DETAIL

CONSTRUCTION SPECIFICATIONS

1. BALES SHALL BE PLACED AT THE TOE OF A SLOPE OR ON THE CONTOUR AND IN A ROW WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES.
2. EACH BALE SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF (4) INCHES, AND PLACED SO THE BINDINGS ARE HORIZONTAL.
3. BALES SHALL BE SECURELY ANCHORED IN PLACE BY EITHER TWO STAKES OR RE-BARS DRIVEN THROUGH THE BALE. THE FIRST STAKE IN EACH BALE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE AT AN ANGLE TO FORCE THE BALES TOGETHER. STAKES SHALL BE DRIVEN FLUSH WITH THE BALE.
4. INSPECTION SHALL BE FREQUENT AND REPAIR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
5. BALES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFULNESS SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE SYRACUSE, NEW YORK	STRAW BALE DIKE	STANDARD SYMBOL SBD

STANDARD AND SPECIFICATIONS FOR SILT FENCE

Definition

A temporary barrier of geotextile fabric (filter cloth) used to intercept sediment laden runoff from small drainage areas of disturbed soil.

Purpose

The purpose of a silt fence is to reduce runoff velocity and effect deposition of transported sediment load. Limits imposed by ultraviolet stability of the fabric will dictate the maximum period the silt fence may be used.

Conditions Where Practice Applies

A silt fence may be used subject to the following conditions:

1. Maximum allowable slope lengths contributing runoff to a silt fence are:

Slope Steepness	Maximum Slope Length (Ft)
2:1	50
3:1	75
4:1	125
5:1	175
Flatter than 5:1	200

2. Maximum drainage area for overland flow to a silt fence shall not exceed 1/2 acre per 100 feet of fence; and
3. Erosion would occur in the form of sheet erosion; and
4. There is no concentration of water flowing to the barrier.

Design Criteria

Design computations are not required. All silt fences shall be placed as close to the area as possible, and the area below the fence must be undisturbed or stabilized.

A detail of the silt fence shall be shown on the plan, and contain the following minimum requirements:

1. The type, size, and spacing of fence posts.
2. The size of woven wire support fences.
3. The type of filter cloth used.
4. The method of anchoring the filter cloth.
5. The method of fastening the filter cloth to the fencing support.

Where ends of filter cloth come together, they shall be overlapped, folded and stapled to prevent sediment bypass. See Figure 5A.9 on page 5A.20 for details.

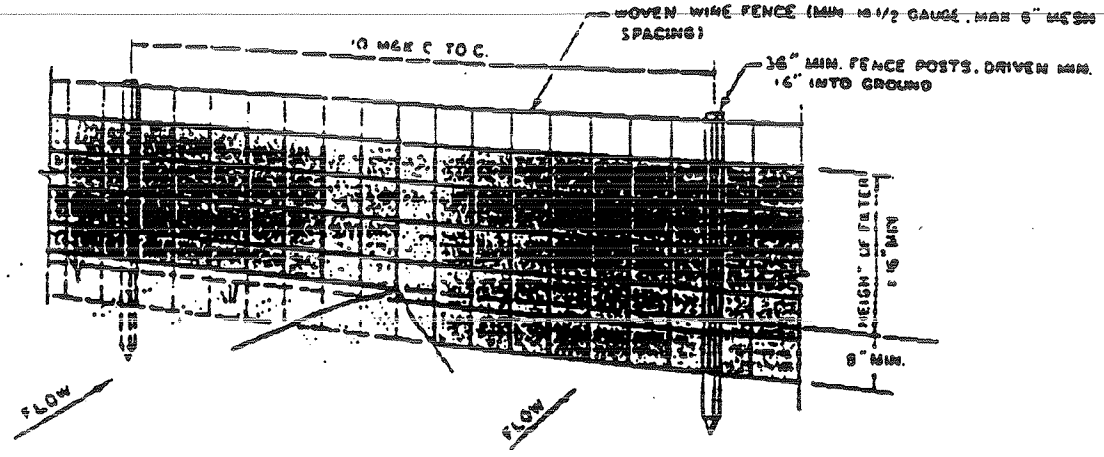
Criteria for Silt Fence Materials

1. Silt Fence Fabric: The fabric shall meet the following specifications unless otherwise approved by the appropriate erosion and sediment control plan approval authority. Such approval shall not constitute statewide acceptance. Statewide acceptability shall depend on in field and/or laboratory observations and evaluations.

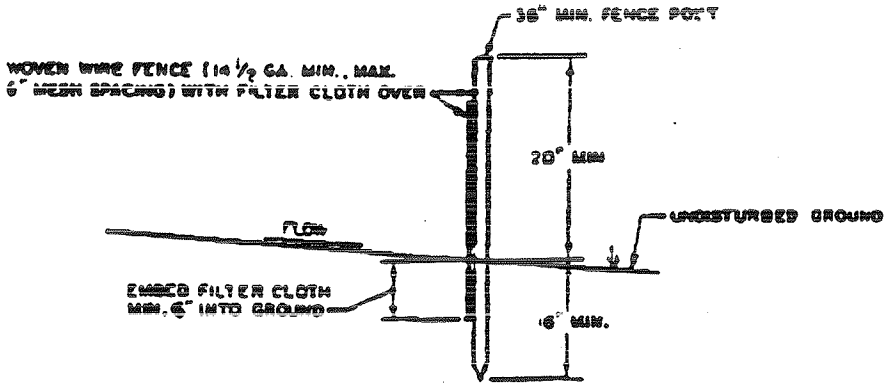
Fabric Properties	Minimum Acceptable Value	Test Method
Grab Tensile Strength (lbs)	90	ASTM D1682
Elongation at Failure (%)	50	ASTM D1682
Mullen Burst Strength (PSI)	190	ASTM D3786
Puncture Strength (lbs)	40	ASTM D751 (modified)
Slurry Flow Rate (gal/min/sf)	0.3	
Equivalent Opening Size	40-80	US Std Sieve CW-02215
Ultraviolet Radiation Stability (%)	90	ASTM G-26

2. Fence Posts (for fabricated units): The length shall be a minimum of 36 inches long. Wood posts will be of sound quality hardwood with a minimum cross sectional area of 3.0 square inches. Steel posts will be standard T and U section weighing not less than 1.00 pound per linear foot.
3. Wire Fence (for fabricated units): Wire fencing shall be a minimum 14-1/2 gage with a maximum 6 in. mesh opening, or as approved.
4. Prefabricated Units: Envirofence or approved equal may be used in lieu of the above method providing the unit is installed per details shown in Figure 5A.9.

Figure 5A.9
Silt Fence Details



PERSPECTIVE VIEW



SECTION

CONSTRUCTION NOTES FOR FABRICATED SILT FENCE

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES.
2. FILTER CLOTH TO BE TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY SIX INCHES AND FOLDED.
4. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE

POSTS: STEEL EITHER "T" OR "U" TYPE OR 2" HARDWOOD

FENCE: WOVEN WIRE. 14 1/2 GA. 6" MAX. MESH OPENINGS

FILTER CLOTH: FILTER X. MIRAFI 100X. STABILINKA T140N OR APPROVED EQUAL.

PREFABRICATED UNIT: GEOFAB. ENVIROFENCE. OR APPROVED EQUAL.

U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE SYRACUSE, NEW YORK	SILT FENCE	STANDARD SYMBOL