New York State Department of Environmental Conservation

Division of Environmental Remediation

Site Remediation Project
Becker Electronics
Site Number: 4-20-007
East Durham, New York

WORK PLAN

Contract Documents
May 15, 2000

Tyree Organization, LTD

Member
The Tyree Organization

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Item No.	*Item Description*	*Unit*	*Estimated Quantity*	*Unit or Lump Sum Price*		*Total Amount ($)*
				Words	*Figures*	
PLI	Pollution Liability Insurance	L.S.	1	Zero	0	0

This item is not to be calculated in the base Bid for the project. **Contractor** is referred to Article 4 of the General Conditions in the Contract Documents. The limits for Pollution Liability Insurance will be the same as defined in Article 4 of the General Conditions. After opening of bids, **Department** will determine if it is in **Department's** best interest to have **Contractor** obtain an additional $4,000,000 Pollution Liability Insurance on a site specific basis, and if so, **Contractor** will be paid separately at the actual documented cost to obtain this additional insurance. The Bidder is required to fill in the above price if it can obtain site-specific Pollution Liability Insurance. This Bid amount will be the upper limit for payment of this item. The **Department** is to be listed on the Bidder's Company Policy as an additional insured at no additional cost to the **Department**.

Michael J. Wright
Contract Authorized Representative

BECKER ELECTRONICS
Contract Name

5-2-00
Date

SITE REMEDIATION PROJECT
BECKER ELECTRONICS
SITE NUMBER 4-20-007
EAST DURHAM
GREENE COUNTY, NEW YORK

WORK PLAN

Prepared for:
New York State Department of Environmental Conservation
Bureau of Central Remedial Action
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Albany NY 12205

Prepared by:
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MAY 2000

Member
The Tyree Organization

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1.0 INTRODUCTION

The Tyree Organization, Ltd. (Tyree) has prepared this Work Plan in support of site remediation activities at the Becker Electronics Site (New York State Department of Environmental Conservation (NYSDEC) Site I.D. No. 4-20-007), which is located in the hamlet of East Durham, Town of Durham, Greene County, New York. A site sketch map showing current conditions is presented as Figure 1.

This work plan is based on the requirements outlined in Title 6 of the New York State Codes of Rules and Regulations Part 375 as well as the New York State Department of Environmental Conservation (NYSDEC) Spill Technology and Remediation Series (STARS) Guidance Document, August 1992.

1.1 Objectives

The objectives of the site remediation activities are to demolish the former chemical storage building with onsite disposal of the building debris, excavate the contaminated soil from under the chemical storage building with offsite disposal/treatment, modify 5 existing groundwater monitoring wells, install a groundwater remediation system, and regrade and construct a capped debris pile.

1.2 Applicable Permits

The Town of Durham requires permits for demolition work and residential building activities, so the applicable permit requirements for the work are for demolition only. Greene County does not require permitting for the project activities.

2.0 SEQUENCE OF WORK

This section details the specific work activities that will be conducted in support of the site remedial activities. The section detail is divided according to the sequence of performing the tasks.

2.1 Project Plan Preparation

Site remediation work such as that specified for the Becker Electronics site requires the preparation of several project plans. The three plans to be developed are: a Work Plan, a Health and Safety Plan (HASP), and a Sampling and Analysis Plan (SAP).

The project-specific Work Plan (this document) identifies the project objectives, sequence of work, major and minor site elements, quality control methods and procedures, and material handling and disposal methodologies.

The HASP will be designed to address the requirements and designated protocols to be followed during the performance of site remedial activities. The HASP will be reviewed and signed by all personnel prior to entering either the exclusion zone or the contaminant reduction zone. The HASP is provided as a separate document.

The SAP will be the guiding document for the sampling, analysis, and data reporting for site media (soil and water). Included within the SAP are specific methods and procedures for the sampling and analysis of: excavated soils; soil excavation; treated construction water and decontamination fluids; monitoring well water; treatment system effluent; and air samples. The SAP will also present sample custody procedures, as well as identify sampling team(s) and equipment.

2.2 Pre-Construction Meeting

A pre-construction meeting will be held to review the project objectives and methods and to discuss potential logistical constraints. Personnel representing the NYSDEC, Tyree, and Tyree's major subcontractors will attend the meeting. The site layout and health and safety procedures will be reviewed as part of the meeting. The Underground Facilities Protection Organization will be contacted a minimum of 72 hours prior to the pre-construction meeting, so that the underground mark-outs can be incorporated as part of the discussion of site logistics.

2.3 Site Mobilization/Establishment of Work Areas

After the pre-construction meeting, mobilization to the site will commence. The preparation for setting up the jobsite trailers, including the power drop will include also the liquid containers and soil staging areas that will be set up. A fractionation tank is proposed for use at the site, and will be staged in an area adjacent to the building slated to house the treatment system. The staging areas for the containment of excavated contaminated soils will be constructed according to the specifications, and will be located as identified on Figure 2. The decontamination pad and contractor equipment staging areas will be setup and constructed according to the layout identified on Figure 2. The proposed work area layout for the project is shown in Figure 2.

Appropriate measures (e.g., barricades and temporary fencing) will be taken to physically isolate work areas at the site from the remaining portion of the property. Water generated from the decontamination process will be transferred to an on-site containment tank and stored prior to sampling to determine waste disposal options.

2.4 Demolition of Former Chemical Storage Building

The work for the contract will begin with the demolition of the building. The existing concrete block building with its associated concrete slab floor and footings will be torn down using an excavator and front-end loader. Special care will be taken to ensure that the slab will be broken into manageable sections that can be easily loaded for subsequent transport to the onsite debris pile. Soils adhered to the pieces of concrete will be removed prior to the concrete pieces moving to the debris pile. The debris will be moved with a loader or small dump truck to the existing onsite debris pile. The work associated with the debris pile is described in Section 2.6

2.5 Excavation of Soils

The soils located below the former chemical storage building are slated for excavation. Once the chemical storage building has been demolished and removed, the contaminated soil under the footprint of the building will be excavated to a depth of approximately seven feet below grade within the limits detailed in the contract drawings. The excavated soils will be transferred to the staging areas with the heaviest contaminated soils (as determined through field screening) to be segregated as hazardous and the lesser contaminated segregated as non-hazardous. The soils will be screened for volatile organic compounds using a photo-ionization detector. Samples will be collected from the stockpiles for laboratory analysis to determine their respective waste stream classification.

Large size boulders should they be encountered, will be cleaned of soil and returned to the excavation as backfill. The excavation will be backfilled with clean select fill brought to the site from a borrow source. The borrow materials will be properly certified as to their physical and chemical composition prior to delivery to the site. The excavation will be backfilled with

successive one-foot lifts of fill materials. Each lift will be compacted with a walk-behind tamper for compaction. The 90% compaction criterion will be field-verified using a densiometer to ensure compliance. All methods of excavation to be performed at the site will conform to OSHA regulations.

2.6 Debris Relocation and Capping

The material associated with the demolition of the building will be transferred to the existing debris pile onsite. The western portion of the property that includes the drainage swale will be grubbed and regraded to promote proper drainage. The cut and chipped vegetation along with the existing debris located along the western portion of the site, and miscellaneous debris will be consolidated into one large pile. Additional material that will be added will include pile will be graded and sloped as per the contract drawings. The regraded pile will be covered with a single layer of stabilization fabric. A minimum 12-inch layer of low permeability soil will be spread over the fabric and compacted. The compacted pile will be finalized with a 6-inch minimum layer of topsoil and then seeded.

The top portion of the debris cap will contain two gas vents that assist in venting out the gasses of decomposition. The vents will be constructed as according to the contract specifications.

2.7 Sampling and Analysis of Site Media

Samples for laboratory analysis will be collected from several sources during site remedial activities. Pre-construction and post-construction soil samples will be collected from the site as a quality control check on the conduct of the work. These samples will be analyzed for volatile organic compounds (VOC) using USEPA Method 8260. Confirmatory soil samples will be collected from locations determined by a Department Representative and analyzed for VOCs by USEPA Method 8260 to ensure that the removal of soils exceeding established cleanup

criterion has been satisfied. Soil samples will also be collected from the excavated contaminated soils to determine the placement into a waste category. These samples will be analyzed for full TCLP as specified.

Waste liquids generated from site activities and decontamination operations will be temporarily stored on-site in appropriate containers. These liquids will be batch processed through the groundwater treatment system following construction after receipt of analytical data that satisfy the effluent limitations and monitoring requirements provided in the contract bid documents.

2.8 Monitoring Well Modification

There are 5 existing groundwater monitoring wells (MW-106D, OW-1, OW-2 and OW-4) that are to be modified and completed as recovery wells as part of the site remediation activities. Each well identified in the contract will be modified according to the specifications. These existing wells are to be redrilled to increase the nominal borehole diameter to 6-inch. Prior to drilling each well, the existing well casings will be removed. The overdrilling will be performed utilizing large diameter hollow stem augers advanced to bedrock. The bedrock section of each well is to be reamed utilizing air-rotary methods. The final elevations of each well will vary per the specifications.

A section of 6-inch steel casing will be socketed a minimum of 6-feet into competent bedrock at each well. The casing will be grouted in place using a bentonite/cement grout. As well PW-1 is an existing 6-inch diameter well, the modification will involve modifying the surface seal and adding a protective casing with a new concrete seal.

In sequence to the additional work being performed at the site, new pumps are to be installed in each of the five wells. The underground discharge lines and electrical conduit will be installed in trenches that will be constructed concurrently with the groundwater treatment facility. The trenches will be backfilled following line pressure testing. The soils and water generated from well modification activities will be managed according to the specifications.

2.9 Groundwater Treatment System

A treatment system for the groundwater will be constructed inside the existing warehouse building onsite. A portion of the existing building will be modified to accommodate the treatment facility. The building modification portion of work will be performed concurrently with the grading of the debris pile.

The building is to be partitioned to form a room of suitable size for the treatment system. Modifications include new interior walls, insulation, replacing the large sliding door with a smaller double leaf door. The concrete floor will be added to provide for secondary containment in the event of future spills and to provide drainage inside the treatment area. A 3-phase power service line will be installed from the Central Hudson utility lines. The piping and conduit from each of the recovery wells will be installed to the building. An effluent drain line will be installed away from the building and trenched for gravity flow to the existing drainage swale. The existing chain link fence surrounding the site will be modified to surround the new treatment building.

The different units of the treatment system will be shipped to the site from the manufacturer for a scheduled delivery prior to the building modification. The system components will be installed into the building and piped as specified. The electrical components will be installed concurrently with the piping. Additional items to be installed include electrical heaters, ventilation fans, lighting, and an alarm system with telephone service for automatic dialing.

2.10 Transport and Disposal of Wastes

The waste streams generated at the site will be properly classified and approval from the NYSDEC for each classification will be obtained prior to offsite shipment. Tyree will prepare the manifests for each waste stream to be shipped offsite. Soils showing chemicals of concern

concentrations which exceed the cleanup criterion will be loaded on permitted trucks and transported for disposal at approved facilities. The copies of the facility permits are attached. The hazardous waste will be sent to Horizon Environment Inc. located in Grandes-Piles, Quebec Canada. The non-hazardous waste will be sent to Hyland Facility located in Angelica, NY (facility permits are attached). The proposed trucking routes into and out of the site are shown in Figure 2.

2.11 Site Restoration

Upon completion of the excavation and debris pile cap construction activities, site restoration will take place. This will consist of fine grading and topsoil placement in both the main excavation area and the cap and grubbed areas where the surface has been disturbed. In the areas of construction where topsoil was placed, seeding will be performed.

2.12 Soil Erosion/Sedimentation/Surface water management Controls

The control of soil erosion and sedimentation will be achieved using silt fences around the perimeter of both the main soil excavation, the pipeline trenches, and the soil staging areas. In addition, systemic controls will be implemented to reduce the potential for soil erosion and/or sedimentation. Such controls include delaying excavation if heavy rain events are forecasted, and efficiently excavating, staging, and confirmatory sampling soils to expedite the backfill process. Infiltration of clean surface water will be prevented by berms to eliminate runoff, and covering contaminated areas with poly sheeting to prevent contact. Any standing clean water will be removed from the working areas to avoid potential contamination of the clean water. The water will be removed to clean portions of the site in suitable drainage areas.

2.13 Construction water management/ Environmental controls

The generation of construction water will be kept to a minimum. Appropriate controls will be established to minimize water. The groundwater intrusion to the excavation is not expected. Should water buildup in the excavation inhibit work and require removal, the water will be containerized after removal and stored until it can be treated through the onsite treatment system. Decontamination water that is containerized will also be treated through the onsite treatment system as needed. Surface water intrusion to thew work areas will be prevented via berming with soil and poly sheeting where appropriate.

Controls will be provided over environmental conditions at the construction site and adjacent areas. All vehicles and equipment will be equipped to minimize noise levels to the greatest degree practical. The equipment used will conform to all current federal, local and state laws and regulations. The discharge of noxious substances by construction operations will be prevented by all methods, means and facilities necessary. Erosion and dust control are described in other sections. Pest and odor controls will be enacted as needed to prevent infestation and odor generation during construction activities.

2.14 Dust Control Measures

To minimize the potential effects of fugitive dusts generated during excavation activities, Tyree will have a water truck available for use in dry, windy conditions. The need for dust control will be largely determined by meteorological conditions. When the monitoring exceeds the action levels, potable water will be sprayed over exposed dust source areas. A truck-mounted polyethylene water tank and a power sprayer will be mobilized to the site should conditions warrant. Dust monitoring will be performed continuously during activities involving excavation, disturbance of contaminated soil and demolition. Monitoring will be performed using a real-time aerosol monitor measuring total particulates.

3.0 SITE SECURITY

Tyree will maintain day and night security throughout the contract period. Security shall be maintained and enforced by the site superintendent during normal working hours, and by uniformed professional security personnel during non-working hours. Security checks shall be at 8-hour intervals during weekends and holidays, and a minimum of two at 8-hour intervals during normal non -working hours. The security post will be located at the site gate, which will enable tight control of site security. A sign will be posted indicating that all persons entering the site must sign in at the field office.

Security personnel will, at a minimum: require display of proper identification by each person entering the site; require personnel to print full name and employer, signing in and out, as required; and maintain logs of people, equipment, and vehicles entering and leaving the site. Security personnel will be unarmed. The security personnel will maintain a log of all security incidents.

Perimeter fences and gates will be checked on a daily basis to ensure there are no breaks or gaps. Vandalism to fences and gates will be reported immediately. In the event of an emergency, the security personnel will contact the appropriate law enforcement, fire department, and/or emergency medical units and response teams.

4.0 QUALITY CONTROL

The quality control procedures described below will ensure that the project activities are conducted in accordance with the stringent requirements set forth by the rules and regulations governing work at inactive hazardous waste sites in New York State.

4.1 Corporate QC Overview

It is the policy of The Tyree Organization, Ltd. (Tyree) to provide environmental products and services with consistently high quality such that they will reliably perform their intended function resulting in recognition as a quality leader in the industry. Achievement of this policy involves all staff, who are individually responsible for the quality of their work, resulting in a continually improving environment for all. This level of quality is achieved through adoption of a system of procedures that reflect the competence of Tyree to clients, property owners, and vendors. The purpose of this internal policy is to provide information and procedures on the full range of Tyree's internal and external activities. Any required client/contract procedures that are not adequately addressed in this document will be implemented by the Project Manager project-by-project basis and documented in the project-specific plans.

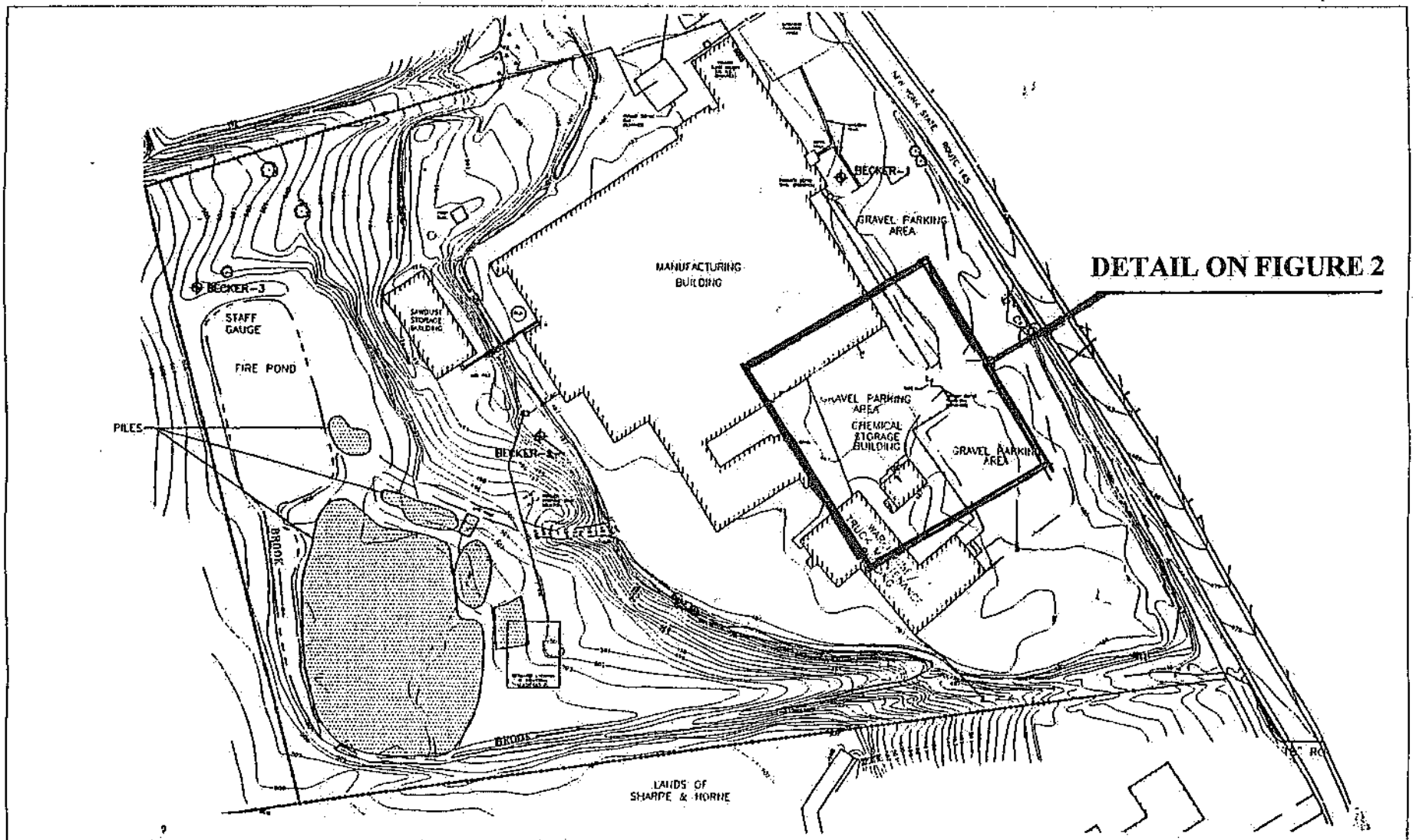
4.2 Project QC

The project-specific QC elements of this site remediation project are detailed in the SAP, which has been submitted as a separate document. The SAP details the field and laboratory methods and procedures that govern the handling, sampling, analysis, and reporting of environmental project data for the project.

5.0 SCHEDULE

The proposed project schedule is included as Appendix A. Tyree believes that this project can be completed in approximately 3 months from mobilization. The schedule has been prepared with the assumption that no constraints exist regarding access to and egress from the site, and that the work will be initiated in July 2000.

FIGURES



BECKER ELECTRONICS
SITE REMEDIATION PROJECT
East Durham, New York
Site # 4-20-007

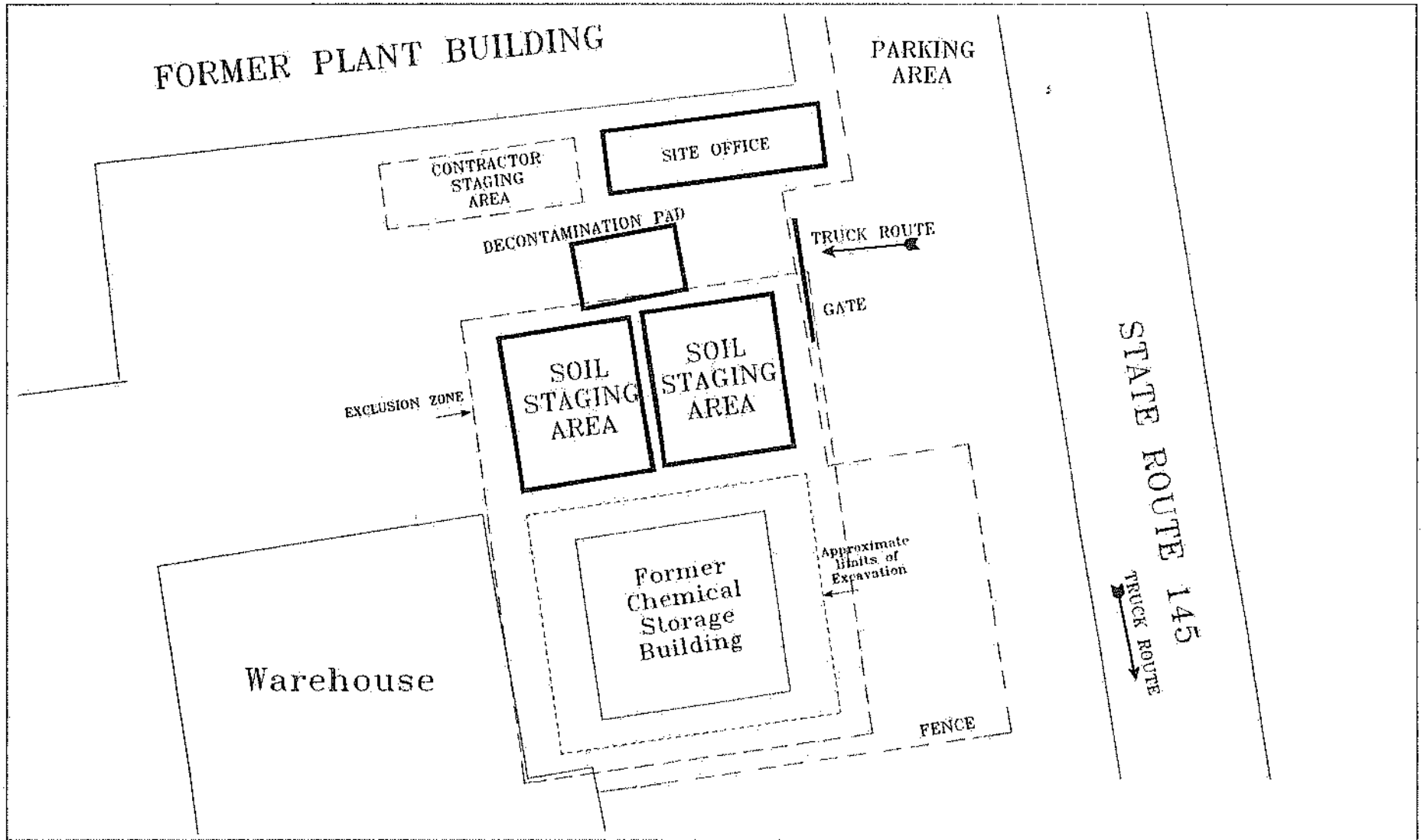
VERTICAL SCALE	NA
DRAWN FROM	MALCOLM PIRNIE 2000
CHECKED BY	
DESIGNED BY	
DESIGN ACTIVITY	
CUSTOMER	
DATE	

TITLE: SITE PLAN

Tyree Organization, Ltd.

SIZE	ESCH NO.	DWG NO. / FILE NAME
A		FIGURE 1

HORIZONTAL SCALE	DATE	SHEET
Not to Scale	May 2000	1 of 1



BECKER ELECTRONICS
SITE REMEDIATION PROJECT
East Durham, New York
Site # 4-20-007

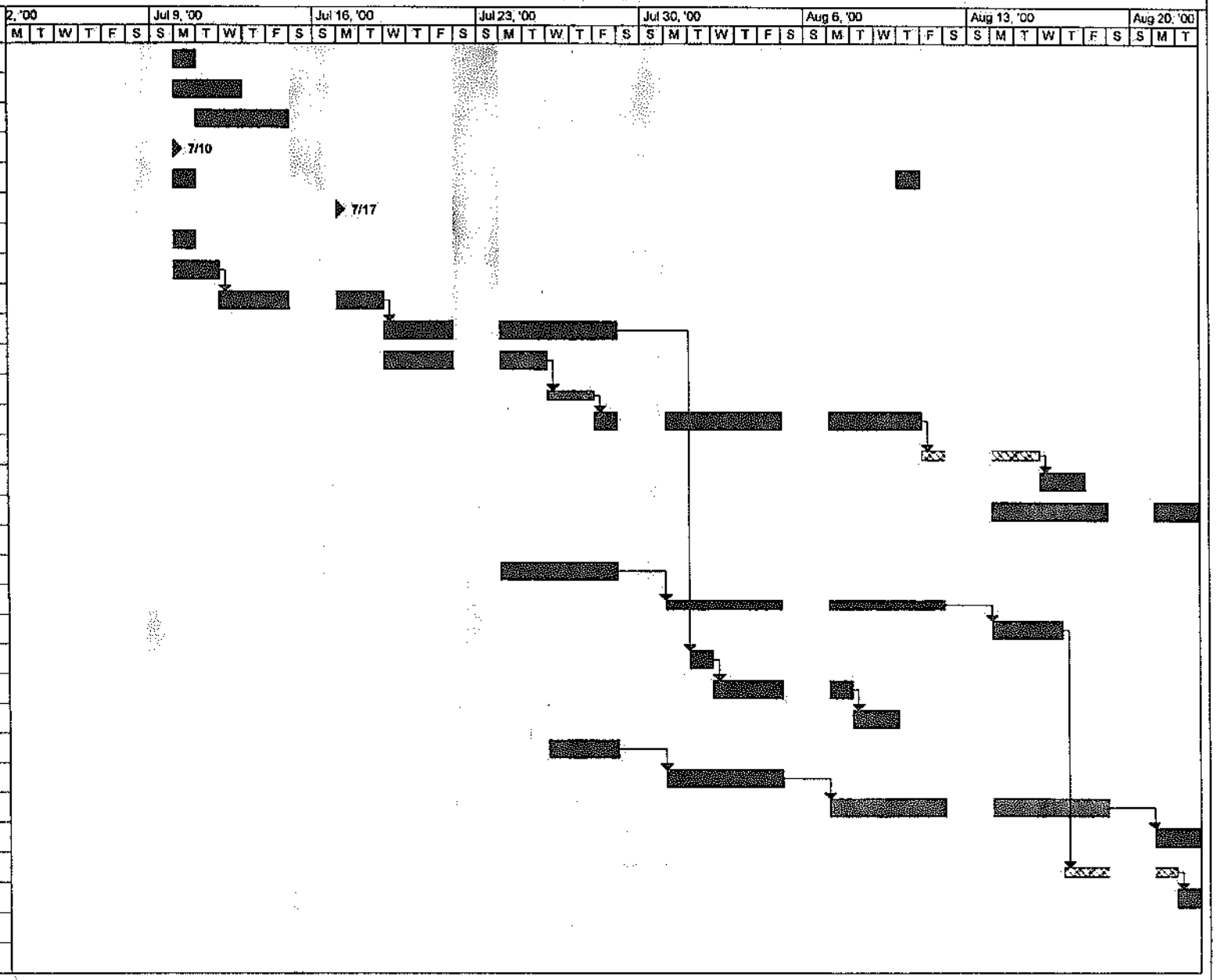
VERTICAL SCALE: NA	DATE	TITLE: SITE WORK STAGING AREAS	
DRAWN BY		Tyree Organization, Ltd.	
CHECKED BY		SIZE: A	FSCM NO.	DWG NO. / FILE NAME: FIGURE 2
DESIGNED BY		HORIZONTAL SCALE: Not to Scale	DATE: May 2000	SHEET: 1 of 1
DESIGN ACTIVITY				
CUSTOMER				

APPENDIX A

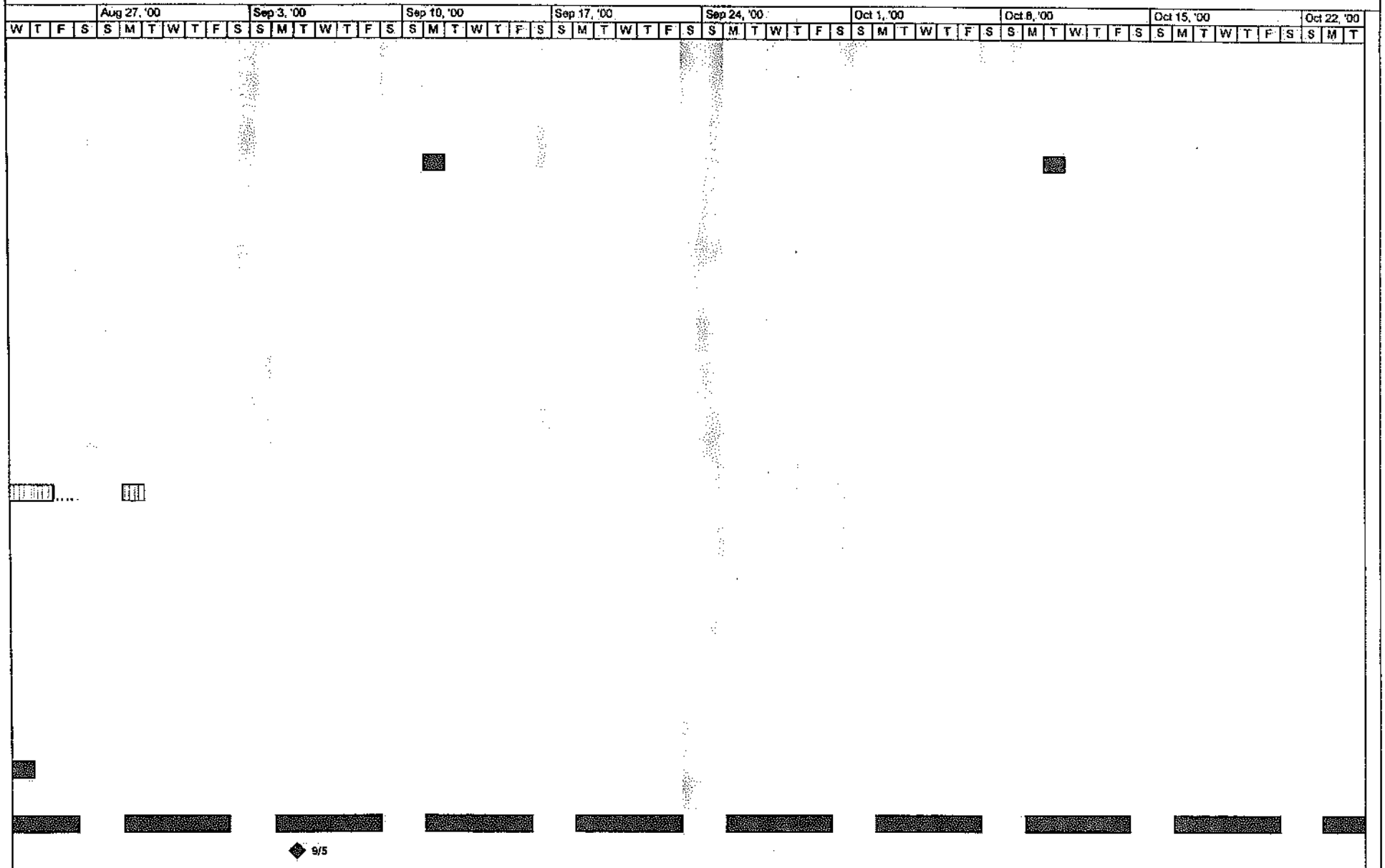
PROJECT SCHEDULE

BECKER ELECTRONICS SITE REMEDIATION CONTRACT

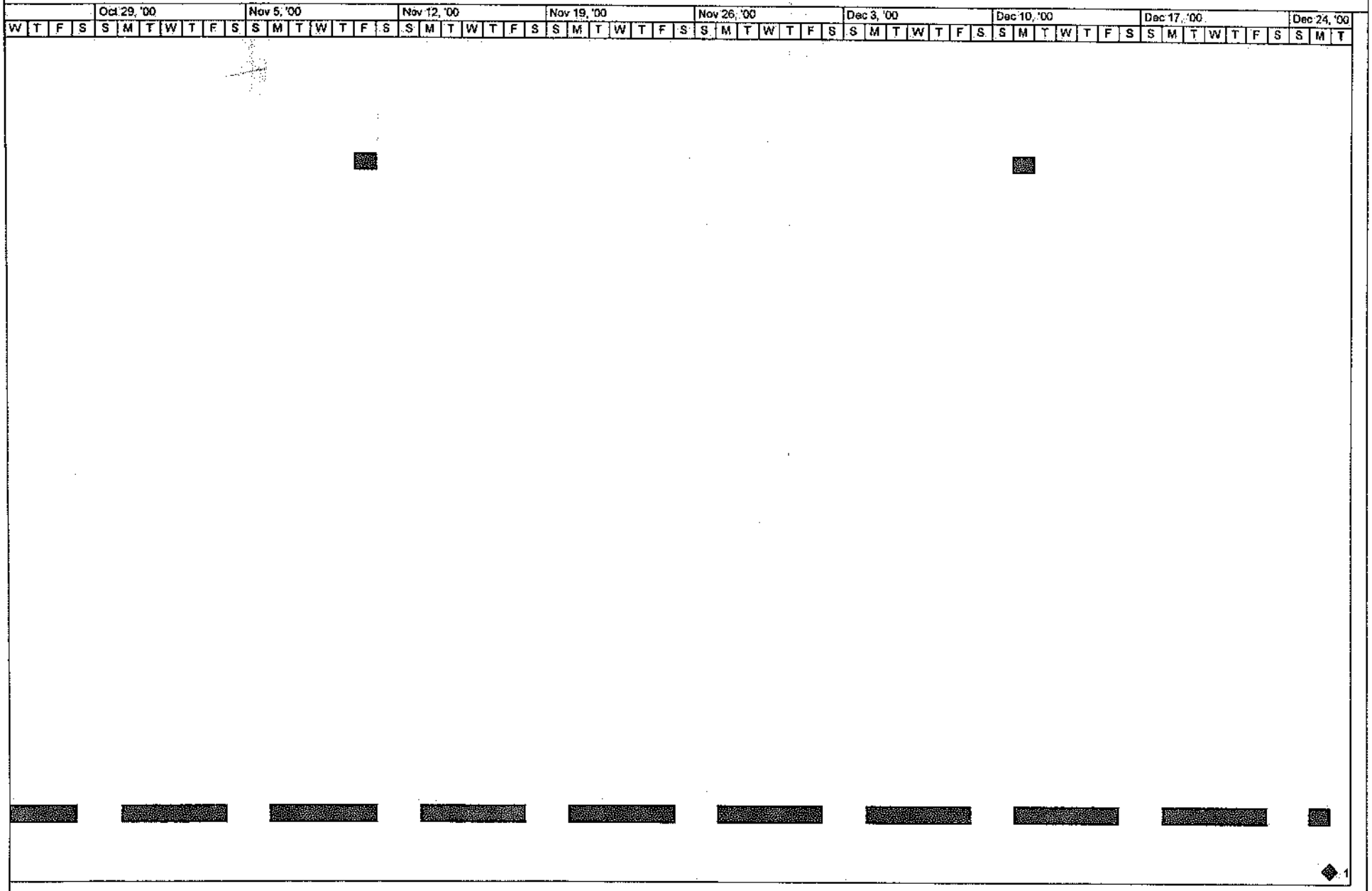
ID	Task Name
1	Permits
2	UFPO- Markout
3	Equipment order
4	Pre-Construction Meeting
5	
12	Progress Meeting
13	Establish Work Areas
14	Mobilization
15	Site Preparation
16	Well Modification
17	Building Demolition
18	Building Debris Move
19	Soil Excavation
20	Confirmatory Sampling
21	Excavation Backfill
22	Waste Characterization
23	Loading Soil and Transport
24	Treatment Building Construction
25	Treatment System Construction
26	Electrical Install
27	Well Pump Installation
28	Pipeline Trenching
29	Pipeline installation
30	Clearing/Grubbing
31	Debris Regradding
32	Debris Cap
33	Topsoil/Restoration
34	System Startup/Testing
35	Treatment system O&M
36	Substantial Completion #1
37	Substantial Completion #2



BECKER ELECTRONICS SITE REMEDIATION CONTRACT



BECKER ELECTRONICS SITE REMEDIATION CONTRACT



SITE REMEDIATION PROJECT
BECKER ELECTRONICS
SITE NUMBER 4-20-007
TOWN OF DURHAM
GREENE COUNTY, NEW YORK

SAMPLING AND ANALYSIS PLAN

Prepared for:
New York State Department of Environmental Conservation
Bureau of Central Remedial Action
50 Wolf Road
Albany NY 12205

Prepared by:
The Tyree Organization, Ltd.
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Latham, New York 12110

MAY 2000

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TABLES

APPENDICES

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) describes the sampling program and associated quality assurance/quality control (QA/QC) procedures for the completion of a hazardous waste remediation project at the Becker Electronics Site in East Durham, New York. NYSDEC Site # 4-20-007

Included with this SAP are resumes of key project QA/QC personnel (Appendix A), a summary of QA/QC objectives (Appendix B), and the analytical laboratory's QA/QC program (Appendix C). Upstate Laboratories, Inc., of Albany, New York is the proposed analytical laboratory for this project.

2.0 SCOPE OF WORK

The scope of work for the site remediation project consists of the following elements:

Preparation and Submittal of Project Plans;
Pre-Construction Meeting;
Mobilization;
Establishment of Work Areas;
Placement of Containers for Liquid and Solid Wastes;
Demolition of former Chemical Storage Building;
Monitoring Well Modification;
Excavation, Sampling, of Contaminated Soils;
Staging, Sampling, and Disposal of Waste Soils;
Regrading Debris Pile;
Backfilling of Excavation;
Debris Cap Construction;
Groundwater Treatment Facility Construction;
Operation and Maintenance
Site Restoration; and
Demobilization.

The work will include, but not necessarily be limited to:

Furnishing, implementing, and maintaining health and safety services. Health and safety equipment, including, but not limited to, personal protective equipment, monitoring equipment, decontamination facilities, and decontamination equipment, will be provided.

Providing all utilities, equipment, and facilities required to perform the work activities; and

Preparation of Final Site Drawings

A site pre-construction meeting will be held to review the project objectives and methods and to discuss logistical constraints presented by the site. The meeting will be attended by personnel representing the NYSDEC, Tyree, and Tyree's major subcontractors. The site layout and health and safety procedures will be reviewed as part of the meeting.

After establishment of the work areas, the contaminated soil staging areas will be built at the site. Appropriate measures (e.g., barricades and temporary fencing) will be taken to physically isolate the work area (the site) from the remainder of the site. Water generated from the decontamination process will be transferred to an on-site tank and stored prior to sampling to determine waste disposal options.

The specific work areas where field monitoring of the breathing zone will be conducted include the building demolision area, the soil excavation area, the debris pile area, the well head area during well drilling, and trenching. Throughout the project Tyree personnel will adhere to strict health and safety guidelines in order to maintain the highest level of worker safety.

3.0 DATA QUALITY OBJECTIVES

The primary QA objective for this work is that all measurements be representative of the actual site conditions and that all data resulting from sampling and analysis activities be comparable. The use of accepted and published sampling and analysis methods, as well as the use of standardized units, will aid in ensuring the comparability of the data.

The data quality objectives (DQOs) of this project have been chosen to ensure worker safety while handling excavated materials and waste liquids, to determine the appropriate disposal method for wastes generated during the course of the project, and to evaluate the acceptability of airborne concentrations of contaminants. In addition to these practical objectives, there is the objective of compliance with NYSDEC ASP, NIOSH, and AIHA protocols whenever applicable.

DQOs are qualitative and quantitative statements that specify the quality of data required in support disposal and closure decisions. The minimum internal data reporting requirements for all analytical laboratories include the following:

Sample identification numbers cross-referenced with laboratory IDs and QC sample numbers.

Problems with arriving samples noted on an appropriate form.

Each analyte reported as an actual value or less than a specified quantitation limit.

Each analyst to be identified and the laboratory results signed by the analyst.

Dilution factors, extraction dates and analysis dates also reported.

QC samples to be included as laboratory blanks, surrogate spikes, matrix spikes, laboratory duplicates, field duplicates and rinseate blanks, as required to achieve DQOs.

3.1 Data Use Objectives

This section will provide information on the specific purpose of each set of data. Any regulatory program which indicates that the sampling be performed is also indicated in this section. The Data Quality Objectives for data developed in this scope of work will be Level I and Level III. Level I is field screening or analysis using portable instruments. Results are typically not compound-specific and not quantitative, but results are available in real-time. Level III analyses are performed in an off-site analytical laboratory. Level III analyses may or may not use CLP procedures, but do not usually use the validation or documentation procedures required of CLP Level IV analysis. The laboratory will be certified in NYSDEC ASP protocols and will maintain current NYS ELAP certification.

3.1.1 Generated Wastes

Generated wastes are expected to include contaminated soils, wastewater, and used personal protective equipment (PPE). Generated wastes must be disposed of in accordance with Resource Conservation and Recovery Act (RCRA) regulations. Thus, samples of waste collected under this program will be analyzed in accordance with RCRA-approved methods, in addition to NYSDEC, USEPA CLP protocols, and requirements of the RCRA-approved treatment, storage and disposal (TSD) facilities that receive the wastes.

Wastes will be sampled from their sources (e.g., excavated soils, construction water, drilling wastes).

3.1.2 Real-Time Air Monitoring

Real-time air monitoring will be used to:

determine if there are flammable, explosive, and/or toxic atmospheres inside or near excavations;

evaluate worker exposure concentrations; and

monitor for off-site migration of contaminants.

Real-time air monitoring equipment will be calibrated daily prior to use. Monitoring equipment used to assess confined spaces will be tested immediately prior to use at the location where it is to be used. The test will be conducted by filling a Tedlar bag (or equivalent) with span gas (isobutylene) and sampling the gas from the bag with the instrument; utilizing any

probes, hoses, water traps or other attachments.

3.2 Quality Assurance/Quality Control Objectives

The data developed from the scope of work described in this plan is intended to meet the objectives discussed below with respect to Precision, Accuracy, Representativeness, Completeness and Comparability (PARCC). These data will be developed in the laboratory from the analysis of field samples. The numerical level of quality required for each type of sample is shown in Appendix B. Section 3.3 then describes corrective actions to be taken if data does not meet the quality levels prescribed in Appendix B. It should be noted that the QA/QC objectives in Appendix B are based on project requirements, as well as the capabilities of the test methods.

3.2.1 Precision

Precision is a measure of the degree of reproducibility of an analytical value and is used a s a check on the quality of the sampling and analytical procedures. Precision is determined by analyzing duplicate samples. The significance of a precision measurement depends on whether the sample is a field duplicate, laboratory duplicate, or a matrix spike/matrix spike duplicate (MS/MSD). Field duplicates will be taken on environmental samples at the rate of approximately 10 percent. Laboratory duplicates or a MS/MSD will be performed at a minimum of 1 in 20 or 1 per analytical batch, whichever is more frequent. Precision of the analytical method, at each stage, is determined by calculation of a relative percent difference (RPD) between duplicate analytical recoveries of a sample component, relative to the average of those recoveries:

$$RPD = \frac{(C_2 - C_1)}{(C_2 + C_1)/2} \times 100\%$$

Where:

C_1 = analyte concentration in the sample;
C_2 = analyte concentration in the duplicate; and
RPD = an absolute value (it is customary to express RPD as a positive number).

These calculations are usually performed on field duplicates, laboratory duplicates and MS/MSDs, provided there is a sufficiently high concentration of analyte in the sample. The precision objectives for each type of sample are presented in Appendix B. Precision objectives that are not achieved will result in the data being flagged as estimated quantities. Corrective actions for samples that do not meet the objectives described in Appendix B are discussed in Section 3.3.

3.2.2 Accuracy

Accuracy is the degree to which a measurement agrees with the actual value, i.e., the amount of measurement bias. Accuracy is expressed as a percent recovery of a known concentration of reference material. The accuracy of an analytical procedure is determined by the addition of a known amount of material (matrix spike) to a field sample matrix or a standard matrix. A standard matrix is made up of distilled water or sterile, clean soil with approximately the same physical properties (porosity, permeability, plasticity, grain size, etc.) as the field sample. The field sample matrix is described as all components of the sample mixture except the analyte (the compound being analyzed). The laboratory will be required to perform matrix spiking on 5 percent of the sample extracts to determine if the sample matrix-analyte chemical interactions affect the analytical results. The matrix behavior of the spike field sample will be comparable to that of the matrix of the original sample. After analysis for the spike is completed, the accuracy of the procedure is expressed as a percent recovery as shown by the following equation:

$$\text{PERCENT RECOVERY} = \frac{(C_2 - C_1)}{C_0} \times 100\%$$

Where:

C_0 = amount of analyte added to the sample matrix;
C_1 = unspiked sample result; and
C_2 = spike sample result.

The amount of a reference analyte spiked into the extract is specified by the laboratory QC program, typically 3 to 5 times the background concentration of the analyte in the sample matrix. Samples cannot be spiked for all organic compounds which could possibly exist in the field sample matrix, however, a set of selected target compounds, are used as spiking compounds in the MS/MSD. Acceptable recovery ranges for each class of organic compounds are discussed in the analytical methods for each parameter.

Target analytes for metals will be used in the spiking solutions for the matrix spike and laboratory control spike samples. The accuracy objectives for each type of sample are shown in Appendix B. Accuracy objectives that are not achieved will result in data being flagged as either estimated quantities or as unusable data. Corrective actions for samples that do not meet the objectives described in Appendix B are discussed in Section 3.3.

3.2.3 Representativeness

Representativeness expresses the degree to which sample data accurately represent actual site conditions. The determination of the representativeness of the data will be performed by:

comparing actual sampling procedures and chain-of-custody forms to those described in the work plan and any subsequent addendum and modification;

review of field log books and laboratory preparation logs;

evaluating holding times and condition of samples on arrival at the laboratory; and

examining blanks for cross contamination.

Representativeness is a qualitative determination. The Project Manager is responsible for identifying non-representative data. The Project Manager will flag data according to the degree of representativeness. Depending on how critical the sample is to the project goals, corrective actions may be required as discussed in Section 3.3.

3.2.4 Completeness

Field completeness will be assessed by comparing the number of samples collected to the number of samples successfully analyzed by the laboratory or field analyst. Analytical completeness will be assessed by comparing the total number of samples with valid analytical results to the number of samples collected. The overall project completeness is, therefore, a comparison between the total number of valid samples. The results will be calculated following data validation and reduction. Completeness is determined by:

$$C = \frac{P_1}{P_0} \times 100\%$$

Where:

P_1 = number of valid sample results; and
P_0 = number of samples analyzed (as a positive number).

A value of 90 percent or higher is the goal. For values less than 90 percent, problems in the sampling or analytical procedures will be examined and possible solutions explored. The Project Manager is responsible for identifying completeness of the data. Depending on how critical the sample is to the project goals will determine the level of corrective action to be taken if corrective action is to be taken at all. The completeness objectives for each type of sample are shown in Appendix B. Corrective actions for samples that do not meet the objectives described in Appendix B are discussed in Section 3.3.

3.2.5 Comparability

Comparability is a qualitative measure of the confidence with which one data set can be compared to another. These data sets include data generated by different laboratories performed under this SAP, data generated by the same laboratory over a period of several years, or data obtained using different sampling techniques or analytical protocol. The comparability objectives of this SAP are to generate consistent data using standard test methods.

These objectives will be achieved by reducing the number variables in the sample collection and analysis by:

Adhering to the SAP;
Maintaining consistency in sampling techniques; and
Maintaining consistency in preparation and analysis (i.e., laboratory methods).

3.2.6 Sensitivity

Sensitivity is a general term that refers to the calibration sensitivity and the analytical sensitivity of a piece of equipment. The calibration sensitivity is the slope of the calibration curve evaluated in the concentration range of interest. The analytical sensitivity is the ratio of the calibration sensitivity to the standard deviation of the analytical signal at a given analyte concentration. Sensitivity objectives are listed in Appendix B. Corrective actions for samples that do not meet the objectives described in Appendix B are discussed in Section 3.3. The detection limit, which is based on the sensitivity of the analysis, and is the smallest reported concentration in a sample within 99% probability that the concentration exceeds zero. Quantitation limits represent the sum of all of the uncertainties in the analytical procedure.

3.2.7 Field Measurements

Field measurements will be performed per manufacturer's recommendations. These will include measurements of:

Volatile organic compound (VOC) vapors using commercially available field photo-ionization detectors (PIDs) and/or flame ionization detectors (FIDs);

Lower explosive limit (LEL) and percent oxygen (O_2) reading using commercially available field combustible gas indicators (CGIs);

Specific chemical parameters monitoring with indicator tubes (e.g., Draeger tubes when chemical constituents are suspected which have weak response ratios on PIDs or FIDs);

Airborne particulate monitoring with a real-time particulate/aerosol meter.

Field air sampling measurements will be conducted during soil excavation and removal activities using a PID or a FID for determining concentrations of organic vapors and a CGI for determining LEL/O_2 concentrations. Indicator tubes may be used to supplement PID/FID monitoring as deemed appropriate. Monitoring of the breathing zone at the excavation sites will be performed in accordance with the HASP.

The PID or FID used for field screening measurements will be subjected to maintenance checks in order to minimize equipment breakdown. Maintenance checks will generally coincide with the calibration of the equipment. Any equipment found to be operating improperly will be removed from service and the malfunction will be noted in the field log book. The PID will be calibrated prior to use each day, at a minimum. Calibration of the PID will be in accordance with the manufacturer's specifications. The PID or FID will be calibrated with a known gas standard

concentration (e.g., 100 ppm isobutylene or 95 ppm methane, respectively).

There are no data quality criteria specified for field screening measurements, because this level is characterized by the use of hand-held instruments that generally measure total organic vapor concentrations only. Accordingly, these instruments are not conducive to the generation of accurate quantitative data. In specialized applications, FIDs can be calibrated to a specific compound and quantitative data can be obtained. Specific information regarding individual compound sensitivities and response factors can be obtained in the manufacturer's manual for specific instruments. The DQO for field measurements will be Level I.

3.3 Corrective Actions

Corrective actions will be taken upon identification of problems that may affect product quality. The Project Manager or a designated person will be responsible for both identifying the causes of the problems and developing a solution. The root causes of the problem will first be determined, and its effect on the project will be identified. The Project Manager, in conjunction with the QAO and Laboratory Project Manager, will develop a plausible corrective action.

A Corrective Action Memorandum will be prepared that documents the problem and then describes the corrective action that will be implemented. A copy of the memorandum will be sent to the NYSDEC Project Manager. The Project Manager or a designated person will be responsible for implementing the corrective actions and for assessing the effectiveness in correcting the problem.

Non-conforming items and activities are those which do not meet the project DQOs. If a non-conformance occurs, the impact of failure to meet the DQOs will be discussed by the Project Manager, in conjunction with the Quality Control Project Manager and Laboratory Project Manager. A re-evaluation of the DQOs will be made to ensure the DQO is appropriate and adequate for the end use of the data. Corrective actions as described in Section 9 will be taken in an attempt to achieve the desired DQO, if upon re-evaluation, the DQO level does not change.

As data problems arise, the field sampler will investigate the problems and perform one or both of the following actions:

If DQOs are not met, the field sampler will try to correct the problem, if possible. If the problem cannot be corrected, he/she will immediately contact the Project Manager.

If the data are deemed unacceptable, then the corrective actions may include, that will not be limited to:

re-analyzing suspect sample;

re-extraction and re-analysis;

re-sampling with re-extraction and re-analysis;

evaluating and amending sampling and/or analytical procedures;

accepting data with an acknowledged level of uncertainty;

re-calibrating analytical instrumentation; and/or

discarding the data.

3.3.1 Problems Discovered Before Reporting Data

If the assessment reveals that any of the QC acceptance criteria are not met, the analyst must immediately review the analytical methods to correct the problem. The analyst notifies the appropriate supervisor and the QC Data and Report Coordinator of the problem and, if possible, identifies potential causes and corrective action. Anyone may identify the need for corrective action. When the need for corrective action is identified, it is documented on a corrective action report and processed as below.

The nature of the corrective action obviously depends on the nature of the problem. For example, if continuing calibration verification is determined to be out of control, the corrective action will require re-calibration of the analytical system and reanalysis of all samples since the last acceptable continuing calibration standard.

When the appropriate corrective action measures have been defined and the analytical system is determined to be "in control", the analyst documents the problem and the corrective action taken no a Corrective Action Report. The original Report remains with the affected data and copies are provided to the appropriate Laboratory Supervisor and QC Data and Report Coordinator, if requested.

Data generated concurrently with an out-of-control system will be evaluated for usability in light of the nature of the deficiency. If the deficiency does not impair the usability of the results, data will be reported and the deficiency noted in the Corrective Action Report. Where sample results are impaired, the Laboratory Supervisor and QC Data and Report Coordinator are notified and appropriate corrective action (e.g., re-analysis) is taken and documented. Re-sampling will be based on an assessment of the ability to meet the project DQOs and will be determined on a case-by-case and sample-by-sample basis.

3.3.2 Problems Discovered After Reporting Data

If data that have already been reported are declared invalid, for whatever reason, a Corrective Action and Non-Conformance Report must be prepared. If the invalid data, including process data, are reported to the regulatory agency (i.e., NYSDEC), then Tyree must notify the NYSDEC Project Manager within 24 hours of the discovery.

4.0 FIELD SAMPLING OPERATIONS

Field sampling activities to be implemented for data acquisition include the following:

Sampling and analysis of stockpiled soil from excavation activities and drill cuttings conducted in potentially contaminated areas for off-site treatment/disposal;

Sampling and analysis of water pumped through the treatment facility originating from: excavation(s), decontamination of excavation and sampling equipment, and development of the monitoring wells;

Real-time air monitoring for worker exposure assessments and impact on work area and site perimeters.

The particulars involving sampling strategy, analytical methods, and locations for waste classification is discussed in the Work Plan, submitted as a separate document. The Tyree Project Manager will determine the number of samples and analytical methodologies for each specific matrix. The particulars involving the procedures and locations for air sampling and real-time monitoring is discussed in the HASP.

4.1 Decontamination

The decontamination of equipment and materials used in the conduct of site activities is critical to the collection of quality environmental data from the site.

4.1.1 Decontamination of Heavy Equipment

Prior to and after completing remediation activities, the heavy equipment (i.e., excavating and drilling equipment) and all equipment that comes in contact with the soil will be decontaminated with a high-pressure steam cleaning system. Heavy equipment and hand tools that come in contact with the soil will also be decontaminated with the high-pressure steam cleaner between excavation and drilling locations and between uncontaminated and suspect contaminated material to minimize potential cross contamination.

The external surfaces of all tools and equipment required to perform this subsurface remediation will be inspected to ensure all equipment is clean and free of materials. In the

unlikely event that contamination is detected on the tools and equipment, such tools and equipment will be rejected and replaced with clean tools or equipment. All tools and equipment leaving the site will be inspected prior to release to ensure no potentially contaminated materials are being taken off-site, and all tools that have been in contact with potentially contaminated material will be cleaned prior to removal from the work area.

A decontamination station will be established for the washing of all equipment. This station will be centrally located on-site in order to serve several locations. The station will be constructed of an impermeable surface to prevent decontamination fluids and solids from contaminating underlying soils. The surface of the decontamination station will be sloped to a sump where solids will be settled out and water will be collected and pumped into the on-site fractionation tank for future discharge, as described in the Work Plan.

4.1.2 Decontamination of Sampling Equipment

To prevent cross-contamination between sampling locations, all non-disposable sampling equipment will be decontaminated at the centrally located decontamination station discussed above. Decontamination of sampling equipment will be in accordance with the procedures outlined in the Work Plan.

4.2 Field Quality Assurance/Quality Control

QC samples will be used to verify that the sampling and analytical techniques are being performed properly. QC samples will be taken in the field and analyzed with the field samples by the same laboratory. QC samples required for sampling may include trip blanks, equipment blanks and duplicates.

Trip Blanks: The purpose of the trip blank is to place a mechanism of control on sample bottle preparation, blank water quality, and sample handling. A trip blank consists of sample bottles filled at the laboratory with analyte-free water. The trip blank travels to the site with the empty sample bottles and back to the laboratory with the samples in an effort to simulate sample handling conditions. While on-site, the trip blank is not opened, but is carried by the sample collector throughout the sampling event.

Trip blanks should be handled, transported, and analyzed in the same manner as samples collected that day. Trip blanks are analyzed for volatile organic compounds (VOCs) and collected for volatile water sampling. Trip blanks should accompany samples at a rate of one per shipment. If samples that day are not being analyzed for VOCs, trip blanks are not necessary.

Field Blanks (Rinseate Blanks): The purpose of a field blank is to place a mechanism of control on sample handling, storage, and shipment. A field blank is used to indicate potential contamination from sampling instruments used to collect the sample and from ambient or background site conditions

that may potentially affect sample quality. The field blank provides an additional check on possible sources of contamination that might not be identified by a trip blank.

Most commonly, a field blank is an aqueous equipment rinseate sample. At the field location, analyte-free water is passed through clean (decontaminated) sampling equipment and collected in appropriate sample containers. When collecting field blanks (as well as duplicate samples), the samples for VOC analysis are collected first with minimal disturbance or aeration to minimize potential loss of VOCs during sample collection. Two identical sets of laboratory-cleaned sample containers are used to collect the field blank. One set is empty and is used to contain the sample; the other set contains analyte-free water, supplied by the laboratory, which is passed over the sampling equipment. The laboratory should supply sufficient water for the field blanks. Certificates of analysis demonstrating that all water used for trip and field blanks will be obtained and kept with the project files on-site for each lot of analyte-free water used. Field blanks should be handled, transported, and analyzed in the same manner as the samples acquired that day. The rinsing procedure should mimic sample collection in that all sample collection devices or surfaces that contact the sample should be rinsed.

Field blanks are typically collected at a rate of one per decontamination event per type of sampling equipment, not to exceed one per day.). The field blank is analyzed for the same parameters and is preserved in an identical manner as the associated samples collected that day. Field blanks are not required when sampling equipment is not used, (e.g., direct collection of surface water or drinking water samples).

Duplicate Samples: Duplicate samples are extra samples that are essentially identical to the original. They may be either a composite or a series of grab samples from the same source. Duplicate samples should be included for each matrix at a minimum rate of 10% (1 duplicate per 10 samples). If fewer than 10 samples are taken during a sampling event, then one duplicate should be collected. Duplicates are analyzed for the same parameters as the corresponding sample. These samples will be sent to the contract laboratory as a field sample and an unidentified QC sample, each with a unique sample number.

5.0 SAMPLE CUSTODY AND HOLDING TIME REQUIREMENTS

The sample custody and holding time requirements are key elements in the acquisition of quality site data. This section describes the sample identification and preparation techniques to be used during site remediation activities.

5.1 Sample Identification

A sample ID labeling scheme has been developed for clarity, consistency, continuity, and for easy data sorting and tracking of all field activities. The sample ID labeling scheme differentiates among sampling matrix type and sampling locations.

A two-letter prefix will represent the sample matrix type or location area. The location number will follow the type of sample/location.

Example 1:	Pre-Construction Soil Sample #2	PC-02
Example 2:	Post-Construction Soil Sample #2	AC-02
Example 3:	Excavation Soil Sample #1	ES-01
Example 4:	Treatment Water Sample #3	RW-03

Trip blanks will be labeled using the prefix TB followed by six number representing the month, day, and year that the trip blank was shipped to the laboratory. If more than one shipment container contains aqueous VOC samples in one day, then a second trip blank with a second suffix number is required.

Example 5: Trip Blank for samples shipped on November 20, 1999
TB112099
TB112099-02 (second trip blank in one day)

Field blanks (rinseate blanks) will be labeled using the prefix FB, followed by six numbers representing the month, day, and year that the field blank was collected. If more than one field blank is collected in one day, then a second suffix number is required.

Example 6: Field Blank collected on November 5, 1999
RB110599
FB110599-02 (second field blank collected in one day)

Field duplicates will be considered "blind" samples; therefore, no identification modifiers will be attached to the sample identification. Discrete sample identification and location for field duplicates will be recorded in the field log book.

5.2 Sample Preparation and Holding Times

When samples are collected in the field, they are containerized and preserved in accordance with Appendix C. Laboratory preserved sample containers will be checked in the field by spot checking (i.e., droplet of preserved sample) a representative number of samples (2 or 3 per matrix) on pH paper. Preservations will be added in the field, if necessary (see Appendix C for preservative/pH). After sampling, the sealed sample container will be wiped with a moist paper towel, dried, and labeled.

Sample labels will be completed in indelible ink and covered with clear, waterproof, plastic tape to preserve label integrity. Following labeling, sample containers will be packed in plastic coolers for storage until delivery to the laboratory. All samples will be packaged and shipped in accordance with New York State Department of Transportation and International Air Transportation Association regulations. At least two bags of ice, sealed in double plastic bags, or four frozen gel packs, will be placed in each cooler and cushioned using foam rubber, bubble-wrap, or other similar packaging material to maintain all samples at 4°C. The sampler will fill out a standard chain-of-custody form for all samples shipped. The sampler will then check the chain-of-custody form and samples prior to shipment to the laboratory. The chain-of-custody will be sealed in a zip-lock bag on top of the ice.

The sample cooler will be wrapped with duct tape and a custody seal will be placed on the cooler to identify if the cooler has been opened after the samples leave custody of the Project Superintendent. The custody seal should be covered with clear tape for preservation. The samples will then be picked up by the laboratory courier or hand delivered to the analytical laboratory. Samples will be shipped within 24 hours of collection whenever possible. Once the samples are delivered to the laboratory, the samples will be placed in the sample refrigerator in the laboratory that will be maintained at 4°C. Appendix C presents a summary of the holding time requirements for the proposed sample parameters/matrices.

6.0 SAMPLE INTEGRITY

The quality of analytical data is suspect if the integrity of the sample cannot be ensured. Integrity includes the procedures and written records which, when taken together, verify that the sample is as represented and was handled in a manner which did not compromise the integrity of a sample.

6.1 Security

Security involves procedures that ensure sample integrity. Security is required until final disposal of the sample after laboratory analysis is complete. Aspects of sample security are discussed below.

6.1.1 Security of Samples in the Field

Samples, once taken, will be in the possession of the sampler(s) or placed in a custody-

sealed cooler and locked in the field trailer.

6.1.2 Security of Samples in the Laboratory

Samples will be stored in a secure area in the laboratory with access limited to authorized laboratory personnel. Upon receipt of the sample cooler, laboratory personnel will check the temperature of the samples, the condition of the samples, and the accuracy of the accompanying paperwork. This will be documented on a laboratory sample log-in form and any problems/discrepancies will be communicated to field personnel immediately for resolution.

6.2 Chain-of-Custody

A strict chain-of-custody will be maintained between the sampler and the ultimate disposal of the samples. This process is described below.

A sample is under custody if:

It is in your possession; or

It is in your view, after being in your possession; or

It was in your possession and you locked it up; or

It is in a designated secure area.

A chain-of-custody record is a tool to document traceable possession of environmental samples from time of collection until analytical data is introduced as evidence in legal proceedings (if necessary). The field sampler is personally responsible for the care and custody of the samples collected until they are properly transferred or dispatched. The Project Manager is responsible for assuring proper custody procedures are followed during the field work.

When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on a chain-of-custody form. These records document sample custody transfer from the sampler to the analyst in the laboratory. All chain-of-custody forms are triplicate copies with one copy (pink) going to the field team, one copy (yellow) going to the laboratory, and one copy (white) to be returned with the analytical results.

All shipments will be accompanied by the chain-of-custody record identifying contents of the shipment. The following information will be specified for each sample on the chain-of-custody form: 1) sequential sample number; 2) sample media; 3) sample date and time; 4) sample location; and, 5) analyses requested.

The original form will accompany the cooler containing the samples designated on the form. Sample coolers will be picked up by the laboratory courier or hand delivered to the analytical laboratory.

6.3 Sample Tracking and Identification

Other than the items listed in Section 6.2, there are additional documents that demonstrate sample integrity. These are listed below.

6.3.1 Field Log Book

Field log books will provide the means of recording data collection activities. Entries into the field log book will be described in as much detail as possible, so that someone visiting the site could reconstruct a particular situation without reliance on memory and to ensure future sample collection activities are consistent.

Field log books will be bound field survey notebooks. Log books will be assigned to field personnel for recording pertinent notes and will be stored in the field project file when not in use. Each log book will be identified by a specific project number. The title page of each notebook will contain:

Person or organization to whom the book is assigned;

The book number;

Project name; and

Start and end dates.

Equipment calibrations, decontamination procedures and information concerning the samples collected will be recorded in the field log book. All entries will be made in waterproof ink and no erasures will be made. Each logbook page will be consecutively numbered and upon data entry require the date and signature of the responsible site personnel at the bottom of each page. Also, corrections should be initiated and dated, and any blank spaces/pages shall be crossed out with a single strike mark, dated and signed. Whenever a sample is collected or a measurement is made, a detailed description of the location of the station, which include distance measurements from permanent landmarks, will be recorded. Any photographs taken by field personnel will also be documented in the field log book. Photographs and the field log book will be labeled with the date the photograph was taken, and the location/direction of the photograph. All equipment used in collecting field measurements will be identified, along with the date and person performing the calibration. All persons involved with the sampling will be identified in the field log book.

6.3.2 Sample Collection Logs

Sample collection logs will provide a summary of data collection activities performed at the site. At a minimum, entrees will consists of the following information:

Tyree project name and number;
Project location;
Sample identification;
Sample matrix;
Chain-of-custody number;
Date sampled;
Sample location/area; and
Pertinent field observations.

6.3.3 Sample Labeling

Subsequent to sampling, the sealed sample container will be wiped with a moist paper towel, dried, and labeled. The sample labels will contain, at a minimum, the following information:

Media;

Sample ID Number;

Sample Location;

Name of Sampling Personnel;

Name of Sampling Organization;

Date and Time Sampled;

Type of Preservative (if any); and

Analysis Requested.

Sample labels will be completed in indelible ink and covered with clear, waterproof, plastic tape to preserve label integrity.

7.0 DATA COLLECTION, REDUCTION, VALIDATION, AND REPORTING

This section describes the QA/QC procedures that govern the analytical laboratory's generation and handling of data derived from the soil and water samples collected as part of the site remedial activities. A detailed description of the analytical laboratory's QA/QC program is presented in Appendix D.

7.1 Data Collection

The accuracy of data collection in the laboratory is ensured through a system of checks involving logbook entries of samples analyzed and sample run lists printed out from the instruments, where applicable. An instrument log is completed listing the laboratory IDs of the samples to be loaded on the system. A sequence list is typed up from the instrument log. Sample results are recorded by laboratory ID and correlated with client IDs by the chain-of-custody.

QC data are correlated with environmental samples by laboratory documentation for extractable samples and by date of analysis. As the results are calculated, recoveries are checked against established control limits to ensure compliance with quality control criteria.

The criteria used for qualifying data are adopted from the applicable methodology. Data are flagged as necessary, with appropriate laboratory comments provided in the final deliverable in the form of a case narrative.

7.2 Data Reduction and Validation

The laboratory is an integrated operation providing data reduction and internal data validation through each analytical department, including quality assurance. Each final report receives a thorough and rigorous review by the laboratory staff. Reviews completed including the following:

7.2.1 Chemist Bench-Level Check

The laboratory chemist checks the instrument performance and calibration, protocols, QC, and data output. 100% of the data is reviewed.

7.2.2 Quality Assurance Department Check

The QA officer (QAO) reviews 5-10% of data to ensure that the QA objectives are met, the QC checks are completed, the final data package is completed, and all project requirements are met.

All equations used to produce final results are from the applicable methodology. The laboratory references USEPA equations as cited in USEPA methodologies and adheres to the current standard operating procedures. Final calculations for most data generated are carried out by computer systems. In all cases, final results are calculated based on standards of known concentration. Validation of generated data can be verified via the standard EPA equations found in each methodology.

The following types of information are used to assess the validity of data:

The SAP;
USEPA methodology criteria;
USEPA quality control criteria; and
Internal laboratory peer review.

Tyree's QAO will conduct a systematic review of the data for compliance with the established QA/QC criteria based on the spike, duplicate, and blank results provided by the laboratory. An evaluation of the PARCC parameters will be presented in the investigation report.

Tyree's QAO will identify out-of-control data points and/or data omissions and interact with the laboratory to correct data deficiencies. The Project Manager may make decisions to repeat sample collection and analyses based on the extent of the deficiencies and their importance in the overall context of the project.

7.3 Data Reporting

Sample results are initially reported on preliminary data reports. One report per sample is provided with the following information included on each: client ID, laboratory sample ID, analytical method, date prepared (if applicable), date analyzed, reporting limits for the analytes listed, sample results, and any necessary comments related to the sample.

Matrix spike results are reported on quality control reporting forms, which include such information as date extracted (if applicable), date analyzed, spike ID codes, sample concentration, spike concentration, amount found, percent recovery and relative percent difference (RPD). Acceptance limits applicable to the method are listed on the form such that it can be readily determined that recoveries and RPDs meet acceptance criteria.

8.0 CALIBRATION PROCEDURES AND FREQUENCIES

The calibration frequencies for the field instruments to be used for this project have been detailed in Section 3.1.4. The calibration procedures shall be pursuant to the respective instrument manufacturer's operating manual supplied with each piece of equipment. With respect to laboratory analytical instrumentation, the calibration procedures and frequencies are described in the laboratory QA plan presented as Appendix C. All calibration procedures are in strict conformance with or exceed the requirements of the respective analytical methods.

9.0 CORRECTIVE ACTION

This section describes the field and laboratory methods and procedures that will govern potential corrective actions required to ensure the quality of data being collected as part of the site remedial action.

9.1 Field Activities

Field activities conducted outside the practices dictated in the work plan will be identified, documented and corrected immediately. The field sampling technician will be responsible for initiating a corrective action, documenting improper activities when the error has the potential to compromise the quality of the data being generated, or when there is a possibility the error may be repeated.

9.2 Field Data

Corrective action for poor quality field data (as determined by replicate measurements or prior expectation) will consist of re-measurement until successive readings agree within reasonable limits. Examples of frequently made measurements and re-measurement limits include:

Calibration of PID – calibration results should be within 95 percent of the known calibration gas standard concentration.

Calibration of CGI – calibration results should be within 100 percent of the known calibration gas standard concentration. Calibration of particulate/aerosol monitors should show instrumentation readings of 0.00 mg/m^3 during zeroing procedure.

If re-measurement is not successful, then instrument calibration, operation, and the user's technique will be evaluated. Once an instrument is re-calibrated or replaced, locations that were outside reasonable limits will be re-sampled and re-analyzed.

9.3 Laboratory

Laboratory corrective action is described in the USEPA-approved analytical method for each analysis and in the laboratory QA/QC manual provided as Appendix D.

9.4 Implementing and Reporting

Corrective action should be initiated at the lowest level possible. All corrective actions must be reported.

TABLES

APPENDIX A

RESUMES OF KEY PROJECT PERSONNEL

BECKER ELECTRONICS

Staffing Plan
Tyree Organization LTD.

Project Manager:
Philip N. Holloway

Project Health and Safety Coordinator:
Aldo Gonzales CSP

Site Safety Officer:
Mike Norkowski

Site Superintendent:
Stuart Eldred

Subcontractors/Suppliers

Drilling:
Aquifer Drilling & Testing, Inc.

Electrical:
To be Determined

Groundwater Treatment System:
National Environmental Systems, Inc.

Backfills/ Aggregates:
A. Colarusso & Sons

Disposal Facility Non-Haz Soils:
Hyland Facility

Disposal Facility Haz-Soils:
Horizon Environment

Mr. Philip N. Holloway
Environmental Project Manager

Tyree Office: Latham, NY

Year Started at Tyree: 1999

Years With Other Firms: 12

Education: B.S., Geology, Guilford College, Greensboro

Certifications/Licensing/Training

OSHA 40 hour training
OSHA 8-hour refresher training
OSHA site supervisors training
OSHA confined space training

Career Profile:

Mr. Holloway currently is a project manager in the environmental department for the Latham, New York and Brookfield, Connecticut offices. He has 12 years experience with environmental consulting and contracting throughout New York and New England. Mr. Holloway has experience with monitoring programs and assessments at hundreds of sites throughout the region. He has experience throughout the petroleum industry, and with assessments and investigations at hazardous waste sites including CERCLA, RCRA, and NYS Superfund. Mr. Holloway has conducted over 450 subsurface investigations, remedial designs and construction projects.

Currently, Mr. Holloway manages large-scale environmental remediation construction projects and serves as a technical resource for Tyree's environmental group in the Latham, NY office. As such, he is responsible for managing a staff of job superintendents and environmental scientists, and providing technical review and quality control of report deliverables.

Project Experience:

Remedial System Design and Installation
Sun Company Inc.
New York
February 1994 – August 1999

Project manager responsible for the assessment of subsurface petroleum contamination at numerous retail gasoline facility. Conducted soil vapor extraction and groundwater pump and treat pilot testing to assist in the identification of the most cost effective remedial alternative and to develop final design criteria. Designed and installed multiple type system utilizing horizontal wells for dual-phase extraction.

Site Investigation and Remediation
Olean Well Field NPL Site
Olean, NY
June 1990-February 1992

Managed extensive assessment of both overburden and bedrock formations to determine whether client's site was responsible for municipal well contamination. Provided communication of assessment activities between client and municipal parties. Responsible for the pilot testing, design and installation of a groundwater pump and treat system to contain contamination at the subject site.

Site Remediation
New York State Department of Environmental Conservation
Valley Falls, New York
Spring 2000

Provided senior project management for remediation of former dry cleaner site contaminated with PCE as part of the State Superfund cleanup. Soil contamination was excavated and removed offsite. Residential water wells replaced.

Interim Remedial Measure
EGG/ Rotron
Saugerties, NY
February 1992-December 1993

Managed interim remedial measure involving removal of over 300 buried drums and excavation of 500 yards of contaminated soil. Contaminant types included volatile and semi-volatile organic compounds, heavy metals, and solid waste materials.

Mr. Michael Norkowski,
Environmental Scientist I

Tyree Office:	Tyree Organization, Ltd Brookfield, CT
Year Started at Tyree:	1993
Years With Other Firms:	5
Education:	B.A., Communications/Human Relations, Western CT State University A.S., Architectural Engineering, Norwalk State Technical College
Certifications/Licensing Training	40 Hr. Hazwoper for Hazordous Waste Site Operations 8 Hr. Hazwoper Refresher for Hazardous Waste Operations 8 Hr. Hazwoper Site Supervisors Training Course Confined Space Entry Traning and Certification CPR and First Aid Training and Certification Blood Borne Pathogen Training and Certification
Professional Societies/ Organizations	National Groundwater Association

Career Profile:
As a Job Supervisor / Environmental Scientist I / Project Manager responsible for environmental site assessments, tank removals, well installations, drywell removals and remediation system installation. Responsible for project initiation through project completion including field work, job costing, report preparation and supervision. Also, as an Environmental Estimator prepared a wide variety of proposals including remediation system installation, landfill closures and underground tank removals.

Project Experience:
Major U.S. Commuter Railroad Company
Remediation System
Installation - 1998
Job supervisor responsible for the installation of a product recovery system. Responsibilities included the following: supervision of construction crews and subcontractors, liason for Tyree to customer field engineer, completion of scope of work as per plans and specifications, coordination of construction crews and subcontractors, meeting job deadlines. Contract amount: $800,000.

Major Northeast U.S. Petroleum Retail and Marketing Corporation
Remediation System Installation
1998
Project Manager responsible for the installation of an air sparging/ vapor extraction remediation system installation. Responsibilities included the following: coordination of construction crews and subcontractors, supervision of construction crews and subcontractors, completion of scope of work as per plans and specifications, meeting job deadlines. Contract amount: $100,000.

Major U.S. Engineering Firm
Landfill Closure
1997
Job Supervisor responsible for the capping and closure of a Town owned 8 acre landfill. Responsibilities included the following: supervision of construction crews and subcontractors, liason for Tyree to customer field engineer, completion of scope of work as per plans and specifications, coordination of construction crews and subcontractors, meeting job deadlines. Contract amount: $800,000.

Major U.S. Commuter Railroad Company
Remediation System
Installation 1997
Job Supervisor responsible for the installation of an offshore containment system and the installation of a product recovery system. Responsibilities included the following: supervision of construction crews and subcontactors, liason for Tyree to customer field engineer, completion of scope of work as per plans and specifications, coordination of construction crews and subcontractors, meeting job deadlines, training of Railroad Company personnel for the operation and maintenance of the product recovery system equipment. Contract amount: $678,000.

Major Northeast U.S. Petroleum Retail and Marketing Corporation
Drywell Removal
1996
Project Manager for removal of Class V Injection Wells (drywells) from various service stations in Connecticut and New York following EPA guidelines and procedures. Responsibilities included the following: investigation and dye testing of bay drains/drywells, removal of drywells, soil sampling, environmental site clean-up, report preparation and supervision of environmental construction crews and field technicians. Contract amount: $160,000.

Major U.S. Engineering Firm
Tank Removals
1996
Project Manager responsible for removal and replacement of underground storage tanks from four New York City Department of Environmental Protection facilities which provide drinking water to New York City. Responsibilities included the following: supervision of construction crews during underground storage tank removals, soil sampling and report preparation. Contract amount: $100,000.

Major Northeast U.S. Retail and Marketing Corporation
Environmental Monitoring Program
1995
Project Manager resonsible for groundwater sampling and analysis, treatment system operation and maintenance, free product bailing and well gauging following region guidelines. Responsibilities included the following: scheduling and supervision of field technicians, report preparation and meeting job deadlines. Contract amount: $100,000.

Mr. Matthew Roche,
Project Manager A

Tyree Office: Tyree Organization, Ltd
Brookfield, CT

Year Started at Tyree: 1990

Years With Other Firms: 10

Education:

B.S., Geological Engineering, University of Arizona
Aeration Technologies for Soil & Groundwater, E3, ,
Analysis & Design of Aquifer Tests, NGWA, ,
Environmental Drilling Technology, , University of Wisconsin
Groundwater & Vadose Zone Monitoring & Sampling Technology,, ,

Certifications/Licensing Training

OSHA 29 CFR 1910.120 (40Hr.)
OSHA Site Supervisor
OSHA Competent Person in Excavation
Troxler Nuclear Density Gauge Operation & Safety

Professional Societies/ Organizations

National Ground Water Association

Career Profile:

Mr. Roche has 10 years of field and project management experience in civil / environmental consulting and contracting. His experience has included supervision of Phase I Site Assessments, Phase II Site Investigations, design and installation of remediation systems and emergency spill response. Mr. Roche has designed soil and groundwater remediation systems using the following technologies: soil vapor extraction, groundwater pump and treat, air sparging, dual phase extraction, NAPL only recovery, and bioremediation.

Currently, Mr. Roche manages large-scale environmental remediation construction projects and serves as a technical resource for Tyrees environmental group in their Connecticut office. As such, he is responsible for managing a staff of job superintendents and environmental scientists, and providing technical review and quality control of report deliverables.

Project Experience:

Project Manager at Elementary School, Westchester County, New York

Responsible for installation of a dual phase high vacuum extraction (DPHVE) system. The purpose of the DPHVE system was to contain and recover #2 fuel oil which had leaked from a product transfer pipe located inside of a courtyard. Construction activities were completed in basements, crawl spaces, narrow hallways and in the courtyard with limited access.

The DPHVE system consisted of 15 recovery wells and a trailer containing two 20 hp liquid ring pumps, oil/water separator, liquid and vapor phase carbon vessels, bentonite/anthracite adsorbers, and a fully automated control

system with remote monitoring access. Start-up, testing, training and operation and maintenance of the system work required as part of the project.

Project Manager at a Major Commuter Rail Yard.
Responsible for design and installation of a NAPL containment and recovery system. The system was designed to contain separate phase diesel fuel present on the water table underlying a portion of the project site. Some of the product was migrating into a large water body adjacent to the project site. The containment system was constructed with the following components: semi-rigid floating hard boom secured in the water body by steel sheet piles and timber-pile clusters, a cut-off/slurry wall, and a gravel NAPL recovery trench with a pneumatic NAPL recovery system.

Team leader for an environmental consulting and construction account for a major petroleum company in the states of Connecticut and New York.
Work included completion of site investigations, pilot testing, remediation system engineering and design, construction of soil and groundwater remediation systems and emergency spill response. Supervised a staff of environmental scientists, environmental technicians and construction personnel.

Project Manager for Service Station, Delmar, New York.
Responsible for investigation and remediation of soil and groundwater underlying premises. The investigation consisted of the following: installation of five soil borings/groundwater monitoring wells and analysis of soil and groundwater samples collected from the borings/wells. The design and installation of the remediation system included the following: installation of a nested air sparge/soil vapor extraction pilot test well, air sparge and soil vapor extraction pilot testing, preparation of a Remedial Action Plan, installation of five nested air sparge/soil vapor extraction wells, installation of three soil vapor extraction wells and installation of an equipment shed housing the air sparge and soil vapor extraction equipment.

Team leader for an environmental monitoring and remediation system operation and maintenance account for a major petroleum company on the east coast.
Sites were located in 10 states from Virginia to New Hampshire. Work included gauging and sampling of groundwater monitoring wells, operation and maintenance of soil and groundwater remediation systems, installation of remediation systems, preparation of monthly status reports and emergency response. Supervised a staff of environmental scientists, environmental technicians and construction personnel located in five Tyree offices.

Project Manager for an automobile service station located in Ithaca, New York.
Responsible for investigation and remediation of groundwater underlying. The investigation consisted of installation and sampling of four soil borings/groundwater monitoring wells. The design and installation of the remediation system consisted of the following: installation of one groundwater recovery well, installation of a gravel groundwater collection trench, and installation of an air stripping tower for treatment of contaminated groundwater collected by the recovery system. Treated groundwater was discharged to a storm drain.

Mr. Robert Blow,
Crew Chief

Tyree Office: Tyree Organization, Ltd
Brookfield, CT

Year Started at Tyree: 1992

Education:

High School Diploma, General Curriculum, Wamogo Regional High School

Certifications/Licensing Training

40 Hour OSHA Training
8 Hour OSHA Refresher Training
Confined Space Training
OSHA Supervisory Training

Career Profile:
Environmental Crew Chief

Responsible for the field management of a two (2) man crew conducting underground storage tank removals, contaminated soil excavation and installation of soil and groundwater remediation systems.

Heavy Equipment Operator

Operate crane, crusher, payloader, backhoe, sweeper and dump truck. Load and unload trucks. Dig trenches for pipeline. Stone and stump removal, run screeners and maintain equipment., Supervise laborer staff.

Manage and maintain equipment. 400 Series American crawler crane. 400 Series P.H. road crane, forklift, payloader, Mack load lugger trucks. Coordinate work for three employees and dispatch employees and equipment.

Responsible for trouble shooting and maintenance of industrial electrical motors, engine production equipment, hydraulic systems, payloader and backhoe equipment. Also responsible for maintenance of plumbing in offices, some welding and light carpentry.

Ms. Hallie Vitolo, L.E.P.
Environmental Branch Manager

Tyree Office: Tyree Organization, Ltd
Brookfield, CT

Year Started at Tyree: 1992

Years With Other Firms: 3

Education:

B.S., Biology, Bucknell University, Lewisburg, Pennsylvania

Certifications/Licensing Training

Licensed Environmental Professional (Connecticut)
OSHA 40 hour training
OSHA 8-hour refresher training
OSHA site supervisors training
OSHA confined space training

Career Profile:

Ms. Vitolo currently manages the environmental department at Tyree's Brookfield, Connecticut branch office. She has extensive experience with environmental regulations in both Connecticut and New York. In fact, Ms. Vitolo is a Connecticut Licensed Environmental Professional. However, her background includes work throughout New England. Ms. Vitolo has experience with monitoring programs and assessments at hundreds of sites throughout the region. She has experience throughout the petroleum industry, with assessments and investigations at hazardous waste sites, and with oversight of a hazardous waste landfill closure. Ms Vitolo has conducted over 500 subsurface investigations, remedial designs and construction projects. She has vast experience with UST closures and state leaking underground storage tank reimbursement funds. She has negotiated numerous cost effective, timely and reasonable responses to applicable regulatory agencies.

Project Experience:

Remedial System
Design and Installation
Spain Oil Corporation
Cornwall, New York
February 1996-present

Project manager responsible for the assessment of subsurface petroleum contamination at retail gasoline facility. Conducted soil vapor extraction and groundwater pump and treat pilot testing to assist in the identification of the most cost effective remedial alternative and to develop final design criteria. Designed system utilizing horizontal wells for dual-phase extraction.

Site Investigation and Remediation
Mobil Oil Corporation
Dover, Massachusetts
June 1990-February 1991

Managed extensive assessment of both overburden and bedrock formations to determine whether clients site was responsible for municipal well contamination. Provided communication of assessment activities between client and municipal parties. Responsible for the pilot testing, design and installation of a groundwater pump and treat system to contain contamination at the subject site.

Site Remediation
New York State Department of Environmental Conservation
Owego, New York
June 1996-September 1997
Provided senior project management for remediation of old industrial site contaminated with heavy metals as part of the state superfund cleanup. Soil contamination was excavated and landfilled onsite. Ensued that soil excavation and landfill capping activities met state specifications.

Site Assessment and Remedial Design
Schering Plough Corporation
Central New Jersey
February 1989-December 1989
Managed assessment of farm utilized by a major U.S. pharmaceutical company for the testing of products for the past three decades. Project involved identifying potential sources and types of contamination based on historical site usage, assessing the extent of contamination in these areas and designing and implementing the necessary remediation. Project included the assessment and remediation of volatile and semivolatile organics, heavy metals, biohazardous and radioactive waste materials.

Property Transfer Investigation
Fort Orange Paper Company
Castleton-on-Hudson, New York
August - October 1995
Managed assessment of old paper manufacturing facility prior to property transfer. Investigation included assessment of onsite manufacturing areas, USTs, private onsite rail yard, private onsite waste treatment and private onsite landfill.

Site Utilization Investigation
Tom Collucci Construction Company
Milford, Connecticut
June 1995-October 1997
Project manager responsible for designing and implementing sampling program to assess the compliance of each of nine parcels to be developed residentially with Connecticut Department of Environmental Protection cleanup regulations. Groundwater underlying proposed building site was contaminated with solvents from offsite source.

Project Insurance Adjusters
AIG Technical Services
Various Sites in New York and Connecticut
November 1996-present
Provide management of residential fuel oil tank insurance claims for major environmental insurance carrier. Responsible for ensuring that contractors are performing satisfactory and cost-effective cleanups.

APPENDIX B

SUMMARY OF QA/QC OBJECTIVES

APPENDIX B

QUALITY ASSURANCE/QUALITY CONTROL OBJECTIVES SUMMARY

Data Use	Matrix	Sample Type	Analytical Method	No. of Field Samples	No. of QC Samples	Precision (RPD)[1]		Lab Accuracy (Matrix Spikes)[2]	Sensitivity	Completeness	DQO Level
						Field Dups	Lab Dups				
Integrated Industrial Hygiene Samples[3]	Air	Composite	NIOSH 1501 and 1003	4 per week	1 field blank for every day of sampling. 1 field duplicate per 20 samples	50% RPD	25% RPD	75-125% (typically)[4]	0.5 ppm per analyte	90% (typically)[4]	III
Waste Classification	Soil, decon-tamination water, dewatering fluids, well development water, drill cuttings	Composite	USEPA 8260	5	N/A			N/A		100%	III
Post-Excavation Samples	Soil	Grab	USEPA 8260	15	1 field duplicate per 10 samples.			75-125% (typically)[4]	0.001ppm per analyte	100%	III
Groundwater Treatment Discharge	Decon-tamination water, dewatering fluids, well development water	Grab	USEPA 8260	Approx. 60	1 field duplicate per 20 samples.			N/A	0.001ppm per analyte	100%	III

APPENDIX C

PRESERVATION AND HOLDING TIME REQUIREMENTS

The Tyree Organization

Member

APPENDIX C

PRESERVATION AND HOLDING TIME REQUIREMENTS FOR SOLID/LIQUID SAMPLES

Reference Method	Parameter	Technique	Container Type, No., and Volume (Solid/Liquid)	Preservation and Storage Requirements	Maximum Holding Time (Extraction) From Date of Collection (Solid/Aqueous)	Maximum Holding Time (Analysis)
USEPA 8260	Volatile Organic Compounds	GC/MS	2 - 40 mL VOC vials (Liquid) (1) 250 mL glass jar (Solid)	Refrigerated at 4°C (no headspace). HCL to a pH < 2 (Aqueous only)	14 days	14 days
USEPA 502.2	Volatile Organic Compounds	GC/MS	(2) 40 mL VOC vials (Liquid)	Refrigerated at 4°C (no headspace). HCL to a pH < 2	14 days	14 days
USEPA 8021	Petroleum Hydrocarbons	GC	(1) 250 mL glass jar (Solid)	Refrigerated at 4°C	14 days (Solid)	14 days

APPENDIX D

LABORATORY QA/QC PROGRAM

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

DEC PERMIT NUMBER	EXPIRATION DATE(S)
9-0232-00003/00002	May 1, 2005
FACILITY/PROGRAM NUMBER(S)	
SW #02A17	

PERMIT

Under the Environmental Conservation Law

NEW

TYPE OF PERMIT: Article 27, Title 7; 6NYCRR 360: Solid Waste Management and 6NYCRR 608: Water QualityCerrification

PERMIT ISSUED TO	TELEPHONE NUMBER
Hyland Facility Associates	716/466-7271
ADDRESS OF PERMITTEE	
P.O. Box 68, Belmont, New York 14813	
CONTACT PERSON FOR PERMITTED WORK Thomas West, Attorney Jean Herdman, Facility Supervisor	TELEPHONE NUMBERS 518/465-1500 716/466-7271
NAME AND ADDRESS OF PROJECT/FACILITY	
Hyland Ash Landfill, Herdman Road, Angelica	
LOCATION OF PROJECT/FACILITY	
A 289 acre site south of the Village of Angelica and west of Peacock Hill Road	

COUNTY	TOWN	WATERCOURSE	NYTM COORDINATES
Allegany	Angelica	N/A	E 252.0 N 4685.8

DESCRIPTION OF AUTHORIZED ACTIVITY

Construct and operate cells 1 and 2 of a 28.27 acre, 2.5 million cubic yard landfill, with a double composite liner, leachate and gas detection/collection systems, including underdrain and 62 acres of ancillary facilities (leachate storage, sediment ponds, office/maintenance building, soil borrow area etc.). Once constructed and properly approved, the Hyland Facility Associates' Landfill is authorized to receive up to 500 tons per day of waste consisting of: municipal solid waste incinerator ash, municipal solid waste and non-hazardous industrial waste.

By acceptance of this permit, the permittee agrees that the permit is contingent upon strict compliance with the ECL, all applicable regulations, the General Conditions specified (see page 2) and any Special Conditions included as part of this permit.

REGIONAL PERMIT ADMINISTRATOR	DIV. OF ENVIRONMENTAL PERMITS, 270 MICHIGAN AVE., BUFFALO, NY 14203-2999, (716) 851-7165	
Steven J. Doleski		
AUTHORIZED SIGNATURE Steven J. Doleski	DATE March 11, 1998	PAGE 1 OF 16

Trois-Rivières, November 11th 1998

MODIFICATION

Horizon Environnement inc.
120, route 155
Grandes-Piles (Québec) G0X 1H0

N/Réf.: 7610-04-01-01788.01
1169036

Object: Setting up of an enhanced security confinement cell and a contaminated soil treatment centre.

Ms,
Mr,

The present modification concerns the authorization certificate issued on august 22nd 1995 under section 22 of the Environment Quality Act (R.S.Q., chapter Q-2) and modified on March 7th 1996, June 6th 1996, November 12th 1996, July 9th 1997 and September 8th 1998, in regards to the following project:

> Setting up and exploitation of an enhanced security confinement cell and a contaminated soil treatment centre on lot 25-7, range II from the Saint-Maurice river, Radnor township, municipality of Grandes-Piles, within the regional municipality of Mékinac.
>
> Acceptability of storing special waste in enhanced security confinement cells equipped with geomembranes, relocation of leachate water accumulation basins and change in the sequence of establishment of the cells.
>
> Modification of a portion of the enhanced security confinement cell to maximum-security confinement cell.
>
> Cells relocation. Modification of all confinement cells into a maximum-security type.
>
> Transformation of the 1B maximum-security confinement cell to an enhanced security cell.

...

ARTICLE 2(b) - Statement of Surety's Intent

To: *New York State Department of Environmental Conservation*

We have reviewed the Bid of TYREE ORGANIZATION, LTD. (Contractor)

of 4 NORTHWAY LANE, LATHAM, NEW YORK 12110 (Address)

for SITE REMEDIATION-BECKER ELECTRONICS SITE, NYS SITE NUMBER 4-20-007, EAST DURHAM, NY (GREEN COUNTY) (Project)

Contract Number _____

NYS Site Number 4-20-007

Bids for which will be received on MAY 2ND, 2000 (insert Bid Opening Date) and wish to advise that should this Bid of Contractor be accepted and the Contract awarded to Contractor, it is our present intention to become surety on the Performance Bond and Labor and Material Payment Bond required by the Contract.

Any arrangement for the Bonds required by the Contract is a matter between Contractor and ourselves and we assume no liability to Department or third parties if for any reason we do not execute the requisite bonds.

We are duly licensed to do business in the State of New York.

SIGNED, SEALED AND DATED THIS 27TH DAY OF APRIL, 2000.

Attest:

Corporate Seal
(If no seal, write "No Seal" and sign)

RELIANCE INSURANCE COMPANY

BY: Gerard S. Macholz

Surety's Authorized Signature(s)
GERARD S. MACHOLZ, ATTORNEY-IN-FACT

(732)494-6050
Telephone Number for Bonding Company

(516)794-7000
Telephone Number for Bonding Broker

Attach Power of Attorney

RELIANCE INSURANCE COMPANY

PHILADELPHIA, PENNSYLVANIA

PRINCIPAL'S ACKNOWLEDGEMENT—IF INDIVIDUAL OR FIRM

State of New York, County of ss:

On this day of , before me personally came

to me known to be (the individual) (one of the firm of)
described in and who executed the within instrument, and he thereupon duly acknowledged to me that he executed the same (as the act and deed of said firm).

Notary Public

PRINCIPAL'S ACKNOWLEDGEMENT—IF CORPORATION

State of New York, County of ss:

On this day of , before me personally came

to me known, who, being by me duly sworn, deposes and says: That he resides in ;
that he is of
the corporation described in and which executed the within instrument; that he knows the seal of the said corporation; that the seal affixed to the said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of the said corporation, and that he signed his name to the said instrument by like order.

Notary Public

SURETY COMPANY'S ACKNOWLEDGEMENT

State of New York, County of NASSAU ss:

On this GERARD S. MACHOLZ 27TH day of APRIL 2000 , before me personally came
to me known, who, being by me duly sworn, did depose and say: That he resides in SUFFOLK COUNTY, NEW YORK ;
that he is Attorney-in-Fact of the RELIANCE INSURANCE COMPANY, the corporation described in and which executed the foregoing instrument; that he knows the corporate seal of said company; that the seal affixed to said instrument is such corporate seal of said company; that it was so affixed by the authority granted to him in accordance with the by-laws of said corporation; that he signed his name thereto by like authority; that the Superintendent of Insurance of the State of New York has, pursuant to Chapter 882 of the Laws of the State of New York for the year 1939 constituting Chapter 28 of the Consolidated Laws of the State of New York known as the Insurance Law, issued to the RELIANCE INSURANCE COMPANY his certificate that said company is qualified to become surety or guarantor on all bonds, undertakings, recognizances, guarantees and other obligations required or permitted by law; and that such certificate has not been revoked.

SUSAN M. RAVID
Notary Public, State of New York
No. 01RA6000923
Qualified in Nassau County
Commission Expires 12/23/ 01

Notary Public

Financial Statement Dated December 31, 1998

ASSETS

Cash and Short Term Investments	$ 295,567,745
Securities (Long Term)	4,682,669,094
Premium Balances	923,739,746
Accrued Interest and Dividends	45,492,624
Federal Income Taxes	1,498,834
Other Assets	340,291,755
Total Admitted Assets	$ 6,289,259,798

LIABILITIES

Losses and Loss Adjustment Expense	$ 2,657,263,221
Unearned Premiums	1,021,803,685
Other Taxes	17,671,059
Other Liabilities	843,887,629
Total Liabilities	$ 4,540,625,594

CAPITAL AND SURPLUS

Capital Stock	$ 44,586,703
Surplus	1,256,826,128
Total Policyholders' Surplus	1,301,412,831
Total Liabilities, Capital and Surplus	$ 5,842,038,425

State of Washington)
County of King) SS.

Larry C. Mitchell, being duly sworn, says: That he is Vice President of the RELIANCE INSURANCE COMPANY; that said company is a corporation duly organized, existing, and engaged in business as a surety by virtue of the laws of the Commonwealth of Pennsylvania, and has duly complied with all the requirements of the laws of said commonwealth applicable to said company and is duly qualified to act as surety under such laws; that said company has also complied with and is duly qualified to act as surety under the Act of Congress of September 13, 1982, as amended (31 U.S.C. §9301 et. seq.); that the foregoing is a full, true and correct statement of the financial condition of said company on the 31st day of December, 1998.

Sworn to me this 19th day of March, 1999.

Janis J. Crossland

Janis J. Crossland, Notary Public, State of Washington, County of King. My Commission Expires February 5, 2000.

JANIS J. CROSSLAND NOTARY PUBLIC COMMISSION EXPIRES 2-5-2000 STATE OF WASHINGTON

Larry C. Mitchell
Vice President

BCR-1827 3/99

RELIANCE SURETY COMPANY
UNITED PACIFIC INSURANCE COMPANY

RELIANCE INSURANCE COMPANY
RELIANCE NATIONAL INDEMNITY COMPANY

ADMINISTRATIVE OFFICE, PHILADELPHIA, PENNSYLVANIA

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS, that RELIANCE SURETY COMPANY is a corporation duly organized under the laws of the State of Delaware, and that RELIANCE INSURANCE COMPANY and UNITED PACIFIC INSURANCE COMPANY, are corporations duly organized under the laws of the Commonwealth of Pennsylvania and that RELIANCE NATIONAL INDEMNITY COMPANY is a corporation duly organized under the laws of the State of Wisconsin (herein collectively called "the Companies") and that the Companies by virtue of signature and seals do hereby make, constitute and appoint **Anthony J. Romano, Eleanor Doudera, Thomas Bean, Fred Nicholson, Gerard S. Machotz, Rita Sagistano., of Uniondale, New York** their true and lawful Attorney(s)-in-Fact, to make, execute, seal and deliver for and on their behalf, and as their act and deed any and all bonds and undertakings of suretyship and to bind the Companies thereby as fully and to the same extent as if such bonds and undertakings and other writings obligatory in the nature thereof were signed by an Executive Officer of the Companies and sealed and attested by one other of such officers, and hereby ratifies and confirms all that their said Attorney(s)-in-Fact may do in pursuance hereof.

This Power of Attorney is granted under and by the authority of Article VII of the By-Laws of RELIANCE SURETY COMPANY, RELIANCE INSURANCE COMPANY, UNITED PACIFIC INSURANCE COMPANY, and RELIANCE NATIONAL INDEMNITY COMPANY which provisions are now in full force and effect, reading as follows:

ARTICLE VII - EXECUTION OF BONDS AND UNDERTAKINGS

1. The Board of Directors, the President, the Chairman of the Board, any Senior Vice President, any Vice President or Assistant Vice President or other officer designated by the Board of Directors shall have power and authority to: (a) appoint Attorney(s)-in-Fact and to authorize them to execute on behalf of the Company, bonds and undertakings, recognizances, contracts of indemnity and other writings obligatory in the nature thereof, and (b) to remove any such Attorney(s)-in-Fact at any time and revoke the power and authority given to them.

2. Attorney(s)-in-Fact shall have power and authority, subject to the terms and limitations of the Power of Attorney issued to them, to execute deliver on behalf of the Company, bonds and undertakings, recognizances, contracts of indemnity and other writings obligatory in the nature thereof. The corporate seal is not necessary for the validity of any bonds and undertakings, recognizances, contracts of indemnity and other writings obligatory in the nature thereof.

3. Attorney(s)-in-Fact shall have power and authority to execute affidavits required to be attached to bonds, recognizances, contracts of indemnity or other conditional or obligatory undertakings and they shall also have power and authority to certify the financial statement of the Company and to copies of the By-Laws of the Company or any article or section thereof.

This Power of Attorney is signed and sealed by facsimile under and by authority of the following resolution adopted by the Executive and Finance Committees of the Boards of Directors of Reliance Insurance Company, United Pacific Insurance Company and Reliance National Indemnity Company by Unanimous Consent dated as of February 28, 1994 and by the Executive and Financial Committee of the Board of Directors of Reliance Surety Company by Unanimous Consent dated as of March 31, 1994.

"Resolved that the signatures of such directors and officers and the seal of the Company may be affixed to any such Power of Attorney or any certificates relating thereto by facsimile, and any such Power of Attorney or certificate bearing such facsimile signatures or facsimile seal shall be valid and binding upon the Company and any such Power so executed and certified by facsimile signatures and facsimile seal shall be valid and binding upon the Company, in the future with respect to any bond or undertaking to which it is attached."

IN WITNESS WHEREOF, the Companies have caused these presents to be signed and their corporate seals to be hereto affixed, this August 24, 1998.

RELIANCE SURETY COMPANY
RELIANCE INSURANCE COMPANY
UNITED PACIFIC INSURANCE COMPANY
RELIANCE NATIONAL INDEMNITY COMPANY

David T. Akers

STATE OF Pennsylvania }
COUNTY OF Philadelphia } ss.

On this, August 24, 1998, before me, Valencia Wortham, personally appeared David T. Akers, who acknowledged himself to be the Senior Vice President of the Reliance Surety Company, and the Vice President of Reliance Insurance Company, United Pacific Insurance Company, and Reliance National Indemnity Company and that as such, being authorized to do so, executed the foregoing instrument for the purpose therein contained by signing the name of the corporation by himself as its duly authorized officer.

In witness whereof, I hereunto set my hand and official seal.

Notarial Seal
Valencia Wortham, Notary Public
Philadelphia, Philadelphia County
My Commission Expires Nov. 18, 2000

Valencia Wortham

Notary Public in and for the State of Pennsylvania
Residing at Philadelphia

I, Anita Zippert, Secretary of RELIANCE SURETY COMPANY, RELIANCE INSURANCE COMPANY, UNITED PACIFIC INSURANCE COMPANY, and RELIANCE NATIONAL INDEMNITY COMPANY do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which is still in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 27 day of APRIL 2000.

Anita Zippert

Secretary

PROJECT PROFILE

Project Name and Activity:
Amerada Hess Corp, NJ & PA, Remediation System Installations

Contracting Office's Name and Address:
Amerada Hess Corporation
1 Hess Plaza
Woodbridge, CT

Contracting Contact:
Mr. John Schenkewitz
732/750-6616

Total Contract Value:
$435,000

Period of Performance:
01/1/97 - 0/0/00

Project Description:

Tyree Organization was contracted to perform soil and groundwater remediation system installation at several of this client's facilities in New Jersey and Pennsylvania. Systems included groundwater pump and treat with soil vapor extraction, air sparge/soil vapor extraction and catalytic oxidation treatment of system off-gas. Services included permitting, equipment procurement, system installation and startup. Systems were designed by this owner's environmental engineering consultant. In each case, systems were installed at active gasoline retail stations with no interruption of normal business. To date (May, 1999), all projects have been completed to the satisfaction of this highly image conscious owner.

PROJECT PROFILE

Project Name and Location:
New York State Superfund Site – Valley Falls Dry Cleaner
Valley Falls, NY

Client:
NYSDEC

Project Value:
$172,400

Completion Date:
April 2000

Project Description:

Tyree was awarded the contract to conduct the excavation of approximately 200 cubic yards of PCE contaminated soils from a former dry cleaner facility. The contaminated soils were shipped offsite to an approved landfill. Tyree was responsible for replacing 3 residential potable water wells, and installing them to each individual residence. Due to the site's proximity to a residential area, the NYSDEC enforced strict dust control and health and safety measures.

The project included the following activities:

- Site preparation
- Excavation of nearly 200 cubic yards of contaminated soils.
- Backfilling of excavation with clean fill in six-inch lifts meeting 90% compaction specs
- Drilling 3 Residential Water Wells and installing new pumps to specifications

PROJECT PROFILE

Project Name and Location:
New York State Superfund Site - Tioga Castings
Owego, NY

Client:
NYSDEC

Project Value:
$410,789

Completion Date:
6/97

Project Description:

Tyree was retained to conduct the excavation of approximately 3,000 cubic yards of heavy-metal contaminated soils from a former foundry. The soils were then consolidated into an existing on-site 1.25-acre landfill. Tyree was responsible for compacting, grading, and capping the landfill. Due to the site's proximity to a school and residential area, the NYSDEC enforced strict dust control and health and safety measures.

The project included the following activities:

- Pre-excavation testing to confirm the extents of contaminated soils to be removed
- Excavation of nearly 3,000 cubic yards of contaminated soils from foundry and adjacent residential, commercial, and school properties
- Backfilling of excavation with clean fill in six-inch lifts meeting 90% compaction specs
- Consolidation and compaction of contaminated soils within the landfill in six-inch lifts
- Testing of each lift to assure compliance with requirements for 90% compaction
- Placement and compaction of a basal fill layer over contaminated soils
- Placement of a 60-mil HDPE geomembrane and a geocomposite drainage layer
- Placement and compaction of 18-inch thick barrier protection layer of common and select fill materials
- Placement and compaction of a six-inch thick vegetative layer (topsoil)
- Construction of a drainage swale surrounding the landfill, lined with 12 ounce geotextile, covered with 12 inches of fine stone
- Final grading of the landfill to meet NYSDEC specifications

PROJECT PROFILE

Project Name and Location:
USEPA Superfund Site - Mattiace Petrochemical Site
Glen Cove, NY

Client:
Foster Wheeler Environmental Corporation

Project Value:
$5,500,000

Completion Date:
10/99

Project Description:

Tyree was awarded the project to design and construct a dual-phase vacuum extraction system and treatment plant to remediate the grounds of a former chemical transfer facility contaminated by chlorinated solvents and other compounds. Contamination was widespread due to the abandonment and burial of hundreds of drums of chemicals, over 30 leaking USTs, and years of improper chemical handling procedures. Contamination had spread throughout the site and threatened a local wildlife preserve and Long Island Sound.

The scope of work for this project included the following elements:

- Design and installation of six (6) vapor extraction wells, five (5) dual phase extraction wells, ten (10) nested vapor extraction wells and ten (10) injection wells.
- Design and installation of several miles of underground pipe to transport vapor and liquid to the treatment facility and injection wells.
- Design and installation of a water treatment process stream capable of extracting and treating liquid influent at up to 25 gpm utilizing phase separation, metals removal via precipitation and flocculation, air stripping, chemical addition, carbon adsorption, sludge handling and disposal.
- Design and installation of a vapor treatment process stream capable of extracting and treating vapor influent at up to 1660 scfm utilizing thermal oxidation and wet scrubbing. This system, when completed, measured in terms of pounds of vapor phase chemical treated per day, will be one of the largest vapor treatment systems in the United States.
- Design and installation of a PLC-based control logic system.
- Design and installation of a 7,500 square-foot treatment plant building, including all electrical, plumbing, HVAC, masonry, carpentry and finish work.
- Site work and restoration.
- System startup, operations and maintenance.
- Training of facility staff.
- Health and safety administration and oversight.
- Security oversight.
- Asbestos investigation and removal.
- Tank and drum removal.
- Hazardous materials characterization, removal, transportation, and disposal.

PROJECT PROFILE

Project Name and Location:
Ron Hill Cleaners – Assessment/SVE System
Glen Cove, NY

Client:
Bedford Affiliates

Project Value:
$275,000

Completion Date:
8/98

Project Description:

Tyree was retained to perform a site assessment at a dry cleaning facility in Glen Cove, New York. Prior to Tyree's investigation, this site was classified as an NYS Inactive Hazardous Waste Site. The assessment included the collection and analysis of soil samples and the installation of monitoring wells for groundwater sampling. The results indicated the presence of soil contamination by tetrachloroethene, acetone, and xylenes above acceptable levels. An Interim Remedial Measure (IRM) Work Plan was submitted by Tyree in 1995. The IRM proposed additional soil borings and pilot testing to properly design and specify a soil vapor extraction system (SVES). The IRM was approved and implemented, and pilot testing began in August 1995. The report summarizing the results and proposed SVES design was published in November 1995. The system was installed and activated in August 1996, and operated for roughly two years before meeting cleanup criteria. In support of regulatory requirements, Tyree designed and implemented a water-quality monitoring program to verify cleanup progress.

PROJECT PROFILE

Project Name and Activity:
Getty, Environmental Contract, Locations From Maine To Virginia

Contracting Office's Name and Address:
Getty Realty Corporation
27 Rear Main Street P.O. Box 1590
South Portland, ME

Contracting Contact:
Mr. James E. Stewart
207-799-8518

Total Contract Value:
$25,000,000

Period of Performance:
00/0/00 - 0/0/00

Project Description:

Tyree has been providing professional environmental consulting and contracting services to Getty Petroleum Corporation since 1985. Work performed by Tyree includes the following: coordination and scheduling of groundwater monitoring/sampling, phase I and II site investigations, remediation system design, pilot testing, installation and operation, emergency response, removal of underground storage tanks and expert testimony.

Environmental remediation systems designed and installed by Tyree at various Getty retail facilities and terminals include the following:

- groundwater pump & treat
- air sparging with soil vapor extraction
- soil vapor extraction
- in-situ bioremediation
- dual phase pump & treat and soil vapor
- free product recovery extraction
- contaminated soil excavation

The treatment systems designed and installed by Tyree have included the following technologies/equipment:

- submersible and pneumatic groundwater pumps
- submersible and pneumatic product recovery pumps
- liquid ring high vacuum pumps
- air stripping towers
- low profile air strippers
- carbon treatment units
- thermal and catalytic oxidizing units
- above and below ground product storage tanks
- environmental equipment buildings.

PROJECT PROFILE

Project Name and Activity:
Getty, Ossipee, NH, S/S, SVE/Pump and Treat
Ossipee, NH

Contracting Office's Name and Address:
Getty Realty Corporation
27 Rear Main Street P.O. Box 1590
South Portland, ME

Contracting Contact:
Mr. James E. Stewart
207-799-8518

Total Contract Value:
$700,000

Period of Performance:
03/16/95 - 0/0/00

Project Description:

This project involves the design and installation of a soil vapor extraction and groundwater treatment system managed by Tyree Organization for a major petroleum retailer. All activities performed are required by the New Hampshire Department of Environmental Services (NHDES), Groundwater Protection Bureau, and New Hampshire Oil Discharge and Disposal Cleanup Fund (ODDF).

A remediation system consisting of Groundwater Recovery/Treatment and Soil Vapor Extraction was installed during June and September 1994. The Groundwater Remediation System consists of one groundwater recovery well, one Grundfos pump, one air stripper, one carbon filter and four injection wells for discharge of treated water. The soil Vapor Extraction system consists of two shallow vapor extraction wells, two deep vapor extraction wells and one Rotron blower unit.

A Telemonitoring System is installed at the site. It can record the groundwater treatment flow rate, air stripper pressure, carbon tank pressure, water level in recovery well, water level in injection wells, submersible water pump, carbon canister high pressure override, and soil vapor extraction system blower vacuum.

Tyree continues to perform system monitoring and operation maintenance including system sampling and groundwater sampling.

PROJECT PROFILE

Project Name and Activity:
Getty, Pelham, NH, S/S, SVE/Pump and Treat
Pelham, NH

Contracting Office's Name and Address:
Getty Realty Corporation
27 Rear Main Street P.O. Box 1590
South Portland, ME

Contracting Contact:
Mr. James E. Stewart
207-799-8518

Total Contract Value:
$230,000

Period of Performance:
10/2/89 - 0/0/00

Project Description:

A release of gasoline detected in 1989 had resulted in an impact to the on-site well, and on subsurface soil and groundwater, and a potential threat to a conservation area.

Three recovery wells were utilized for a pump and treat groundwater system, which was operated for approximately 3 years. The system was shut down due to iron fixing bacteria causing deposits in the carbon drums. A soil vapor extraction system, which had been operating since 1992, was upgraded with the addition of six more wells and a significantly more powerful blower.

Tyree is currently assessing the risk posed by the remaining contamination, and the overall geochemistry of the site. The site consists of two separate environments: an area of filled land with groundwater at a depth approximately 10 feet, and adsorbed phase soil contamination as well as dissolved phase in the groundwater; and a wooded flood plain below the filled area, with limited access and shallow groundwater. Geochemistry is different at each location, and different approaches are needed to continue environmental improvement.

PROJECT PROFILE

Project Name and Activity:
Getty, Weymouth, MA, S/S, Pump & Treat
Weymouth, MA

Contracting Office's Name and Address:
Getty Realty Corporation
27 Rear Main Street P.O. Box 1590
South Portland, ME

Contracting Contact:
Mr. James E. Stewart
207-799-8518

Total Contract Value:
$40,000

Period of Performance:
06/2/97 - 0/0/00

Project Description:

On July 5, 1988, Department of Environmental Protection (DEP) personnel investigated a reported gasoline release at the Service Station as reported in a Phase I Limited Site Investigation conducted by Metcalf & Eddy, Inc. (M&E) of Northborough, MA. During the investigation, 20 to 30 inches of non-aqueous phase liquid (NAPL) were discovered in the on-site 36-inch diameter recovery well (RW-2).

On July 6, 1988, Zecco, Inc. responded to an emergency response regarding gasoline vapors inside a restaurant located approximately 120 feet to the east of the site property. During the response, gasoline vapors were detected within both the sewer line leading to the restaurant and restrooms inside the restaurant. A Short Term Measure (STM) was implemented with the approval of the DEP to abate the vapors in the restaurant building and recover the free-phase product. The STM included the installation of an exhaust blower within the sewer invert located behind the restaurant, and the immediate and continuous pumping of NAPL out of the recovery well.

As part of the continued emergency response, a vapor phase recovery system was installed in the sewer invert, and a monitoring program for volatile organic compounds (VOCs) was initiated for the sewer line and the restrooms of the restaurant. As a result of the release, three monitoring wells (MW-1, MW-2, and MW-3) and two recovery wells (RW-1 and RW-2) were installed on the Getty property. Additionally, two monitoring wells (MW-4 and MW-5) were installed on the restaurant property. An additional monitoring well (MW-6) was installed adjacent to RW-2 in December 1995.

A groundwater treatment system (GWTS) was installed adjacent to the Service Station building consisting of the following: a groundwater depression pump in RW-1; a groundwater/product pump in RW-2; an air stripping tower with liquid phase carbon polishing of the tower liquid effluent; and vapor phase carbon of the tower air effluent.

On September 19, 1988, the GWTS was activated. On June 28, 1989, the GWTS was modified to utilize aqueous phase granular activated carbon (GAC) units only, per DEP approval. Groundwater is pumped from recovery well RW-2 through primary and secondary 55-gallon GAC units. Treated groundwater is then discharged into a storm sewer operated by the Massachusetts Highway Department (MHD) located on an adjacent street. Initially, the system was not insulated, therefore the operation was seasonally shut-down during the winter months. Prior to shut-down, the aboveground components were drained to prevent damage from freezing. As of November 1995, the GWTS has been insulated and is now operated year-round.

In October of 1990, the vapor recovery system and blower were removed from the sewer line at the restaurant. However, ambient air in the sewer line and restrooms was monitored on a monthly basis as part of the STM.

In August of 1991, a letter was issued by the DEP to the owner stating that the STM could be terminated. In December 1991, a Waiver of Approvals was granted by the DEP for the site, number 3-2837.

The remediation system was originally installed by M&E. In December 1994, Tyree was retained by the owner to conduct environmental operations at the site. At the time of the transfer, the remediation system had been shut down for the winter. In the spring of 1995, repairs were made to the GWTS and the system commenced operation on May 8, 1995. The system has been in continuous operation, with the exception of periodic shut-downs for routine maintenance.

The primary objective of a RAM Plan dated June 17, 1997, is to enhance the existing GWTS by installing additional monitoring wells for the introduction of an oxygen release compound (ORC). This product is manufactured by Regenesis Bioremediation Products of San Juan Capistrano, California, and was formulated to release oxygen slowly to enhance bioremediation. ORC will enhance the supply of oxygen to naturally occurring microbes which metabolically transform toxic organic compounds, including benzene, toluene, ethylbenzene, and xylenes (BTEX), into harmless by-products. The remedial response actions will be conducted in an area downgradient of the highest total BTEX concentrations but within the radius of influence of the pumping well for the GWTS. This area is located in the vicinity of the current underground storage tanks (USTs) and RW-1, MW-1 and MW-6. The objective is to draw the aerated groundwater toward the recovery well and allow the bacteria to "sweep" the area of BTEX contaminants. The ORC was installed in two on-site wells in August 1997.

If quarterly sampling of the existing wells indicates that ORC is unsuccessful, then the RAM will also consist of the introduction of a bioremediation product. This product is manufactured by Micro-Bac International, Inc. of Austin Texas, and was formulated to degrade a variety of organic compounds including BTEX. The product and nutrients necessary to enhance biological activity would be introduced into two monitoring wells at a product-to-nutrient ratio of approximately 1:4. It is anticipated that no more than 50 gallons of this mixture will be introduced into each monitoring well.

PROJECT PROFILE

Project Name and Activity:
Greenhaven Correctional Facility, UST Removal, Dual Phase Extraction

Contracting Office's Name and Address:

Contracting Contact:

Total Contract Value:
$0

Period of Performance:
00/0/00 - 0/0/00

Project Description:

Gasoline contamination was detected in the soil and bedrock surrounding a 4,000 gallon gasoline UST during its removal. Installation and sampling of five bedrock groundwater monitoring wells at the facility delineated petroleum contamination of groundwater in the bedrock. Data obtained during a groundwater pump test performed on one of the bedrock monitoring wells was used to calculate aquifer characteristics. The groundwater yield obtained from the pump test was very low while the observed influence on surrounding bedrock monitoring wells was high. Tyree designed, constructed and operated a dual phase extraction system to dewater and then vent the contaminated bedrock zone.

PROJECT PROFILE

Project Name and Activity:
Major Petroleum Retailer S/S, Dual Phase Extraction

Contracting Office's Name and Address:

Contracting Contact:

Total Contract Value:
$125,000

Period of Performance:
00/0/00 - 0/0/00

Project Description:

Tyree Brothers Environmental Services, Inc. is a sole source environmental consultant for a major oil company. As a result of a leaking underground storage tank (UST) at a gasoline retail service station, site remediation was initiated. An unknown amount of gasoline was discharged to the subsurface soils and ground water. During the investigation phase monitoring wells were installed. Ground water is approximately 10-13 feet below grade and has a southeasterly flow. The soils consist of very compact fine grain sands, silts, and clays. Delineation of the plume was confirmed by conducting a Geoprobe investigation.

Subsequent to the well installations, Tyree conducted a soil vapor extraction (SVE) pilot vent test. A vacuum truck was utilized as a high vacuum source and connected to a well. Results of the pilot test indicated that a high vacuum dual phase soil and water vapor extraction system will be an effective means of addressing the hydrocarbon impact beneath this site.

A liquid ring vacuum pump capable of providing higher vacuum with less power requirements through the use of a liquid tight seal is being used to extract the contaminated vapors and liquid. The ground water extraction prevents off-site migration of the dissolved phase plume. The small amount of water that is extracted from the tight formation will be treated using an oil/water separator and carbon canisters, resulting in the remediation of the existing free and dissolved phase plumes. Three (3) vapor extraction wells are utilized to extract the existing plume beneath the site.

The construction of the remediation system consists of underground piping that connects the three (3) wells with the treatment area. Treated effluent is metered and discharged into the municipal sewer under permittance. All electrical control panels are explosion proof. The treatment area is fenced and a steel insulated shed encloses the skid mounted liquid ring pump unit, vapor and liquid phase canisters, oil/water separator, and product recovery drum. To prevent freezing, the enclosure is temperature controlled by use of an explosion proof heater.

In order to determine the efficiency of the system, the wells are monitored on a weekly basis for free phase product and sampled for dissolved constituents on a monthly schedule. It is anticipated that the soil and ground water will be remediated within 2-3 years.

PROJECT PROFILE

Project Name and Activity:
Midland Elementary School, Rye, NY, Dual Phase Extraction
Rye, NY

Contracting Office's Name and Address:
Rye City School District
Central Administration Building 324 Midland Avenue
Rye, NY

Contracting Contact:
Mr. Larry Hires
914-967-6100

Total Contract Value:
$349,000

Period of Performance:
06/1/97 - 9/1/97

Project Description:

Tyree was retained by the Rye City School District to construct a Dual Phase Vacuum Extraction remedial system at the Midland Elementary School. The purpose of the remedial system was to contain and reverse the effectws a spill of nearly 30,000 gallons of number two (2) fuel oil which had leaked from a ruptured transfer pipe. Constructions was constrained by intense deadline pressure and physical restrictions which limited equipment access. All construction activities were required to be completed within one summer while students were required to be completed within one summer while students were on break. Construction activities were completed in basements, crawl spaces, narrow hallways and courtyards with limited access. Many of these environments introduced the complications of Confined Space Entry and required forced ventilation.

Construction included the following elements:

Installation of Six (6) two (2) inch diameter dual phase wells in a completely enclosed courtyard using a tripod and hammer rig. Equipment access was limited to a 32.5 inch diameter doorway.
Installation of two (2) two (2) inch diameter dual phase wells into a crawl space from the hallway floor above using a tripod and hammer rig. The hallway ceiling allowed for a maximum of 9.5 feet of clearance after removing ceiling tiles.
Installation of three (3) two (2) inch diameter dual phase wells in a basement storage area with eight (8) foot ceilings using a tripod and hammer rig. Drilling was not allowed through the ceiling above this area. The basement floor was a eight (8) inch thick concrete slab which was removed with a jackhammer.
Installation of three (3) two (2) diameter dual phase wells outside the building using a drill rig equipped with hollow stem augers.
Installation of piping to manifold all wells through crawl spaces and trenches to a treatment system housed outside the building.
Installation of a 40 foot long treatment trailer containing vapor and water treatment equipment. Equipment used in this system included liquid ring pumps, liquid and vapor phase carbon

vessels, bentonite/anthracite adsorbers, oil/water sparation, fully automated control system with remote monitoring and access, motor control center.
Start up, testing and O&M of the remedial system.
Injection of ORC grout using direct push probes outside the school building.

PROJECT PROFILE

Project Name and Activity:
State University of New York - Brockport, SVE System
Brockport, NY

Contracting Office's Name and Address:

Contracting Contact:

Total Contract Value:
$60,000

Period of Performance:
09/1/92 - 11/1/92

Project Description:

Tyree performed site investigations, pilot testing and subsequently designed and installed a soil vapor extraction system (SVES) at a service garage located on the SUNY Brockport campus. The purpose of the SVES was to mitigate hazardous vapors and to remediate contaminated soil resultant from releases of gasoline from UST's located at the project site. The UST's were located immediately adjacent to the service garage building. Product released from the UST's migrated into the soils and groundwater underlying UST's and the service garage building. As a result of the releases, petroleum vapors built-up under the concrete floor in the service garage building, creating a potentially explosive environment.

The SVES was installed to eliminate the hazardous vapors and to remediate the contaminated soil underlying the service garage. The SVES consisted of the following:

- five soil vapor extraction wells installed inside the service garage building
- four soil vapor extraction wells installed outside the service garage building
- the extraction wells were installed to approximately 10 feet below grade
- the extraction wells were manifolded into two extraction loops (trenching through asphalt and concrete.
- each extraction loop was connected to a regenerative blower located inside of a treatment shed.

The SVE system operated for approximately three years and successfully remediated the contaminated soil and eliminated the hazardous vapors below the service garage.

ARTICLE 3(b)

Certificate of Insurance

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Construction Services
50 Wolf Road, Albany, NY 12233-7010

NYSDEC-DER Site No. 4-20-007

Certificate of Insurance
_X_ New ____ Renewal

SECTION 1

Name and Address of Insured Contractor
(for Coverages 1,2,3,4,6,7,8,9,10)

~~Tyree Organization, Ltd.~~
~~4 Northway Lane~~
~~Latham, NY 12110~~

Name of Insured or Additional Insured
(for Coverage 5,6,7 & 10)
State of New York & NYS Department of Environmental Conservation

Location and Description of Work Becker Electronics Site Number: 4-20-007
East Durham, Greene County, NY
Site Remediation Project

SECTION 2

This is to certify that policies of insurance listed below have been issued to the contractor, named above, and are in force at this time.

Insurance	Policy #	Name of Company Affording Coverage	Expir. Date	Limits of Liability (in thousands) Each Occurrence	Aggregate
1. Contractor's Liability	GL4178227	Commerce & Industry	3/31/01	1,000,000	2,000,000
2. Contractor's Protective Liability	GL4178227	Commerce & Industry	3/31/01	1,000,000	2,000,000
3. Complete Operations/Products	GL4178227	Commerce & Industry	3/31/01	1,000,000	1,000,000
4. Contractual Liability	GL4178227	Commerce & Industry	3/31/01	1,000,000	2,000,000
5. Owner's Protective Liability	GL	Commerce & Industry	3/31/01	1,000,000	2,000,000
6. Automobile Liability	CA7566918	Commerce & Industry	3/31/01	1,000,000 CSL	
7. Pollution Liability	7619851	AIU Insurance Co.	3/31/01	$5 million per claim if possible	10,000,000
8. Worker's Comp. Disability Benefits	WC7083794	National Union Fire	3/31/01	Limits as required by Law Limits as required by Law	1,000,000 1,000,000 1,000,000
9. Excess Umbrella	BE6061594	National Union Fire	3/31/01	15,000,000	15,000,000
10. Other Builders Risk	IMB4021989	National Union Fire	3/31/01	2,500,000 any one project	

Such insurance as is herein certified: 1) applies to all operations of said insured in connection with the work required by the provisions of the documents forming this contract, 2) applies whether or not the contract documents between the insured contractor and the State of New York Department of Environmental Conservation have been executed, and 3) is written in accordance with the company's regular policies and endorsements, subject to the company's applicable manuals or rules and rates in effect as modified by this certificate and the insurance article of the contract.

No policy referred to herein shall be changed, cancelled or coverage terminated for any reason including expiration of the policy or non-payment of premiums until thirty (30) days written notice has been received by the Division of Environmental Remediation, Room 267, NYS Dept. of Environmental Conservation, 50 Wolf Road, Albany, NY 12233-7010. Such notice shall be mailed via certified or registered mail.

4/28/00
Date Issued

By Harold Ennis
(Signature of Authorized Representative)

Aon Risk Services Inc.
Print Insurance Agency Name

Policy coverages must agree with coverages stated on the Certificate. False statements of coverage are punishable under Section 117 of the New York State Insurance Law.

CCA-1 (4/91)

FED. ID. NO.: 13-3516545

NEW YORK STATE
UNIFORM CONTRACTING QUESTIONNAIRE

INSTRUCTIONS

Submit this form as required by the contracting agency after being announced the low bidder for any competitively bid contract of $10,000 or more, or when proposed for subcontract work valued at $10,000 or more. If you submitted one within 12 months of the bid date with any contracting agency, as long as the information remains unchanged and accurate, you may submit a complete certified copy of that form, together with an Affidavit of No Change, to the agency with which you are bidding. A contracting agency may require additional information deemed necessary for its review. Whenever more space is needed to answer any question, or you wish to give further explanation complete by attaching extra pages. All questions must be answered.

NOTE: Please indicate whether you believe that any of the information supplied herein is confidential and should be exempt from disclosure under the Freedom of Information Law: ____ yes, X no. If you checked "yes" you must identify the information you feel is confidential by placing an asterisk in front of the appropriate question number(s) and you are requested to attach an additional sheet(s) upon which the basis for such claim(s) is explained.

GENERAL INFORMATION

1. NAME OF FIRM Tyree Organization, Ltd.
   DBA NAME, IF ANY
   MAILING ADDRESS 4 Northway Lane
   ACTUAL LOCATION same
   FAX NO. (518) 786-7351
   CITY Latham, COUNTY Albany STATE NY ZIP 12110
   PHONE NO. (518)786-3200
2. TYPE OF FIRM (Check (X) Only One) X CORPORATION ____ PARTNERSHIP ____ PROPRIETORSHIP ____ JOINT VENTURE
3. HOW MANY YEARS HAS THE FIRM BEEN IN BUSINESS? 69 yrs. UNDER THE SAME NAME? 1930 under affiliates
4. WHAT IS THE FIRM'S BONDING RANGE? $10 million SINGLE PROJECT $50 million AGGREGATE
5. ARE YOU CERTIFIED AS A DBE ____ MBE ____ IF SO, WITH WHOM ____

OWNERSHIP, MANAGEMENT, AFFILIATION

6. Identify each person who is, or has been within the past five years, an owner of 5.0% or more of the firm's shares, a direction an officer, a partner or the proprietor. Joint ventures: provide information for all firms involved. Fill in name, % owned, office held; indicate by Y or N whether director, officer or partner.

FIRST NAME	MI	LAST NAME	DATE OF BIRTH	% OWNED	DIRECTOR (Y or N)	OFFICER (Y or N)	TITLE	PARTNER (Y or N)
William	F	Tyree	32730	331/3	Y	Y	President & Director	Y
William	M	Tyree	11152	331/3	Y	Y	VP, Treasurer, Director	Y
Stephen	J	Tyree	11296	331/3	Y	Y	Director, Secretary	Y

FED. ID. NO.: 13-3516545

Does the firm own, or has the firm within the past five years owned, 5.0% or more of any other firm? ____ Yes, list below X No

FEDERAL ID NO.	% OWNED	COMPANY NAME	ADDRESS

Identify any affiliate not listed in your answered to questions 6 and 7. For purposes of this question your firm and another are affiliates when, either directly or indirectly, one controls or has the power to control the other, or a third party or parties controls or has the power to control both.

FEDERAL ID NO.	COMPANY NAME	ADDRESS
11-1881588	Larry E. Tyree Co., Inc.	209 Route 109 Farmingdale, NY 11735
11-2926219	Tyree Brothers Environmental Services, Inc.	209-Route 109,Farmingdale, NY 11735

Identify any and all shareholders, directors, officers, partners, or proprietors in common between your firm and any firm listed in response to questions 6, 7 or 8:

FEDERAL ID NO.	FIRST NAME, MI & LAST NAME	OTHER FIRM
13-3516545	William, F. Tyree President & Director	Tyree Organization, Ltd.
13-3516545	William M. Tyree VP, Treasurer, Director	Tyree Organization, Ltd.
13-3516545	Stephen J. Tyree Director, Secretary	Tyree Organization, Ltd.

CCA-1 (4/91)

FED. ID. NO.: 13-3516[illegible]

I. List the ten most recent contracts the firm has completed. If less than ten, include most recent subcontracts on projects up to that number:

	AGENCY/OWNER, CONTACT PERSON & TELEPHONE NO.	CONTRACT NO.	PRIME OR SUB	DESIGN ARCHITECT AND/OR DESIGN ENGINEER	AWARD DATE	AMOUNT	DATE COMPLETED
1	Metro North 212-499-4415		Prime	Mr. Mikesh Mechta		$620,000	6/30/97
2	NYS-DEC Robeson Site 518-457-9285		Prime	Mr. David Chrisano		$501,000	8/1/98
3	Getty Realty Corp. 202-755-8578		Prime	Mr. James Stewart		$25,000,000	6/99
4	NYS OGS Dist. 113 404-943-0343		Prime	Mr. William Stampel		$15,746,204	3/25/98
5	US Postal Service 860-285-7191		Prime	Ms. Val Wilson		$506,105	4/27/99
6	Shelton Econ. Dep.Corp 203-424-2521		Prime	Mr. James Ryan		$650,000	2/23/99
7	Price Chopper 518-355-9000		Prime	Mr. Eldon Smith		$124,065	12/15/98

(#8, #9, #10) -See Attached Sheet

II. List all current uncompleted construction contracts:

AGENCY/OWNER, CONTACT PERSON & TELEPHONE NO.	CONTRACT NO.	PRIME OR SUB	DESIGN ARCHITECT AND/OR DESIGN ENGINEER	TOTAL $ AMOUNT OF FIRM'S CONTRACT (OR SUBCONTRACT)	$ AMOUNT SUBJECT TO OTHERS	UNCOMPLETED $ AMOUNT OF FIRM'S CONTRACT (OR SUBCONTRACT)
Town of New Milford 860-355-1049		Prime	Mr.Kenneth Bailey	$135,000	65,000	20,000
NYS OGS Region 1 914-983-0343		Prime	Dimetrius Saphrides	6,000,000		
SpainMedosalloy Oil 914-625-8516		Prime	Mr. Tom Dickson	500,000	100,000	50,000
Getty Realty 516-238-1421		Prime	Mr. Scott Healy	5,000,000	1,500,000	1,000,000

12. Net Total Billings for Firm's Previous 3 Fiscal Years:

19	99	$ 134,752,535.00
19	98	$ 119,532,762.00
19	97	$ 93,118,881.00

Average Backlog for Firm's Previous 3 Fiscal Years:
(Estimated total value of uncompleted work on outstanding contracts)

19	99	$ 73,000,000
19	98	$ 60,000,000
19	97	$ 45,000,000

Agency Owner, Contact Person & Telephone #	Contract #	Prime or Sub	Design Architect and/or Design Engineer	Award Date	Amount	Date Completed
8. Rye City School District 414-567-6100		Sub	Mr. Larry Hines		$349,000	9/1/97
9. Mobil Oil Corp. 516-232-4900		Prime	Mr. Rich Ciccatelli		$35,000,000	3/99
10. Oil City 203-637-5602		Prime	Mr. Jay Ford		$70,000	8/99

FED. ID. NO.: 13-3516545

3. Has the firm, or any firm listed in response to questions 6, 7 or 8, defaulted or been terminated on, or had its surety called upon to complete, any contract awarded within the past five years? If so, give date(s), agency(ies)/owner(s), project(s), contract numbers, and describe including the result: NONE

4. For all contracts within the past give years: (a) list and describe all liens or claims over $25,000 filed against the firm and remaining undischarged or unsatisfied for more than 90 days; and (b) list and describe all liquidated damages assessed.

NANCIAL INFORMATION

5. Complete the attached financial statement or attach a copy of the firm's most recent annual financial statement.

TIER INFORMATION

6. Within the past five years has the firm, any affiliate, any predecessor company or entity, or any person identified in question number 6 above been the subject of any of the following: (respond to each question and describe in detail the circumstances of each affirmative answer: attach additional pages if necessary)

a)	a judgment of conviction for any business-related conduct constituting a crime under state or federal law?	no	x	yes	
b)	a criminal investigation or indictment for any business-related conduct constituting a crime under state or federal law?	no	x	yes	
c)	a grant of immunity for any business-related conduct constituting a crime under state or federal law?	no	x	yes	
d)	a federal or state suspension or debarment?	no	x	yes	
e)	a rejection of any bid for lack of qualifications, responsibility or because of the submission of an informal, non-responsive or incomplete bid?	no	x	yes	
f)	a rejection of any proposed subcontract for lack of qualifications, responsibility or because of the submission of an information, non-responsive or incomplete bid?	no	x	yes	
g)	a denial or revocation of prequalification?	no	x	yes	
h)	a voluntary exclusion from bidding/contracting agreement?	no	x	yes	
i)	any administrative proceeding or civil action seeking specific performance or restitution in connection with any public works contract except any disputed work proceeding?	no	x	yes	
j)	an OSHA Citation and Notification of Penalty containing a violation classified as serious?	no	x	yes	
k)	an OSHA Citation and Notification of Penalty containing a violation classified as willful?	no		yes	x see attached
l)	a prevailing wage or supplement payment violation?	no	x	yes	
m)	a State Labor Law violation deemed willful?	no		yes	X pending
n)	any other federal or state citations, Notices, violation orders, pending administrative hearings or proceedings or determinations of a violation of any labor law or regulation?	no	x	yes	
o)	any criminal investigation, felony indictment or conviction concerning formation of, or any business association with, an allegedly false or fraudulent women's, minority or disadvantaged business enterprise?	no	x	yes	
p)	any denial, decertification, revocation or forfeiture of Women's Business Enterprise, Minority Business Enterprise or Disadvantaged Business Enterprise status?	no	x		
q)	rejection of a low bid on a State contract for failure to meet statutory affirmative action or M/WBE requirements?	no	x	yes	
r)	a consent order with the NYS Department of Environmental Conservation, or a federal, state or local government enforcement determination involving a violation of federal or state environmental laws?	no	x	yes	
s)	any bankruptcy proceeding?	no		yes	x
		no	x	yes	

FED. ID. NO.: 13-3516545

t) any suspension or revocation of any business or professional license? no ___x___ yes _____

u) any citations, Notices, violation orders, pending administrative hearings or proceedings or determinations for violations of: no _____ yes ___x___

- ① federal, state or local health laws, rules or regulations
- ② unemployment insurance or workers compensation coverage or claim requirements
- ③ ERISA (Employee Retirement Income Security Act)
- ④ federal, state or local human rights laws
- ⑤ federal or state security laws?

_____ None of the above

CERTIFICATION

The undersigned recognizes that this questionnaire is submitted for the express purpose of inducing the State of New York or its agencies and instrumentalities to award a contract; or approve a subcontract; acknowledges that the State or its agencies and instrumentalities may in its discretion, by means which it may choose, determine the truth and accuracy of all statements made herein; acknowledges that intentional submission of false or misleading information may constitute a felony under Penal Law §210.40 or a misdemeanor under Penal Law §210.35 or §210.45, and may also be punishable by a fine of up to $10,000 or imprisonment of up to five years under 18 U.S.C. §1001; and that the information submitted in this questionnaire and any attached pages is true, accurate and complete.

Sworn to before me this

15th day of May, 2000.

Beverly A Durante
Notary Public

BEVERLY A. DURANTE
Notary Public, State of New York
Qualified in Saratoga County
Reg. No. 01DU6020732
Commission Expires March 8, 20 01

Signature of Officer

V.P.
Title

Tyree Organization LTD
OSHA Citation Summary

Date	Inspection No.	Division	Site Location	Citations	Type	Fine	Outcome	Action Taken
8/17/99	Not Assigned at this time	Tyree Organization LTD Brookfield, CT	Thomaston H.S. Waterbury, CT	NO VIOLATIONS/CITATIONS				
8/9/99	Not Assigned at this time	Tyree Organization, LTD Farmingdale, NY	Stonybrook Hospital StonyBrook, NY	NO VIOLATIONS/CITATIONS				
7/20/99	Not Assigned at this time	Tyree Organization, LTD Farmingdale, NY	Bethpage Post Office, Bethpage, NY	NO VIOLATIONS/CITATIONS				
7/1/99	302551007	Tyree Organization, LTD, Latham, NY	West Ave Saratoga, NY	Citation 1, Item 1: 29 CFR 126.651(k)(1) - The competent person did not take soil samples of the material removed from the excavation prior to entrance of the employee	Other	$0.00	$0.00	Geo Technical Engineer (F.A. Deniz Engineering) had Taken soil samples on July 1, 1999 and had classified the site soil.
4/12/99	302481367	Tyree Organization, LTD Sterling, VA	Marriottsville Rd Marriottsville, MD	Citation 1, Item1: MOSH Section 6-405(b)(3) - Chemical Information list was not revised every two years	Other	$0.00	$0.00	Chemical Information list revised
				Citation 1, Item 2 - MOSH Section 6-406(a)(1): A copy of the chemical information list was not submitted to the Maryland Department of Environment.	Other	$0.00	$0.00	Chemical Information List submitted to the Maryland Department of Environment
9/17/98	301124604	Tyree Organization, LTD Hayward, CA		NO VIOLATIONS/CITATIONS				
4/3/98	300616992	Larry E. Tyree Farmingdale, NY	Douglas Sweet & 4th Brooklyn, NY	Citation 1, Item 1: 29 CFR 1926.652.(a)(1) - Subcontractor employee in excavation was not protected from cavein by an adequate protective system designed in accordance with 29 CFR 1926.652D	Serious	$3,500.00	$1,700.00	Subcontractor has been suspended from doing work for Tyree, A Subcontractor Health and Safety Training Program is being developed and will be implemented by September 1998.
3/25/98	302019294	Tyree Organization, LTD Sterling, VA	10003 Field Road Gaithersburg, MD	Citation 1 Item 1: 29 CFR 1926.501(b)(10) - Subcontractor's employees were working on flat edge of 14' high roof, without fall protection.	Serious	$1,875.00	$1,300.00	Subcontractor has been suspended from doing work for Tyree, A Subcontractor Health and Safety Training Program is being developed and will be implemented by September 1998.
3/20/98	301101341	Tyree Organization LTD Sterling,VA	1442 U Street Washington DC	Citation 1, Item 1a: 29 CFR 1926.501 (b)(1) - Subcontractor employees were observed working from industrial truck lift without using any type of fall protection and were exposed a 18 foot fall hazard.	Serious	$4,500.00	$2,250.00	Sub-contractor did not work for Tyree, worked directly for client, Authorized site supervisor to stop and/or remove client sub-contractors from site, if in violation of any OSHA standard or the Tyree H&S Program
				Citation 1, Item 1b: 29 CFR 1926.501 (b)(10) - Subcontractor employees was observed working on a canopy roof without using any type of fall protection and were exposed to a 18 foot fall hazard	Serious	$0.00	$0.00	Sub-contractor did not work for Tyree, worked directly for client, Authorized site supervisor to stop and/or remove client sub-contractors from site, if in violation of any OSHA standard or the Tyree H&S Program
3/27/97	300595026	Tyree Organization, LTD Farmingdale, NY	Casey Stengel Bus Depot, Flushing, NY	NO VIOLATIONS/CITATIONS				
2/28/97	300542875	Tyree Organization LTD Westborough, MA	245 Haverhill Street Methuen, MA	Citation 1, Item 1: 29 CFR 1926.651,O (2) - The employer did not provide a ladder for safe means of egress located in an excavation that was seven feet deep	Serious	$5,000.00	$5,000.00	Ladders will be place in all excavation at a minimum distance of 25 feet. Employees were informed via Daily Tool Box Meeting.
				Citation 2, Item 1: 29 CFR 1926.652 (a)(1) - The employer did not provide each employee inside an excavation seven feet deep against sheight side walls, protection from cave-in.	Repeated	$25,000.00	Contested - Amended to Section 17 Violation reduced to $10,000.00	All Tyree Superintendents and Crew Chief have attended the OSHA Management/Supervisor Training Course (5 Hour) between March and April 1997.
10/26/96	123317918	Tyree Organization LTD Latham, NY	Union & West Street Rockville CT	CItation 1, Item 1: 29 CFR 1926.652 (a)(1) - Two employees working in an excavation over five feet deep were not provided with cave-in protection. A protective box, shoring, sloping or benching was not provided.	Serious	$1,925.00		The Tyree Health and Safety Program was revised, every employee was provided with an copy. The revised program was reviewed during the OSHA HAZWOPER annual refresher (Jan Mar 1997). In project where excavations can't be properly slope, the excavation will be protected with a shoring system.
10/21/96	125447898	Tyree Organization LTD Sterling,VA	15 Douglas Ct Sterling, VA	NO VIOLATIONS/CITATIONS				
8/6/96	75190482	Tyree Organization LTD Westborough, MA	Mats Street Holden, MA	NO VIOLATIONS/CITATIONS				
8/14/96	300522927	Tyree Organization LTD Latham, NY	Rout 30 Hess Station Amsterdam, NY	Citation 1, Item 1: 29 CFR 1926.300 (b)(2) - Employees exposed to unguarded fan blade and belt and pulley on Isuzu hydraulic pump.	Serious	$500.00	Reduced to $400.00	A guard was installed, Project Manager/Supervisors will be responsible for inspecting all equipment that is sent to or arrive at the site. The Division mechanic is responsible for Preventative maintenance and identifing any hazards associated with equipment.
7/25/96	112888948	Tyree Organization LTD Westborough, MA	860 Southbridge St Worcester, MA	NO VIOLATIONS/CITATIONS				

Tyree Organization LTD
OSHA Citation Summary

8/5/98	127382374	Tyree Organization LTD Sterling,VA	5425 Fats Road, Baltimore Maryland	Citation 1, Item 1A: 29 CFR 1926.501 (b)(1)- Employee of subcontractor working from roof installing metal studs were not protected from a fall of approximately 18' on a concrete surface. Citation 1, Item 1B: 29 CFR 1926.501 (b)(1) - Employee of subcontractor accessing a canopy were unprotected from an edge approximately 16' long, 14' above a concrete surface. Citation 2, Item 1A: 29 CFR 1926.1053 (b)(1) - An access ladder, was approximately 3.5' below the roof, approximately 16' above a concrete surface. Citation 2, Item 1B: 29 CFR 1926.1053 (b)(8) - An extension ladder, approximately 14' high, was placed in front of 1 of 2 front door to a structure under construction. Citation 3, Item 1: 29 CFR 1926.20 (b)(2) - Safety and Health inspection were not conducted by an individual who is aware of the safety and health standards and/or individual who has sufficient authority to control or eliminate the hazard.	Serious Serious Serious Serious Other	$2,550.00 $1,052.00 $0.00 $0.00	Reduced to $1,020.00 Deleted Corrected during Inspection- Reduced to $424.00 Corrected during Inspection	Tyree has develop a sub-contractor Health and Safety Requirements which are included as part of the Sub-Contractor Agreement. As part of our routine safety inspection all sub-contractors are also inspected. Sub-contractor did not work for Tyree, worked directly for client. Authorized site supervisor to stop and/or remove client sub-contractors from site, if in violation of any OSHA standard or the Tyree H&S Program The ladder was extended 36 inch above the roof and secured. The ladder was moved away from the doors Ron Dye was designated as the Health and Safety Representative for the Virginia Division. His responsibilities will include, implementing the Tyree H&S program and performing site safety inspections.
5/8/96	126831490	Tyree Organization LTD Sterling, VA	17805 Jefferson Davis Woodbridge, VA	NO VIOLATIONS/CITATIONS				
4/8/96	114124944	Tyree Brothers Environmental Services	NYPD Precinct 60 New York, NY	NO VIOLATIONS/CITATIONS				
10/11/95	109038111	Larry E. Tyree Farmingdale, NY	Mamaroneck Ave White Plains	NO VIOLATIONS/CITATIONS				
8/1/95	123184055	Tyree Organization LTD Brookfield, CT	2775 Nicholas Ave Trumbull, CT	Citation 1, Item 1: 29 CFR 1910.24 - The company did not have an effective fire protection and prevention program in that no inspections were conducted of the work area to determine if flammable conditions existed in the area, prior to performing cutting operations with oxy-acetylene torch. Citation 1, Item 2: 29 CFR 1910.3501 - The company's Health and Safety program was inadequate in that the company did not have a "Hot Work" permitting system as designated by the NFPA Standard 51B. The company exposed workers to potentially explosive atmospheres without conducting an inspection of the area or issuing a written permit prior to performing the work. Citation 1, Item 3: 29 CFR 1926.352 (c) - Workers were exposed to fire and explosive hazards when a worker was observed conducting a cutting operation on a steel I-beam, using oxy-acetylene torch, while motorist were filling their motor vehicles with gasoline.	Serious Serious Serious	$4,500.00 $4,500.00 $4,500.00	Item 1 and 2 grouped as one and reduced to $4,000.00 Item 1 and 2 grouped as one and reduced to $4,000.00 Contested - Recharacterized as a Section 17 Violation, reduced to $2,000.00	Tyree revised the Fire Prevention and Protection Program, which includes a "Hot Work Permit" system and instruments for air monitoring (LEL and O2). Tyree revised the Fire Prevention and Protection Program, which includes a "Hot Work Permit" system and instruments for air monitoring (LEL and O2). Tyree revised the Fire Prevention and Protection Program, which includes a "Hot Work Permit" system and instruments for air monitoring (LEL and O2).
7/7/95	122113210	Tyree Organization LTD Westborough, MA	Main Street Tewksbury, MA	Citation 1, Item 1: 29 CFR 1926.451 (e)(9) - The employer did not provide a ladder or stairway affixed or built into a manually propelled mobile scaffold system for proper access and exit. Citation 1, Item 2: 29 CFR 1926.451 (g)(1)(i) - The employer did not ensure that a standard guard rail was installed on a mobile scaffold system that was 14 feet from ground level. Citation 1, Item 3: 29 CFR 1926.501 (b)(1) - The employer did not ensure that each employee was protected from off the roof with a 6 pitch and eave to groundheight 14'6. Citation 1, Item 4: 29 CFR 1926.1053 (b)(8) - The employer did not ensure that a six foot ladder was not used on an unstable surface such as a mobil scaffold.	Serious Serious Serious Serious	$4,000.00 $4,000.00 $4,000.00 $4,000.00	Reduced to $1,000.00 Deleted Deleted	Tyree Hires a full time Health and Safety Manager, Aldo M. Gonzalez. He is responsible for facets of the Tyree Health and Safety. The Fall Protection Program was revised to include scaffolding and ladders.
4/18/95	107954136	Tyree Guam LTD	Mobil Service Station Sinajana, Guam	Citation 1, Item 1: 29 CFR 1926.652 (a)(1) - Employees were in excavation seven feet 7 inches deep in previously disturbed soil with no shoring or other protective measures taken. Citation 1, Item 2: 29 CFR 1926.651 (j)(2) - Employee wre working in trench/excavations with pipes, loose soils at the edge of the trench/excavations.	Serious Serious	$5,000.00 $5,000.00	Reduced to $2,500.00 Reduced to $2,500.00	

4/26/95	122247802	Tyree Organization LTD Brookfield, CT	Saratoga Spgs, NY	NO VIOLATIONS/CITATIONS				
4/21/95	109182640	Tyree Organization LTD Westborough, MA	Falmouth Road Mashpee, MA	Citation 1, Item 1a: 29 CFR 1926.403 (h) -Power strips connected to extension cord without a ground were not listed for outdoor use.	Serious	$1,875.00	Reduced to $ 937.50	All unauthorized power strips were removed from use. Crew chiefs were issued proper power strips for using outdoors (grounded) w/GFIC.
				Citation 1, Item 1b: 29 CFR 1926.404 (f)(4) -The path to ground in the extension cord to the power strip was not continuous.	Serious	$0.00		Power strips were replaced with grounded power strips with GFIC
				Citation 1, Item 1c: 29 CFR 1926.405 (g)(2)(iv) - A flexible cord to the power strip was not properly clamped to strain relief section of the plug.	Serious	$0.00		
				Citation 1, Item 1d: 29 CFR 1926.416 (e)(1) - A frayed electrical cord to the power strip was not removed from use.	Serious	$0.00		Frayed or damaged cord have been removed from the work site, the warehouse will replace all frayed or damage cords
4/20/95	109187908	Tyree Organization LTD	RT 28 Hyannis, MA	Citation 1, Item 1: 29 CFR 1926.251 (a)(1) - The two hooks on a wire rope sling were not provided with safety latches and thimble was bent and distorted in the eye of the sling.	Serious	$1,125.00	$1,125.00	Damaged wire ropes were removed from service, safety latches were installed and repaired the wire rope was re-certified by the manufacturer.
				Citation 1, Item 2a: 29 CFR 1926.1053 (b)(16) - A fiberglass extension ladder had a damaged side rail three feet from the foot of the ladder.	Serious	$1,125.00	$1,125.00	Extension ladder was destroyed and replaced.
				Citation 1, Item 2b: 29 CFR 1926.1053 (b)(1) - A fiberglass extension ladder used for access and egress in an excavation did not extend at least 36 inches above grade.	Serious	$0.00	Corrected during inspection.	
				Citation 1, Item 2c: 29 CFR 1926.1053 (b)(8) - A fiberglass extension ladder used for access and egress to a 12 foot deep excavation was not secured from displacement.	Serious	$0.00	Corrected during inspection	
3/10/95	106189244	Tyree Guam LTD	Mobil Service Station Tamuning, GU	Citation 1, Item 1: 29 CFR 1926.28(a): The superintendent was on top of metal beams without using personal protective equipment (safety belts at a height 15 feet.	Serious	$3,750.00	Deleted	

M/WBE-EEO Utilization Plan

New York State Department of Environmental Conservation

(To be completed by each contractor/consultant and submitted to DEC for review)

Consultant/Contractor Name: Tyree Organization LTD		**Date:** 5-15-00
Address: 4 Northway Lane	**City:** Latham	**State:** NY **Zip:** 12110
Name and Title of Authorized Representative: Philip N Holloway - Project Manager	**Signature of Authorized Representative:**	
Name and Title of M/WBE Representative: Philip Holloway - PM	**Signature of M/WBE Representative:**	
Contract Description: Becker Electronics Site Remediation East Durham, NY Site 4-20-007		**Contract Number:** Not yet available

Projected M/WBE and EEO Summary

	Percent	*$ Amount*		*Percent*	*Number of Employees*	*Work Hours*
1. Total Dollar value of the Prime Contract/product provided	100 %	449,000	5. Total No. Employees and work hours	100%	110	1500
2. MBE goal applied to the contract	15 %	67,350	6. Total goal for minority employees	10 %	11	150
3. WBE goal applied to the contract	5 %	22,450	7. Total goal for female employees	10 %	11	150
4. M/WBE combined totals	20 %	89,800	8. EEO combined totals	20 %	22	300

SECTION I - MBE INFORMATION **In order to achieve MBE goals, minority firms are expected to participate in the following manner:**

MBE Firm	*Description of Work to be Done by MBE*	*Projected Contact Amount & Award Date*	*Scheduled Contract Start Date*	*Contract Payment Schedule*	*Contract Completion Date*
Name Mitkem Corporation *Address* 175 Metro Center Boulevard *City* Warwick, Rhode Island *ST/Zip* 02886-1755 *Phone* 401-732-3400	Laboratory Services	$ 12,190 **Date:** 6-15-00	7-15-00	Monthly	12-29-00
Name Gomez Electrical Contr *Address* 251 N. Pearl St *City* Albany NY *ST/Zip* *Phone* 518 427 8365	Electrical work	(possible 40,000) Pending Pending	Pending	—	—
Name *Address* *City* *ST/Zip* *Phone*					
Name *Address* *City* *ST/Zip* *Phone*		$ **Date:**			
Name *Address* *City* *ST/Zip* *Phone*		$ **Date:**			

SECTION II - WBE INFORMATION In order to achieve WBE goals, minority firms are expected to participate in the following manner:

WBE Firm	*Description of Work to be Done by MBE*	*Projected Contact Amount & Award Date*	*Scheduled Contract Start Date*	*Contract Payment Schedule*	*Contract Completion Date*
Name The Liner Company *Address* 7 meadows Run drive *City* Colts Neck *ST/Zip* New Jersey 07722 *Phone* 732-761-0700	Supplier of PVC material	$ 3,000 **Date:** 6-15-00	7-15-00	Monthly	12-29-00
Name National Environmental Systems *Address* 36 Maple Ave *City* Seekonk MA *ST/Zip* *Phone* 508 761 6611	Supplier of Remediation System and Instrumentation	$ 40,946 **Date:** 6-15-00	7-15-00	Monthly	12-29-00
Name *Address* *City* *ST/Zip* *Phone*		$ **Date:**			

SECTION III - EEO INFORMATION **In order to achieve the EEO goals minorities and females are expected to be employed in the following job categories for the specified amount of work hours:**

Job Categories	*Total Work Hours of Contract*	*All Employees*		*Minority Employees*			
		Males	*Females*	*Black*	*Asian*	*Native American*	*Hispanic*
Officials/Managers							
Professional	100	50	25				25
Technicians							
Sales Workers							
Office/Clerical	200		200				
Craftsmen	200	200					
Laborers	1000	850		150			
Service/Workers							
TOTALS	1500	1100	225	150			25

THE TYREE ORGANIZATION, LTD.

9 Otis Street, Westborough, Massachusetts
Fax: 508-871-8301 • Phone: 508-871-8300

BWP HW TDS 01

ATTACHMENT TDS 01 - 6

In response to request for information on past/pending legal or administrative actions, we attach the following:

A. Stipulation of Settlement and Order on Consent between the New York State Dept. of Environmental Conservation and Tyree Bros. Environmental Services, Inc. and Larry E. Tyree Company, Inc. dated August 6, 1996.

B. Consent Order between the Massachusetts Dept of Environmental Protection and the Tyree Organization, Ltd. dated August 17, 1993.

C. Table of Violations.

D. Table of U.S. Dept of Transportation Violations as of April, 1998.

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

In the Matter of the Violations of Articles 17, 19, 27 and 71 of the New York State Environmental Conservation Law, ("ECL"), Article 12 of the Navigation Law ("NL") and Title 6 Parts 201, 360, 364, 370, 371, 372, 373 and 613 of the Official Compilation of Codes, Rules & Regulations of the State of New York ("6 NYCRR"), by	STIPULATION OF SETTLEMENT AND ORDER ON CONSENT
TYREE BROS. ENVIRONMENTAL SERVICES, INC. a/k/a TYREE BROTHERS ENVIRONMENTAL SERVICES, INC. and LARRY E. TYREE COMPANY, INC.	File No.'s 1-5564, 1-5565, 1-5806, and WP.108-92
Respondents	

1. The New York State Department of Environmental Conservation (hereinafter "the Department"), has administrative jurisdiction over the prevention, control and cleanup of petroleum discharges onto the lands or waters of New York State pursuant to Article 12 of the Navigation Law and Articles 17 and 71 of the Environmental Conservation Law (hereinafter "ECL"). The Department is also charged with the implementation of the New York State solid waste management plan consistent with the state resource recovery policies pursuant to Article 27 of the ECL and the rules and regulations promulgated pursuant thereto. Additionally, the Department has administrative jurisdiction over air pollution control pursuant to Article 19 of the ECL and the rules and regulations promulgated pursuant thereto.

2. Tyree Environmental Technologies is an unincorporated entity which provides environmental services to the private and public sector through these Respondent corporations; TYREE BROS. ENVIRONMENTAL SERVICES, INC. also known as and doing business as TYREE BROTHERS ENVIRONMENTAL SERVICES, INC. and LARRY E. TYREE CO., INC., among others. These corporations are domestic corporations organized and existing under and by virtue of the laws of the State of New York and are in good standing with the Secretary of State of the State of New York. Respondents maintain their corporate office at 208 Route 109, Farmingdale, New York 11735.

3. The Department has documented violations against Respondents and commenced an enforcement action with regard to these violations of the Navigation Law, the ECL and the rules and regulations promulgated thereunder by complaint dated April 22, 1996. (The "Complaint).

4. Respondents filed a written answer to the complaint dated May 10, 1996 denying any violations of law and asserting affirmative defenses.

5. The Department and Respondents have settled this enforcement proceeding by entering into this stipulation and order on consent. (The "Order").

6. Respondents operate a facility located at 208 Route 109 in Farmingdale, New York, Suffolk County (the "facility") which includes a New York State certified testing laboratory and corporations that develop site assessment and remediation plans, usually for the petroleum industry, perform storage tank testing, emergency spill services, remediation action design, hazardous waste disposal incidental to transport, treatment of petroleum contaminated water and general contracting. Respondents are currently listed as contractors for the State of New York and in some instances bring materials back from spill sites under authorization from the Regional Spill Engineer. Respondent Tyree Bros. Environmental Services, Inc. was issued a waste transporter permit, pursuant to 6 NYCRR Part 364 and Part 381 effective November 2, 1995 and expiring July 31, 1996.

7. Respondents have affirmatively waived their rights to a public hearing in this matter, in the manner provided by law, and having consented to the issuing and entering of this Order pursuant to the provisions of the Environmental Conservation Law and agree to be bound by the terms and conditions contained herein,

NOW, therefore, having considered this matter and being duly advised, it is ORDERED that:

I. Respondents shall pay to the Department as a civil penalty the sum of $90,000.00. $30,000.00 immediately upon Respondents execution of this Order; $30,000.00 of which shall be paid the 30th day thereafter and the final installment of $30,000.00 shall be paid 60 days thereafter.

II. Respondents shall fully comply with all of the terms, provisions and conditions set forth within this Order including Schedule A attached hereto and made a part of this Order.

III. For the purpose of insuring compliance with this Order, duly authorized representatives of this Department shall be permitted access to 208 Route 109 Farmingdale, New York during reasonable hours, in order to inspect and/or require such tests as may be deemed necessary.

IV. The terms of this Order shall not be construed to prohibit the Commissioner or his duly authorized representative from exercising any summary abatement powers, either at common law or as granted pursuant to statute or regulation.

V. Respondents shall not suffer any penalty or be subject to any proceedings or actions for any remedy or relief, if Respondents cannot comply with any requirement of any term or condition of this order because of an act of God, war, riot, or other catastrophe as to which negligence

or willful misconduct on the part of Respondents was not a proximate cause, provided, however, that Respondents shall immediately notify the Department in writing, when it obtains knowledge of any such condition and shall request an appropriate extension or modification of the provisions hereof. Respondents will adopt all reasonable measures to prevent or minimize any delay. Provided Respondents make application within 7 business days from the occurrence of any event from which relief is sought, time for compliance shall be extended as provided by the Department or after 7 business days from a decision from the Department denying an extension.

VI. The effective date of this Order shall be the date it is executed by the Department.

VII. Nothing contained herein shall prevent the Department from requiring Respondents to perform any actions deemed by the Department to be necessary to protect human health and the environment.

VIII. For the purposes of this Order, service of any notices or orders shall be deemed complete upon mailing by certified mail to the parties at the addresses set forth below:

Department: Commissioner of the New York State
Department of Environmental Conservation
c/o Lori J. Riley
Region One Regional Attorney
Building 40, SUNY
Stony Brook, NY 11790-2356

Respondent: Robert G. DelGadio, Esq.
EAB Plaza
West Tower - 12th Floor
Uniondale, NY 11556-0150

and

William M. Tyree
Larry E. Tyree Company, Inc.
208 Route 109
Farmingdale, NY 11735

IX. Respondents shall indemnify and hold the Department, the State of New York, and their representatives and employees harmless for all claims, suits, actions, damages and costs of every name and description arising out of or resulting from the fulfillment or attempted fulfillment of the provisions presented hereof by Respondents, their directors, officers, employees, servants, agents, successors or assigns.

X. The terms and conditions of this Order shall be binding upon Respondents, their successors and assigns.

XI. Nothing contained herein shall relieve Respondents from at all times complying with all applicable Federal, State and local laws, rules and regulations.

XII. If Respondents desire that any term of this Order be changed, Respondents shall make written timely application setting forth the reasonable grounds for the relief sought, to the Commissioner, care of Lori J. Riley, Regional Attorney for Region One at the address given in paragraph X above.

XIII. No terms, conditions, understandings or agreements purporting to modify the terms of this Order shall be binding unless approved in writing by the Department. No informal advice, guidance, suggestions or comments by the Department regarding reports, proposals, plans, specifications, schedules, or any other writing submitted by Respondents shall be construed as relieving Respondents of their obligation to obtain such formal approvals as may be required of this Order.

XIV. That any change in this Order shall not be made or become effective, except as specifically set forth by written Order of the Commissioner, such written Order being made either upon written application of Respondents, or upon the Commissioner's own findings.

Dated: Albany, New York
August 6, 1996

MICHAEL ZAGATA
Commissioner of the Department of
Environmental Conservation

By _____
RAY E. COWEN, P.E.
Regional Director
Region One

TO: Robert G. Del Gadio
EAB Plaza
West Tower -12th Floor
Uniondale, New York 11556-0150

CONSENT BY RESPONDENT

Respondent acknowledges the authority and jurisdiction of the Commissioner of the Department of Environmental Conservation of the State of New York to issue the foregoing Order, waives public hearing or other proceedings in the matter, accepts the terms and conditions set forth in the Order and consents to the issuance thereof.

LARRY E. TYREE COMPANY, INC.

By _____

STATE OF NEW YORK }

COUNTY OF SUFFOLK } ss:

On the 2 day of AUGUST, 1996, before me personally came JAMES TORRO to me known, who being duly sworn, deposed and said that he resides at COMMACK NY that he is the VICE PRESIDENT of Respondent Corporation and that he signed his name for and on behalf of said Corporation with full authority to do so.

_____
NOTARY PUBLIC

CONSENT BY RESPONDENT

Respondent acknowledges the authority and jurisdiction of the Commissioner of the Department of Environmental Conservation of the State of New York to issue the foregoing Order, waives public hearing or other proceedings in the matter, accepts the terms and conditions set forth in the Order and consents to the issuance thereof.

TYREE BROS. ENVIRONMENTAL SERVICES, INC.
a/k/a
TYREE BROTHERS ENVIRONMENTAL SERVICES, INC.

By _____ VP

STATE OF NEW YORK }
ss:
COUNTY OF Suffolk }

On the 2 day of August, 1996,
before me personally came _____ to me known, who being duly sworn,
deposed and said that he resides at _____ that he
is the Vice President of Respondent Corporation and that he signed his name for and on
behalf of said Corporation with full authority to do so.

_____
NOTARY PUBLIC

S C H E D U L E A

COMPLIANCE SCHEDULE
for
Consent Order File No.'s 1-5564, 1-5565, 1-5806 & WP108-92
Against

TYREE BROS. ENVIRONMENTAL SERVICES, INC. a/k/a TYREE BROTHERS ENVIRONMENTAL SERVICES, INC. and LARRY E. TYREE COMPANY, INC.

I. Immediately:

[A] An account to fund a full time Environmental Monitor shall be established with the Department as follows:

(a) The sum of $75,000 shall be submitted to the Department within 15 days of the Commissioner's Order. This sum is based on an estimate of annual Monitor program costs and is subject to quarterly revision. Subsequent quarterly payments shall be made for the duration of this Order to maintain an account balance sufficient to meet the next nine months' anticipated expenses. Quarterly payments shall be made for the duration of the Commissioner's Order in accordance with the following provisions:

(b) Costs to be covered by this fund include:
  (1) Direct personal service costs and fringe benefits of the Environmental Monitor and full-time Monitor supervisor(s), including the costs of replacement personnel for the person(s) regularly assigned to these positions.
  (2) Direct non-personnel service costs, including without being limited to purchase or lease of a vehicle if necessary and its full operating costs, and any appropriate chemical sampling and analysis.
  (3) Inflation increases and negotiated salary increases.
  (4) Indirect support or overhead costs at the NYSDEC Federally approved Indirect Cost Rate.

(c) Upon written request by the Respondents, the Department shall make available to Respondents any records (e.g., vouchers, time records) relating to such Monitor costs, consistent with applicable law.

(d) As noted, the Department may revise the required payment on a quarterly basis to include all costs of monitoring to the Department. The quarterly revision may take into account all factors such as inflation, salary increases, accrued interest to be applied to the balance, changes in operating hours and procedures and the need for additional on-site Monitors and supervision of such Monitors by full-time Monitor supervisors. Upon written request by the Respondents, the Department shall provide Respondents with a written explanation of the basis for any modification.

(e) Within 30 days of written notice by the Department that a payment is due, payment shall be forwarded to the Department. Payment should be sent to:

NYS Department of Environmental Conservation
50 Wolf Road - Room 593
Albany, NY 12233-1510
ATTENTION: Director of Environmental Monitors

Payments are to be in advance of the period in which they will be expended.

(f) Upon termination (expiration, surrender, transfer) of this Order and payment of any outstanding costs the unexpended balance, if any, including interest, will be returned to the Respondents.

(g) Failure to make the required payments shall be a violation of this Order. The Department reserves all rights to take appropriate action to enforce the above payment provisions.

(h) The Monitor shall, when present at Respondents' facility, abide by all of Respondents' health and safety and operational requirements and policies; provided however, that this subparagraph shall not be construed as limiting the Monitor's powers as otherwise provided for by law and shall not result in the Monitor being less protected than the Monitor would be if he or she were to abide by State and Federal health and safety requirements.

(i) The NYS DEC Monitor shall receive from Respondents all general safety training which is normally given to new site employees. This training will be a supplement to the mandatory safety training that Environmental Monitors receive from the Department.

(j) The Respondents shall furnish to the Environmental Monitor a current site policy and procedures manual for health and safety issues. Within ten (10) days of any revision to the health and safety plan, the Respondents shall notify the Department, in writing, of such modification.

(k) The Monitor is not a consultant or auditor for Respondents, but is an employee of the New York State Department of Environmental Conservation. The placement of the Monitor at Respondents' facility does not imply that no violations[1] will be found; that existing violations, not specifically resolved herein, will be overlooked or that violations will not be reported by the Monitor to the appropriate Department personnel for appropriate enforcement action.

(l) The Monitor will be assigned to Respondents' facility for a period of one year beginning with the first day the Monitor reports to Respondents' facility. The year does not begin upon execution of the Order on Consent or upon payment of the $75,000 sum.

(m) The Monitor may make reasonable recommendations[2] in writing to Respondents after working with the facility for four months or less. If Respondents feel that some or all of the recommendations are not "reasonable" they may appeal the recommendation(s) by writing to the Region One Regional Director within twenty (20) days of receiving the recommendation(s). Within thirty (30) days of receiving the appeal, the Regional Director will review the recommendation(s) and determine whether or not it is "reasonable". All reasonable recommendations will be substantially complied with within three (3) months after receiving the Monitor's recommendations or the Regional Director's decision on the appeal. If the reasonable recommendations are not or cannot be substantially complied with within three (3) months the Monitor will continue at the facility for, at minimum, an additional three (3) months after the initial one year period. "Substantial compliance"

---

[1] "Violations" in this regard refers to <u>any</u> violations of the ECL, the rules and regulations promulgated thereunder, this Consent Order and/or Consent Order number 1-5564;1-5565 and any permits, registrations or other Department authorizations.

[2] These "reasonable recommendations" are in no manner to be considered an environmental audit and therefore the written recommendations will not be privileged under current or future environmental audit privilege(s).

means that steps have been actively taken by Respondents to implement those recommendations and a time as to when the recommendation(s) will be implemented can be given and is in the foreseeable future.

[B] Prior to acceptance of any wastes not otherwise authorized, Respondents shall obtain all permits required under the New York State Environmental Conservation Law and the rules and regulations promulgated pursuant thereto.

[C] Any and all wastes brought into Respondents' facility under Emergency Authorization must have written approval from the Regional Spill Engineer or Regional Hazardous Waste Remediation Engineer prior to receipt. No solid or hazardous waste may be stored more than thirty (30) days under such Emergency Authorization unless a thirty (30) day extension is provided by the above Regional Engineers in writing.

[D] Respondents shall provide a complete inventory of all wastes kept in the storage building of Respondents' facility from November 10, 1995 through and including the date of this Order. Such inventory shall include contents, exact quantities, spill numbers and engineers if applicable, dates of accumulation, receipt and disposal, copies of any and all manifests and copies of the analytical results associated with each drum. This inventory is to be submitted to the Regional Hazardous Substance Engineer, New York State Department of Environmental Conservation, Region One, Building 40, SUNY, Stony Brook, New York 11790-2356, Attention: Katy Murphy.

[E] All Emergency Authorizations, manifests, shipping papers and analyses must be maintained on site in a manner which will allow any Department representative to, immediately upon request, obtain all information on any specific drum in the storage area.

II. <u>Within Twenty (20) Days From The Date of the Order:</u>

[A] Respondents must set up and maintain a logging system for all manifested shipments of hazardous waste being temporarily stored and/or transferred at the facility.

[B] Respondents must set up and maintain a logging system to document container and vehicle inspections for any wastes brought on site.

[C] Respondents must provide documentation to demonstrate that no containers or vehicles containing ignitable or reactive wastes are stored within fifty (50) feet of the property line and all are protected from source of ignition or reaction.

III. Within Thirty (30) Days From the Date of the Order:

[A] Set up and maintain an inventory log for all wastes brought into the storage building which includes the contents, source of the waste, spill number if generated from a spill and the date put into storage.

[B] Segregate and maintain segregation of all wastes from product within the storage building; segregate Environmental Testing Laboratory's wastes within the storage building.

[C] All wastes in the storage building currently and/or at any future time must be marked with Hazardous Waste or Non-Hazardous Waste labels, the contents of the containers and the dates such containers are put into storage. These labels and all information must be legible and able to read easily.

[D] Respondents will submit to the Department for its approval an approvable** training program which will address, but not be limited to, the following:

1. how all of its employees involved in spill cleanup, remediation, tank testing and/or tank removal will be trained in proper notification procedures for discharges (including Nassau and Suffolk requirements as well as New York State notification procedures) and
2. how these employees will be taught the necessary procedures to properly dispose of contaminated materials.

IV. Within Ninety (90) Days From the date of the Order:

[A] Respondents will implement the Department-approved training program and have applicable (see (1) above) employees trained once annually.

** Approvable means approval can be granted by the Department, as determined solely by the Department, after minimal revision. Minimal revision means that Respondents can incorporate such revisions indicated by the Department, resubmit the required documents within fifteen (15) days after receiving Department comments, and obtain subsequent Department approval of the document. Respondent is advised to consult with the Department reviewing unit sufficiently in advance of the approvable document submittal date to assure that the document will be approvable, and allowing thirty (30) days for any preliminary review desired.

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION

In the Matter of

THE TYREE ORGANIZATION, INC.

AP-BO-92-2003

CONSENT ORDER

I. THE PARTIES

1. The Department of Environmental Protection [pursuant to Stat. 1989, c. 240, Section 101, "...the department of environmental quality engineering shall be known as the department of environmental protection", hereinafter in this document referred to as the "Department"] is a duly constituted agency of the Commonwealth of Massachusetts. Its principal office is located at One Winter Street, Boston, Massachusetts 02108.

2. The Department is responsible for regulating the storage, collection, transport, treatment, disposal and use of hazardous waste in the Commonwealth of Massachusetts for the protection of the public health, safety and welfare and the environment pursuant to M.G.L.c. 21C, and 310 CMR 30.000.

3. The Department is authorized to issue this Consent Order pursuant to M.G.L.c. 21C, Sections 7 and 9. The Department is authorized to assess civil administrative penalties pursuant to M.G.L.c. 21A, Section 16, and 310 CMR 5.00.

4. The Tyree Organization, Inc. (Tyree) is a New York corporation. Its principal office is located at Route 6, P.O. Box 6, Brewster, New York. Tyree also operates a transportation yard at 768 Washington Street, Auburn, Massachusetts.

5. Tyree is the holder of Massachusetts Hazardous Waste Transporter License Number 328.

II. STATEMENT OF LAW

6. 310 CMR 30.407 Reporting provides, in part:

> (1) ...[A]ll transporters licensed by the Department pursuant to 310 CMR 30.000 shall submit monthly operating reports to the Department no later than the last day of the following month...If no hazardous wastes are handled in a particular month, a monthly report stating that fact shall by submitted. Such reports shall...include, but not be limited to, for each shipment of hazardous waste, the following information:

(a) Generator EPA identification number, name, generator state, generator zip code, site address;

7. 801 CMR 4.07, promulgated pursuant to G.L. c. 21C, Section 7, and G.L. c. 7, Section 3B, provides, in part:

> (1) ...[E]ach authorized transporter of hazardous wastes shall pay a fee of 18.2 cents per gallon or 1.82 cents per pound upon each gallon or pound of materials manifested or logged for transport in Massachusetts by said transporter...
>
> (9) ...The fee will be assessed on the basis of materials manifested or logged for transport during quarterly reporting periods, ending on September 30, December 31, March 31, and June 30 of each year. Within thirty days of the end of each such reporting period, each licensed transporter shall report to the Commissioner of the Department of Environmental Quality Engineering, on forms prescribed by said Commissioner, the total quantities of materials manifested or logged for transport by said transporter during said reporting period, along with such other information as said Commissioner shall require. Said report shall be accompanied by payment in full for the fee due on the amounts manifested or logged for transport by said transporter during said reporting period.

8. 310 CMR 30.415 Emergency Procedures Guide provides, in part:

> ...No transporter shall transport hazardous waste in the Commonwealth without being in possession of the following, all of which shall accompany the driver at all times during transport and shall include, at a minimum, the following:
>
> (4) ...All of the following equipment in good operating condition:
>
> (b) a fully equipped first-aid kit which contains provisions for eye wash.
>
> (c) a flashlight.

9. 310 CMR 30.409 Instruction and Training provides, in part:

> (4) Each vehicle driver of the licensed transporter

shall carry in the vehicle, at all times while transporting hazardous waste, a certification of hazardous waste transporter training which shall include the following:

(a) The licensee name and number, signature of the license holder, signature of the driver, EPA identification number, and dates when signed; and

(b) A statement which says: I (license holder), hereby certify pursuant to M.G.L. c. 21C that (driver's name), holder of driver's license # _____, Class __, in State of _____, has successfully completed training in the transportation of hazardous waste required by 310 CMR 30.409 of the Massachusetts Hazardous Regulations. I understand that the driver certified here may be subject to examination at the time of vehicle inspection.

10. M.G.L. c. 21C, Section 5, provides, in part:

No person shall...transport hazardous waste in a manner which could endanger human health, safety or welfare, or the environment, or in a manner inconsistent with any provision of this chapter, or of any regulation standard, license, or order issued pursuant to this chapter....

No person shall use a motor vehicle for the transportation of hazardous wastes on any way unless there has been issued for said vehicle a vehicle identification device, issued under the provisions of this chapter, and said device is attached to a cab card which is carried in the operators compartment of said vehicle where it is accessible to the operator of said vehicle.

11. 310 CMR 30.408 Hazardous Wastes in Transit provides, in part:

(1) A hazardous waste transporter shall expeditiously transport all shipments of hazardous waste directly from the generator to the facility designated on the manifests, except that the provisions of 310 CMR 30.408(2) shall apply if:

(a) there is a delay in the acceptance of the hazardous waste by the designated facility; or
(b) there are weather delays or vehicle breakdowns; or
(c) the driver is ill or "out of hours" pursuant

to 40 CFR 395.3; or
(d) the shipment originated from a pre-scheduled sequence of combined less-than-truckload pickups from individual generators; or
(e) the hazardous waste being shipped originated from water-contaminated tanks; or
(f) the hazardous waste was generated pursuant to an emergency response pursuant to M.G.L. c. 21E.

(2) In the event of the occurrence of one or more of the conditions listed in 310 CMR 30.408(1)(a) through (f), the shipment shall be held...without being subject to the storage requirements of 310 CMR 30.000, for a period of up to five days, not including weekends or state holidays...

12. 310 CMR 30.402 Requirements for Transporting Hazardous Waste provides, in part:

No person, unless exempted by 310 CMR 30.401, shall transport hazardous waste without obtaining and maintaining in effect:

(3) A vehicle identification device for each vehicle used to transport hazardous waste.

13. 310 CMR 30.414 Vehicle Identification Device provides, in part:

No transporter shall transport hazardous waste in any motor vehicle in the Commonwealth unless the Department has issued a vehicle identification device to that transporter for that vehicle. Said vehicle identification device shall be attached to the cab card and shall accompany each shipment of hazardous waste.

14. 310 CMR 30.006 Accurate and Timely Submittals to the Department provides, in part:

(1) No person shall make any false, inaccurate, or misleading statement in any application, record, report, plan, or statement which that person submits, or is required to submit, to the Department pursuant to M.G.L. c. 21C.

15. 310 CMR 30.822 General Conditions provides, in part:

(1) Duty to Comply. The licensee shall comply at all times with the terms and conditions of the license, 310 CMR 30.000, M.G.L. c. 21C, and all other applicable State and Federal statutes and regulations...

III. DEPARTMENT'S STATEMENT OF FACTS AND VIOLATIONS

16. On October 11, 1990, the Department issued a Notice of Noncompliance (NON) to Tyree. The NON notified Tyree that it was not in compliance with 310 CMR 30.407(1) due to Tyree's failure to submit transporter monthly operating reports by the last day of the following month for the months of August of 1989 through June of 1990, respectively.

17. As of August 4, 1992, Department records indicate that Tyree failed to submit the transporter monthly operating reports for the months of April, 1991, and January, February, March, April, May, and June, 1992, respectively, as required by 310 CMR 30.407(1). As a result, each failure by Tyree to submit a required monthly operating report is a separate violation of 310 CMR 30.407(1).

18. By July 31, 1992, Tyree was required, pursuant to 810 CMR 4.07(9), to submit a Hazardous Waste Transporter Fee Report specifying the quantity of hazardous wastes manifested or logged for transport by Tyree for the period from April 1, 1992 to June 30, 1992. Tyree was also required to pay in full any transporter fees due on the quantities manifested or logged for transport during this reporting period, as required by 810 CMR 4.07(1).

19. As of August 4, 1992, Department records indicate that Tyree had failed to submit the transporter fee report, as referenced in paragraph 18 above, and pay any transporter fees due on the amounts manifested or logged for transport by Tyree during that quarter, in violation of 810 CMR 4.07.

20. On July 30, 1992, Department personnel inspected a Tyree vehicle during its return from delivering a load of hazardous waste to Connecticut. At that time, Department personnel observed that the vehicle contained neither a vehicle identification device in violation of M.G.L. c. 21C, Section 5, 310 CMR 30.402(3) and 30.414, nor a flashlight in violation of 310 CMR 30.415(4)(c), nor provisions for eye wash in violation of 310 CMR 30.415(4)(b), and that the driver did not have in his possession a certification of hazardous waste transporter training in violation of 310 CMR 30.409(4).

21. In conjunction with the Department's July 30, 1992 inspection, Massachusetts State Police (State Police) personnel inspected Tyree's vehicle. The State Police cited Tyree, among other violations, for the vehicle's lack of: an emergency remote shutoff valve, internal valves, shear sections for all outlets, an at least six inch distance between the rear outlet and rear bumper, a specification container for wastes, and a visual testing of the container in the past two years. Due to these violations of the United States Department of Transportation regulations, the State Police placed the vehicle out of service until such time as the defects were repaired.

22. The transport of hazardous waste by Tyree in a vehicle equipped with neither an emergency remote shutoff valve nor any internal valves nor shear sections for all outlets nor an at least six inch distance between the rear outlet and the rear bumper nor a specification container nor a visual testing of the container in

the past two years constitutes transport of hazardous waste in a manner which could endanger human health, safety or welfare, or the environment, in violation of M.G.L. c. 21C, Section 5.

23. On August 4, 1992, Department personnel inspected Tyree's premises at 768 Washington Street in Auburn, Massachusetts. At that time, Department personnel observed that Tyree's manifests (manifest number MAF378825, MAC696051, MAG117251, MAC696073, MAC696075, MAC696074, MAC696072) indicated that these seven (7) shipments of hazardous waste were held by Tyree for greater than five days, not including weekends or state holidays, constituting seven (7) separate violations of 310 CMR 30.408.

24. Department personnel also observed that Tyree's hazardous waste manifests indicated that Tyree had transported hazardous waste on thirty-five (35) days (March 30 and 31; April 2,6,8,10,21, and 24; May 6,13,15,19,20,23,24 and 29; June 3,5,8,9,11,24,26,29, and 30; and July 1,6,20,21,22,23,27,28,29, and 30) during 1992 although Tyree had neither applied for nor obtained vehicle identification devices for 1992, constituting thirty-five (35) separate violations of M.G.L. c. 21C, Section 5, 310 CMR 30.402(3) and 30.414.

25. On September 14, 1992 Tyree submitted monthly operating reports for the months of April of 1991, and January through July of 1992, each of which Tyree certified was a true, accurate and complete record of all hazardous wastes transported by Tyree during those periods. Department parsonnel observed that these reports did not include the shipments on five (5) of the manifests (manifest

number MAF378825, MAC696054, MAC696056, MAG117252, MAG117251) observed during the inspection of Tyree's premises on August 4, 1992.

26. The failure by Tyree to include the five (5) manifests noted in paragraph 25 on its monthly operating reports for June and July, is two (2) separate violations of 310 CMR 30.407(1), 310 CMR 30.006(1) and 310 CMR 30.822(1).

27. On September 23, 1992 the Department issued to Tyree a Notice of Enforcement Conference letter which documented the violations observed during the July 30 and August 4, 1992 inspections, which informed Tyree of the Department's intention to take enforcement action in response to the noncompliance observed, and which requested Tyree to attend an enforcement conference at the Department's Boston office to discuss the alleged violations and Tyree's return to compliance.

28. On September 24, 1992 Tyree submitted its Hazardous Waste Transporter Fee Report for the period from April 1, 1992 to June 30, 1992 in which Tyree certified that it had transported 2,852 gallons of hazardous waste subject to the transporter fee. Department personnel observed that neither this transporter fee report, nor the report submitted by Tyree for the period from January 1, 1992 to March 31, 1992 included the 1301 gallons of hazardous waste Tyree certified in its March, 1992 monthly operating report that it had transported during that month. In addition, neither transporter fee report included the 1300 gallons of hazardous wastes in the shipments on the five (5) manifests

noted in paragraph 25. These omissions constitute violations of 810 CMR 4.07.

IV. DISPOSITION AND ORDER

29. The Department and Tyree agree that it is in the public interest, and in their own interest, not to expend the considerable time and resources necessary to litigate, in an adjudicatory or other proceeding, the allegations and remedy contained herein, but instead to utilize those resources and time to undertake the actions provided for below within the time frames set forth in this Consent Order.

30. Pursuant to the authority granted to the Department by M.G.L. c. 21C, ss. 7 and 9, the Department hereby issues, and Tyree hereby consents to the issuance of this Consent Order, and, therefore, waives any right to an administrative hearing, a tentative decision and judicial review of this Consent Order and to notice of any such rights of review, but only with respect to issuance of this Consent Order. This waiver is not intended and should not be construed to extend to any other order issued by the Department or any other claim, action, suit, cause of action or demand which the Department, TYREE, or any other person may initiate with respect to subject matter covered by this Consent Order. Tyree admits to the jurisdiction of the Department to require the actions herein and agrees to comply fully with the terms of this Consent Order.

31. This Consent Order shall not constitute, be construed as, or operate as an admission that Tyree has violated any law or

regulation or otherwise committed a breach of duty at any time, and shall not constitute, in this proceeding or any other proceeding, litigation or otherwise, any evidence or implication of any such violation or breach of duty. Tyree makes no admissions of fact or law nor waives any causes of action, defenses or claims except as provided in paragraph 30.

32. For the violations alleged in paragraphs 17, 22, 24, and 26 above, Tyree shall pay to the Department a civil administrative penalty of twenty thousand dollars ($20,000), all of which shall be paid, at the time of execution of this Consent Order, by certified check, cashier's check, or money order, payable to the Commonwealth of Massachusetts. Tyree's name and the file number AP-BO-92-2003, should be clearly printed on the face of the certified check, cashier's check, or money order. Failure to do so could delay the crediting of the payment. Payment of the penalty shall be mailed to: Commonwealth of Massachusetts, Department of Environmental Protection, P.O. Box 4062, Boston, Massachusetts 02211.

33. Within ten (10) days of the effective date of this Consent Order, Tyree shall submit to the Department, if it has not already done so, revised monthly operating reports giving a true, accurate, and complete accounting for hazardous wastes transported for the months of June and July of 1992.

34. Within ten (10) days of the effective date of this Consent Order, Tyree shall submit to the Department revised hazardous waste transporter fee reports giving a true, accurate, and complete accounting for hazardous wastes transported for the

quarters ending March 31, 1992 and June 30, 1992, if Tyree has not done so already. This submission shall be accompanied by a check for $236.78 representing the transporter fee due on the 1301 gallons of hazardous waste Tyree certified it had transported during March of 1992 and for which Tyree did not pay transporter fees as alleged in paragraph 28. This submission shall also be accompanied by the transporter fees due on that part of the 1300 gallons of hazardous waste which was transported during the second quarter of 1992 by Tyree on the five manifests noted in paragraph 25 and for which Tyree did not pay transporter fees as referenced in paragraph 28.

35. Within ten (10) days of the effective date of this Consent Order, Tyree shall equip all its hazardous waste transport vehicles with provisions for eyewash and shall submit documentation to this effect.

36. Within ten (10) days of the effective date of this Consent Order, Tyree shall equip all its hazardous waste transport vehicles with a working flashlight and shall submit documentation to this effect.

37. Within thirty (30) days of the effective date of this Consent Order, Tyree shall document that its 1500 gallon vacuum truck, New York license plate number PD8728 is equipped with an emergency remote shutoff, internal valves, shear sections for all outlets, at least six inch distance between the rear outlet and the rear bumper, a specification container, and a visual testing of the container.

38. Within thirty (30) days of the effective date of this Consent Order, Tyree shall document that all its drivers have received hazardous waste transporter training and have in their possession a certification of hazardous waste transporter training during the transport of hazardous waste.

39. Within thirty (30) days of the effective date of this Consent Order, Tyree shall document the management procedures it has undertaken to assure that all shipments of hazardous waste are expeditiously transported and that no shipment is held for a period of more than five days, excluding weekends or state holidays.

40. Hereafter, Tyree shall obtain vehicle identification devices for all its vehicles which are used to transport hazardous waste in compliance with 310 CMR 30.402(3), 310 CMR 30.414 and M.G.L. c. 21C.

41. Effective immediately and hereafter, Tyree shall submit true, accurate, and complete monthly operating reports to the Department by the last day of the following month in compliance with 310 CMR 30.407.

42. Effective immediately and hereafter, Tyree shall submit true, accurate, and complete quarterly hazardous waste transporter fee reports, accompanied by payment in full for the fee due, within thirty days of the end of each quarterly reporting period in compliance with 801 CMR 4.07.

43. This Order shall be binding on Tyree and on its successors, heirs and assigns. Tyree shall not violate this Order, and shall not allow or suffer its employees, agents, or contractors

to violate this Order.

44. In addition to being a Consent Order, this is also a Notice of Noncompliance issued pursuant to General Laws, Chapter 21A, Section 16 and 310 CMR 5.00. Pursuant to General Laws, Chapter 21A, Section 16 and 310 CMR 5.00, the Department hereby determines, and Tyree agrees, that the deadlines set forth above constitute reasonable time for coming into compliance with the provisions cited above.

45. The Department represents that the Commissioner of the Department has authorized, Steven A. DeGabriele, Acting Director of the Division of Hazardous Waste to sign this Consent Order on his behalf.

46. Tyree represents that Stephen Tyree is authorized by Tyree to sign this Consent Order on behalf of Tyree and thereby bind Tyree to the terms of this Consent Order.

48. This Consent Order is hereby deemed consented to and effective as of the last date set forth below.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY:_____ DATE:_____

Steven A. DeGabriele, Acting Director
Division of Hazardous Waste, Bureau of Waste Prevention
Massachusetts Department of Environmental Protection
One Winter Street
Boston, MA 02108

THE TYREE ORGANIZATION, INCORPORATED

BY:_____ DATE: 8/17/93

Stephen Tyree, President
The Tyree Organization, Inc.
Route 6, P.O. Box 6
Brewster, NY 10509

THE TYREE O' ANIZATION
SCHEDULE OF VIOLATIONS

A. NEW YORK

COMPANY NAME	DESCRIPTION OF VIOLATION	AGENCY	FINE	DATE
Larry E. Tyree	760.1207	NYS	$2,500	September 1989
Tyree Brothers Env. Serv.	NYCRR 364.2(A)(1) Waste Transporter Violation	NYS	$1,000	November 1989
Tyree Brothers Env. Serv.	NYCRR 364.6(B) Waste Transporter Violation	NYS	$1,000	December 1989
Larry E. Tyree	27-4105 ADM. Acetylene bottles not secure	NYS	$150	March 1990
Larry E. Tyree	VTL - unsecured cylinder and labeling	NYS	$1,550	September 1990
Larry E. Tyree	Town Ordinance 53.681? - no permit for tank removal	?	$200	October 1990
Larry E. Tyree	Nassau County Fire Prevention Ordinance 3.6.3 - underground tanks	Nassau County Fire Marshall	$2,000	October 1990
Larry E. Tyree	Town Ordinance - no shipping documents	Southampton	$250	January 1991
Larry E. Tyree	VTL 385(6)&(10) - truck overweight	NYS	$1,625	January 1991
Larry E. Tyree	Southampton Town Ordinance 14.F - lack of shipping documents	Southampton	$700	February 1991

ry E. Tyree	Nassau County Fire Prevention Ordinance 3.6.1.5 - failure to submit plans	Nassau Co Fire Marshall	$500	December 1991
Larry E. Tyree	Town Ordinance - failure to notify tank pull	Southampton	$150	December 1991
Tyree Brothers Env. Serv.	ECL 364.2 - Waste transporter violation	NYS	$500	January 1992
Larry E. Tyree	49CFR 177.823 - improper placarding	DOT	$350	January 1992
Tyree Brothers Env. Serv.	49CFR 177.823 - improper placarding	DOT	$350	February 1992
Tyree Brothers Env. Serv.	VTL 385(10) - truck overweight	NYS	$125	March 1993
Tyree Brothers Env. Serv.	VTL 385(8) - truck overweight	NYS	$600	July 1993
Larry E. Tyree	Administrative Code 15-223.1? - tank removal		$1,000	August 1993
Larry E. Tyree	VTL 385(8) - truck overweight	NYS	$100	September 1993
Larry E. Tyree	No construction permit	NYC ECB	$250	May 1994
Tyree Brothers Env. Serv.	ECL 71-0907? - failure to vacuum test	NYS	$250	June 1994
Tyree Brothers Env. Serv.	VTL 385(10) - truck overweight	NYS	$1,700	June 1994
Tyree Brothers Env. Serv.	Bureau Air Resources	NYS	$1,500	January 1995

ry E. Tyree	VTL 385(8) - truck overweight	NYS	$100	February 1995
Larry E. Tyree	Construction permit violations		$1,450	April 1995
Larry E. Tyree	VTL 385(10) - truck overweight	NYS	$1,200	May 1995
Larry E. Tyree	49 CFR 140.2 - no driver inspection report	DOT	$150	April 1995
Tyree Brothers Env. Serv.	Request for Information - ENCON, Art. 27, title 13	NYS DEC	Pending	Pending
Tyree Organization, Ltd.	DOT Violation	DOT	$150	12/4/97
Larry E. Tyree	DOT Violation	DOT	$200	5/14/98
Larry E. Tyree	ENCON	NYS DEC	Pending	Pending
Larry E. Tyree	ENCON	NYS DEC	Pending	Pending
Tyree Organization, Ltd.	DOT Violation	DOT	$200	Pending

B. CONNECTICUT

COMPANY NAME	DESCRIPTION OF VIOLATION	AGENCY	FINE	DATE
Larry E. Tyree	CT 53a-172 - truck overweight	DEP	$125	September 1992
Larry E. Tyree	CT 53a-172 - truck overweight	DEP	$425	March 1993

D. NEW JERSEY

COMPANY NAME	DESCRIPTION OF VIOLATION	AGENCY	FINE	DATE
Tyree Organization, Ltd.	Truck Overweight		Pending	Pending

D. PENNSYLVANIA

COMPANY NAME	DESCRIPTION OF VIOLATION	AGENCY	FINE	DATE
Tyree Brothers Env. Serv.	Notice of Violation missing/inaccurate transporter EPA ID number Regulation § 262.20(g)(5) - no fine paid with adjudication			December 28, 1994
Tyree Org., Ltd	Truck Overweight		$120	June 9, 1998

L. CALIFORNIA

COMPANY NAME	DESCRIPTION OF VIOLATION	AGENCY	FINE	DATE
Tyree Org., Ltd.	Improper Registration	California	$65	September 15, 1997
Tyree Bros. Env. Serv.	Truck Overweight, Vehicle Code § 35550(a)	California	$500	August 26, 1997

03df14.2

FEDERAL HIGHWAY ADMINISTRATION
OFFICE OF MOTOR CARRIERS

C A R R I E R P R O F I L E

THE INFORMATION CONTAINED IN THIS PROFILE REPRESENTS ALL THE USABLE DATA THAT HAS BEEN REPORTED TO THE FEDERAL HIGHWAY ADMINISTRATION'S (FHWA) OFFICE OF MOTOR CARRIERS THROUGH THE REQUIREMENTS OF STATE AND FEDERAL PROGRAMS.

NOTICE

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VIVIAN OLIVER, TRANSPORTATION SPECIALIST
(202) 366-4023
USDOT/FHWA/OMC, HIA-10
400 SEVENTH STREET, S.W.
WASHINGTON, D.C. 20590

LS50-CP1A MOTOR CARRIER MANAGEMENT INFORMATION SYSTEM 04/02/1998
REPORT: 1 C A R R I E R P R O F I L E
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CARRIER OPERATIONS AND SAFETY RATINGS

LEGAL NAME : TYREE ENVIRONMENTAL TECHNOLOGIES
DOING BUSINESS AS:
ADDRESS : 208 ROUTE 109
FARMINGDALE NY 11735
(516) 249-3160 COUNTY NAME: NASSAU

USDOT #: 369209 ICC NUMBERS:

STATUS : ACTIVE
CLASS : PRIVATE PROPERTY
TYPE : CARRIER/SHIPPER
CARRIER OP: INTERSTATE
SHIPPER OP: INTERSTATE
CARGO : LIQUIDS/GASES
HAZMAT C :
HAZMAT S :
DRIVERS : 72 POWER UNITS: 83
SAFETY RATING: SAT RATING DATE: JUL2396 REVIEW/AUDIT DATE: JUN1796

REVIEW/RATING HISTORY

TYPE	REVIEW DATE	RATING DATE	RATING	CONDUCTED BY	CODE	REASON NOT RATED
SR	DEC0590	FEB2791	SAT	US0509		
CR	JUN1796	JUL2396	SAT	US0485		

BELOW ARE DETAILS FROM MOST RECENT RATED COMPLIANCE REVIEW:

CRITICAL AND ACUTE VIOLATIONS :

	PRIMARY VIOLATION	SECONDARY VIOLATION
CRITICAL	177.817(a)	

FACTORS RATED CONDITIONAL OR UNSATISFACTORY

FACTOR 5 CONDITIONAL PART 177 - CARRIAGE BY PUBLIC HIGHWAY

ACCIDENTS: (FROM COMPLIANCE REVIEW, PART C)

TOTAL MILES: 1,963,813

	NUMBER	RATE (PER MILLION MILES)
TOTAL RECORDABLE	0	.00
PREVENTABLE RECORDABLE	0	.00

ENFORCEMENT DATA

LEGAL-NAME : TYREE ENVIRONMENTAL TECHNOLOGIES
DOING BUSINESS AS:
USDOT # : 369209

CASE/INVESTIGATION # : NY-98-101-US0485
TOTAL SETTLEMENT AMOUNT : $2,000.00
CLOSED DATE : 10/04/98 - FULL PAYMENT RECEIVED
FULL PAYMENT RECEIVED : 10/04/98

ENFORCEMENT TOOLS USED : NONE

SECTION NUMBERS CITED IN VIOLATIONS	SETTLEMENT AMOUNT $$$
177.824	$1,500.00
177.824	$250.00
177.824	$250.00

LS50-CP1A MOTOR CARRIER MANAGEMENT INFORMATION SYSTEM 04/02/1998
REPORT: 5 C A R R I E R P R O F I L E
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INSPECTIONS - 2 YEAR SUMMARY

LEGAL-NAME : TYREE ENVIRONMENTAL TECHNOLOGIES
DOING BUSINESS AS:
USDOT # : 369209

* DR (DRIVER) INCLUDES INSPECTION LEVELS 1, 2 AND 3.
VEH (VEHICLE) INCLUDES INSPECTION LEVELS 1, 2 AND 5.
HM (HAZARDOUS MATERIALS) INCLUDES ALL INSPECTIONS
WHERE VEHICLE CARRIES HAZARDOUS MATERIALS.

* AVG.# OOS VIOL PER INSP = AVERAGE NUMBER
OUT-OF-SERVICE VIOLATIONS PER INSPECTION.

* % OOS INSPECTIONS = PERCENTAGE OF INSPECTIONS WITH
1 OR MORE OUT-OF-SERVICE VIOLATIONS.

* CATEGORIES DR, VEH AND HM MAY NOT ADD TO THE ALL
COLUMN BECAUSE TWO OR MORE OF THESE TYPES OF
VIOLATIONS MAY OCCUR ON THE SAME INSPECTION.

	NUMBER OF INSPECTIONS				AVG # OOS VIOL/INSP				% OOS INSPECTIONS			
YEAR	DR	VEH	HM	ALL	DR	VEH	HM	ALL	DR	VEH	HM	ALL
04/02/96 TO 04/01/97	43	41	11	43	.0	.7	.4	.6	0%	44%	27%	42%
04/02/97 TO 04/01/98	38	37	17	38	.2	.6	.1	.8	11%	46%	6%	53%

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INSPECTION CHARACTERISTICS - 04/02/88 TO DATE
NUMBER AND PERCENT OF VIOLATIONS BY TYPE

LEGAL-NAME : TYREE ENVIRONMENTAL TECHNOLOGIES
DOING BUSINESS AS:
USDOT # : 368209

TYPE	04/02/97 TO 04/01/98 NUM OF VIOLS	%	04/02/96 TO 04/01/97 NUM OF VIOLS	%
DRIVER				
NEDCRT	3	3	8	8
FLSLOG	0	0	0	0
LOGVIO	5	5	1	1
10/15	0	0	0	0
15/20	0	0	0	0
60/70	0	0	0	0
OTHHOS	0	0	0	0
DSQDRV	2	2	0	0
DRUGS	0	0	0	0
ALCOHL	0	0	0	0
SEATBT	1	1	2	2
TRFENF	7	7	10	10
RADAR	0	0	0	0
OTHDRV	8	8	8	8
VEHICLE				
BRKADJ	3	3	3	3
BRKOTH	17	17	8	8
COUPLR	0	0	0	0
FUEL	1	1	0	0
FRAMES	0	0	0	0
LIGHTS	12	12	15	15
STERNG	3	3	0	0
SUSPEN	1	1	4	4
TIRES	3	3	3	3
WHEELS	1	1	2	2
LDSECR	3	3	3	3
WNDSHL	0	0	0	0
EXHST	1	1	0	0
EMREQP	6	6	7	7
PERINS	1	1	5	5
OTHER	17	17	8	8

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MOTOR CARRIER MANAGEMENT INFORMATION SYSTEM 04/02/1998
C A R R I E R P R O F I L E

INSPECTION CHARACTERISTICS - 04/02/88 TO DATE
NUMBER AND PERCENT OF VIOLATIONS BY TYPE

LEGAL-NAME : TYREE ENVIRONMENTAL TECHNOLOGIES
DOING BUSINESS AS:
USDOT # : 369209

HAZMAT				
HPAPRS	0	0	5	5
HPLCRD	1	1	2	2
HIMSHP	0	0	0	0
HBRACE	0	0	1	1
HTEST	0	0	0	0
HSHTOF	0	0	0	0
HSPEC	0	0	0	0
EMGRES	0	0	2	2
HOTHR	2	2	0	0
INVALID				
UNKNOWN	0	0	0	0
TOTAL	98	100%	97	100%

INSPECTION CHARACTERISTICS - DESCRIPTIONS

DRIVER VIOLATIONS

MEDCRT	-	MEDICAL CERTIFICATE
FLSLOG	-	FALSE LOG BOOK
LOGVIO	-	NO LOG BOOK,LOG NOT CURRENT,GENERAL LOG VIOLATIONS
10/15	-	10/15 HOURS
15/20	-	15/20 HOURS
60/70	-	60/70/80 HOURS
OTHHOS	-	ALL OTHER HOURS-OF-SERVICE
OSQDRV	-	DISQUALIFIED DRIVERS
DRUGS	-	DRUGS
ALCOHL	-	ALCOHOL
SEATBT	-	SEAT BELT
TRFENF	-	TRAFFIC ENFORCEMENT
RADAR	-	RADAR DETECTORS
OTHDRV	-	ALL OTHER DRIVER VIOLATIONS

VEHICLE VIOLATIONS

BRKADJ	-	BRAKES, OUT OF ADJUSTMENT
BRKOTH	-	BRAKES, ALL OTHERS
COUPLR	-	COUPLING DEVICES
FUEL	-	FUEL SYSTEMS
FRAMES	-	FRAMES
LIGHTS	-	LIGHTING
STERNG	-	STEERING MECHANISM
SUSPEN	-	SUSPENSION
TIRES	-	TIRES
WHEELS	-	WHEELS, STUDS, CLAMPS, ETC.
LDSECR	-	LOAD SECUREMENT
WNDSHL	-	WINDSHIELD
EXHST	-	EXHAUST DISCHARGE
EMREQP	-	EMERGENCY EQUIPMENT
PERINS	-	PERIODIC INSPECTION
OTHER	-	ALL OTHER VEHICLE DEFECTS

HAZMAT VIOLATIONS

HPAPRS	-	SHIPPING PAPER
HPLCRD	-	IMPROPER PLACARDING
HINSHP	-	ACCEPTING SHIPMENT IMPROPERLY MARKED
HBRACE	-	IMPROPER BLOCKING AND BRACING
HTEST	-	NO RETEST AND INSPECTION (CARGO TANK)
HSHTOF	-	NO REMOTE SHUTOFF CONTROL
HSPEC	-	USE OF NON-SPECIFICATION CONTAINER
EMGRES	-	EMERGENCY RESPONSE
HOTHR	-	ALL OTHER HM VIOLATIONS

INVALID VIOLATIONS

UNKNOWN	-	UNKNOWN

LS50-CP1A MOTOR CARRIER MANAGEMENT INFORMATION SYSTEM 04/02/1998
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INDIVIDUAL INSPECTIONS - MIN: 1 YEAR, MAX: 2 YEARS
(FROM THE DATE OF THE CARRIER PROFILE)

LEGAL-NAME : TYREE ENVIRONMENTAL TECHNOLOGIES
DOING BUSINESS AS:
USDOT # : 389208

* THE REPORT SHOWS ALL INSPECTIONS FOR AT LEAST ONE YEAR. (A YEAR IS DEFINED AS A TOTAL OF 12 MONTHS OF DATA PREVIOUS TO THE DATE OF THE REPORT).

* FOR A MOTOR CARRIER INVOLVED IN LESS THAN 50 INSPECTIONS IN THE REQUESTED YEAR -- THE REPORT WILL SHOW INSPECTIONS FOR THE PREVIOUS YEAR UP TO A MAXIMUM OF 50 INSPECTIONS.

LVL	INSPECTION: DATE TIME ST / REPORT # COUNTY / LOCATION	TOT OOS	VIOLATION: INDIVIDUAL	CARRIER/VEH: NAME CITY ST / COMPANY NUMBER / PU VEH LIC #	DRIVER: FNAME MI LNAME / DRV LIC # ST / BIRTHDATE
2	MAR0698 0426 CA CA76680E74 SOLANO 00786	00 00		TYREE FARM NY TR CA-5P57028	MARIO R NIEVES N4814281 CA UNKNOWN
1	FEB2098 1145 NY NYBJ000473 ULSTER KINGSTON (EXIT 19	02 01	1 LIGHTS* 1 LIGHTS	TYREE FARM NY 417 TR NY-877098	ROBERT A GROCK 515 851 048 NY 04/23/1965
2	FEB1298 1004 CA CA3668120E SOLANO 00386	02 00	1 TRFENF 1 OTHER	TYREE FARM NY TR CA-5L98624	JOSE R SANCHEZ D A5241235 CA UNKNOWN
1	JAN2798 0918 NY NY38001356 SUFFOL YAPHANK	05 01	2 LDSECR* 1 EMREQP 1 OTHER 1 OTHER 1 FUEL	LARRY FARM NY F-204 TR NY-AU-1865	SHANNON J MCMULLEN 540-848-834 NY 08/03/1969
1	JAN2098 1210 MA MA00000063 BARNST H-BARNSTABLE	00 00		TYREE FARM NY TR MA-E31179	BRIAN J SWEET 019583288 MA 05/28/1981
1	JAN1698 1100 CT CTA-071474 FAIRFI DANBURY	00 00		TYREE FARM NY 5 TT NY-PD5153	JAMES E TOZZI 205086375 NY 04/28/1961
2	DEC1897 1608 CA CA76674C35 SOLANO 00786	02 01	1 OTHER * 1 TRFENF	TYREE FARM NY TR CA-VIN	MATTHEW J DOYLE B8627264 CA UNKNOWN
1	DEC1897 1235 NY NY27000784 ORANGE WAWAYANDA (REST A	02 01	1 TRFENF* 1 EMREQP	TYREE FARM NY F 415 TR NY-PD 5182	JAMES E TOZZI 205 086 375 NY 04/28/1961
1	DEC0397 0825 MD MD00902504 FREDER I-70 NEW MARKET S	03 00	1 LIGHTS 1 BRKOTH 1 BRKADJ	TYREE FARM NY TOV317 TR VA-16903P	RUDOLPH F HASSALL 218846205 VA 05/19/1969
1	NOV0797 1118 CT CT28001758 TOLLAN I-84 W/B UNION S	00 00		TYREE FARM NY TMC213 TR MA-E65872	MICHAEL A SILVA 022486511 MA 04/28/1956

MOTOR CARRIER MANAGEMENT INFORMATION SYSTEM 04/02/1998
C A R R I E R P R O F I L E

INDIVIDUAL INSPECTIONS - MIN: 1 YEAR, MAX: 2 YEARS
(FROM THE DATE OF THE CARRIER PROFILE)

LEGAL-NAME : TYREE ENVIRONMENTAL TECHNOLOGIES
DOING BUSINESS AS:
USDOT # : 389209

LVL	INSPECTION: DATE TIME ST / REPORT # COUNTY / LOCATION	VIOLATION: TOT OOS / INDIVIDUAL	CARRIER/VEH: NAME CITY ST / COMPANY NUMBER / PU VEH LIC #	DRIVER: FNAME MI LNAME / DRV LIC # ST / BIRTHDATE
1	NOV0597 0820 NY NY28000934 DUTCHE PAWLING	03 2 OTHDRV* 1 TIRES * 02	TYREE FARM NY 210 TR NY-PD5159	JOHN A GILES 244669328 CT 12/14/1964
1	NOV0497 0745 CA CA36877C40 SOLANO 00368	00 00	TYREE FARM NY TR CA-6L98624	VICTOR S DE ANDA A7491582 CA UNKNOWN
1	NOV0387 1035 NY NYAH000218 DELAWA SIDNEY	00 00	TYREE FARM NY 416 TR NY-PD5161	LEWIS A GELINAS 047842486 NY 05/11/1956
1	NOV0387 1311 NY NY28000924 SUFFOL SOUTHAMPTON	01 1 BRKADJ* 01	TYREE FARM NY 415 TR NY-PD5162	GARY R BILLINGS 536 240 223 NY 04/02/1954
1	OCT3197 1042 CT CT22000155 TOLLAN I-84 W/B UNION SC	06 1 BRKOTH* 1 BRKOTH* 03 1 LOSECR* 1 HPLCRD 1 LIGHTS 1 STERNG	TYREE FARM NY TDM432 TR MA-30818	ROGER L CHOUINARD 028401702 MA 03/18/1951
2	OCT3097 1010 NY NYAD000872 RENSSE T/SCHODACK	01 2 WHEELS 00	TYREE FARM NY TDM433 TT MA-30822	JAMES F NYKIEL 029 427 075 MA 05/01/1952
1	OCT2497 0714 CT CT28001697 TOLLAN I-84 W/B UNION S	05 1 OTHER * 1 OTHER * 03 1 BRKOTH* 1 OTHER 1 LIGHTS	TYREE FARM NY TDM316 TR MA-30820	PATRICK T KEATING 018588582 MA 12/30/1966
1	OCT1497 0837 NY NYAG000448 ONONDA ELBRIDGE	04 0 LOGVIO* 0 OTHDRV* 02 1 OTHDRV 1 EMREQP	TYREE FARM NY 8305 TR NY-NZ3044	HARRY A EDMONDS 351 588 893 NY 07/06/1967
1	OCT1497 1008 NY NY12000743 CORYLA PREBLE (REST AREA	00 00	TYREE FARM NY 417 TR NY-DD5160	STEVEN D VUKAS 906105872 NY 09/20/1946
2	OCT1397 1115 NH NH00098118 CHESHI KEENE (005)	11 0 TRFENF* 0 DSQDRV* 03 0 DSQDRV* 0 MEDCRT 0 OTHDRV 0 LOGVIO	TYREE FARM NY TR NY-GM5427	ARTHUR M JOHNSON 027547424 MA 04/08/1962
2	OCT0897 0918 NY NYA8000248 SARATO CLIFTON PARK TOW	02 0 LOGVIO 1 OTHDRV 00	TYREE FARM NY 418 TR NY-PD5155	SCOTT V KRAUSS 076366440 CT 07/31/1971
1	SEP2297 1730 CT CTA-070898 FAIRFI DANBURY	08 1 BRKOTH* 1 STERNG 01 1 STERNG 1 BRKOTH 1 BRKOTH 2 BRKOTH	TYREE FARM NY TBF420 TT NY-PM8658	PHILIP PAGLIARO 308795735 NY UNKNOWN
1	SEP2297 0858 MD MD00804295 PRINCE I-95 @ I-495 (PAR	07 2 BRKOTH* 2 BRKOTH* 02 0 MEDCRT 1 BRKOTH 2 BRKOTH 2 BRKOTH	TYREE FARM NY TOV441 TR VA-15901P	NEPHTAL EYASSU 025624409 VA 06/12/1962

MOTOR CARRIER MANAGEMENT INFORMATION SYSTEM
C A R R I E R P R O F I L E

INDIVIDUAL INSPECTIONS - MIN: 1 YEAR, MAX: 2 YEARS
(FROM THE DATE OF THE CARRIER PROFILE)

LEGAL-NAME : TYREE ENVIRONMENTAL TECHNOLOGIES
DOING BUSINESS AS:
USDOT # : 389208

LVL	INSPECTION: DATE TIME ST / REPORT # COUNTY / LOCATION	VIOLATION: TOT OOS / INDIVIDUAL	CARRIER/VEH: NAME CITY ST / COMPANY NUMBER / PU VEH LIC #	DRIVER: FNAME MI LNAME ST / DRV LIC # / BIRTHDATE
1	SEP1297 1445 CA CA02585226 LOS AN 00541	02 1 OTHER * 1 TIRES 01	TYREE CERR CA TR NY-P05154	JOHN M PRECIADO R0828390 CA UNKNOWN
1	SEP0297 0957 NY NYAN000310 ONONDA 30233	05 1 OTHER * 0 OTHDRV 01 1 EMREQP 1 PERINS 2 LIGHTS	TYREE FARM NY T08316 TR NJ-AA886D	MICHAEL RETOS 251051535 NY UNKNOWN
1	AUG1597 1200 CA CA02837543 LOS AN 00541	01 1 OTHER 00	TYREE FARM NY TR NY-P05154	MATTHEW T DOYLE 104986725 NY UNKNOWN
1	AUG0897 1824 CA CA76872FE5 SOLANO 00788	01 1 HOTHR * 01	TYREE FARM NY TR NY-VN2151	MARIO R NIEVES N4614281 CA UNKNOWN
2	JUL3097 1100 MA MA00307435 BRISTO N-N ATTLEBORO	01 2 LIGHTS* 01	TYREE WEST MA TT MA-30822	JAMES P NYKIEL 029427075 MA 05/01/1952
1	JUL2897 0930 NY NYAX000233 WESTCH 80057	01 1 BRKOTH* 01	TYREE FARM NY UNKNOWN TR NY-PW1943	ANDREW PICKERD 777 449 598 NY UNKNOWN
1	JUL2597 1045 NY NY05000735 SCHENE 10726	02 0 OTHDRV 1 OTHER 00	TYREE FARM NY TMC152 TR NY-SR9580	JAMES CALLAHAN 839 182 168 NY UNKNOWN
2	JUL1497 0811 CA CA7667296A SOLANO 00788	03 1 HOTHR 1 TRFENF 00 1 OTHER	TYREE FARM NY TR NY-P05154	MARIO R NIEVES N4614281 CA UNKNOWN
1	JUL1197 1021 CA CA5417365E SOLANO 00541	01 1 OTHER 00	TYREE FARM NY TR NY-P05154	MATTHEW J DOYLE 104986725 CT UNKNOWN
1	JUL0197 1000 VA VA8D000271 FAIRFA VAN DORN STREET	03 1 BRKADJ* 1 SUSPEN* 02 1 LIGHTS	TYREE FARM NY 422 TR VA-TP58113	TITO A MUNOZ 099820022 VA 11/30/1960
3	JUN2697 0840 MD MD00803140 PRINCE I-95 @ I-495 (PAR	00 00	TYREE FARM NY T0V4TZ TR VA-P125913	DRAN E MERCER JR 254234233 VA 07/25/1970
1	JUN1997 1138 NY NY26000557 DUTCHE 80846	00 00	TYREE FARM NY TB8424 TR NY-P05153	JAMES TOZZI 205 088 376 NY UNKNOWN
1	MAY2897 1125 CT CT38000213 FAIRFI 034	11 0 OTHDRV* 0 MEDCRT 01 1 TRFENF 1 TRFENF 1 LIGHTS 1 LIGHTS	TYREE FARM NY 215 TR NY-P05163	JOHN C KUNKEL 433046283 NY UNKNOWN

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MOTOR CARRIER MANAGEMENT INFORMATION SYSTEM 04/02/1998
CARRIER PROFILE

INDIVIDUAL INSPECTIONS - MIN: 1 YEAR, MAX: 2 YEARS
(FROM THE DATE OF THE CARRIER PROFILE)

LEGAL-NAME : TYREE ENVIRONMENTAL TECHNOLOGIES
DOING BUSINESS AS:
USDOT # : 369209

INSPECTION: LVL	DATE TIME ST REPORT # COUNTY LOCATION	VIOLATION: TOT OOS	INDIVIDUAL	CARRIER/VEH: NAME CITY ST COMPANY NUMBER PU VEH LIC #	DRIVER: FNAME MI LNAME DRV LIC # ST BIRTHDATE
1	MAY0797 1135 NY NYAF000182 ONONDA 30233	02 0	D LOGVIO 1 OTHER 00	TYREE FARM NY 319 TR CT-17244A	JOHN KUNKEL 433046263 NY UNKNOWN
1	APR2597 1053 NY NY17000428 LIVING 40354	04 0	D LOGVIO* 1 BRKOTH* 02 1 BRKOTH 2 TIRES	TYREE FARM NY UNKNOWN TR NY-PW1941	DAVID SCHERMERH 411926530 NY UNKNOWN
3	MAR2797 2207 CA CA7867110D9 SOLANO 00768	00 00		TYREE FARM NY TR CA-VIN	BRENT A CLUMPNER N6235403 CA UNKNOWN
1	MAR2797 1454 NY NYBA000055 SUFFOL 00411	04 1	BRKOTH* 1 BRKADJ* 02 1 LIGHTS 1 LIGHTS	TYREE FARM NY F208 TR NY-PD8729	DOUGLAS MARQUES 914 356 169 NY UNKNOWN
1	MAR2697 1255 NY NYBH000D13 ORANGE 80569	08 1	HPAPRS* 1 EMGRES 01 0 SEATBT 0 MEDCRT 1 EMREQP 1 EMREQP	TYREE FARM NY TMC208 TR CT-JE6444	ANTHONY NACRI 081634130 CT UNKNOWN
2	MAR2497 1109 NY NY29000213 SULLIV 80718	00 00		TYREE FARM NY NA TR CT-17244A	JOHN KUNKEL 433 046 263 NY UNKNOWN
1	MAR1897 1755 MA MA00301078 BRISTO RAYNHAM	00 00		TYREE FARM NY TR NY-J66821	PAUL E BOURBEAU 013303469 MA 09/02/1939
1	MAR0797 0954 NY NY33000151 NASSAU 01280	01 0	OTHDRV 00	TYREE FARM NY F 400 TR NY-IC5381	RICHARD WRIGHT NONE NY UNKNOWN
1	FEB2697 1157 NY NY35000170 NASSAU 00634	00 00		TYREE FARM NY F405 TR NY-VJ4370	MICHAEL HAMCHUK 335 974 985 NY UNKNOWN
2	FEB2497 1305 MA MA00301489 WORCES H-AUBURN	03 0	TRFENF 0 TRFENF 00 1 TRFENF	TYREE WEST MA TR MA-30819	RAYMOND M PICILLO 028400224 MA 09/01/1950
2	FEB0697 1810 MA MA00275717 HAMPDE 311H	01 0	TRFENF 00	TYREE WEST MA TR MA-E65872	MICHAEL SILVA 022485511 MA UNKNOWN
2	FEB0297 1252 NY NY29000034 ULSTER 80843	00 00		TYREE FARM NY 304 TR NY-PD5157	BRYAN KOVZELOVE 18552818 CT UNKNOWN
1	JAN3097 1320 NY NY24000086 ORANGE 80865	01 1	BRKOTH 00	TYREE FARM NY 304 TR NY-PD5157	BRYAN KOVZELOVE 184542816 CT UNKNOWN

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INDIVIDUAL INSPECTIONS - MIN: 1 YEAR, MAX: 2 YEARS
(FROM THE DATE OF THE CARRIER PROFILE)

LEGAL-NAME : TYREE ENVIRONMENTAL TECHNOLOGIES
DOING BUSINESS AS:
USDOT # : 369209

INSPECTION	VIOLATION	CARRIER/VEH	DRIVER
LVL DATE TIME ST REPORT # COUNTY LOCATION	TOT -----INDIVIDUAL---- OOS	NAME CITY ST COMPANY NUMBER PU VEH LIC #	FNAME MI LNAME DRV LIC # ST BIRTHDATE
2 JAN2897 1558 MA MA00278659 WORCES 322S	01 D TRFENF 00	TYREE WEST MA 7198A2 TR MA-C21582	RONALD BEAVER 023568814 MA UNKNOWN

REPORTS NOT PRINTED

LEGAL-NAME : TYREE ENVIRONMENTAL TECHNOLOGIES
DOING BUSINESS AS:
USDOT # : 369209

THE FOLLOWING CARRIER SAFETY PROFILE REPORTS WERE NOT PRINTED DUE TO INSUFFICIENT DATA (OR NO DATA) AVAILABLE:

REPORT 3: ACCIDENTS - 4 YEAR SUMMARY
REPORT 4: INDIVIDUAL ACCIDENTS - MIN: 1 YEAR, MAX: 2 YEARS

STATE POINT OF CONTACT LISTING

STATE	TELEPHONE #
ALABAMA	(334) 242-4395
ALASKA	(907) 278-1779
AMERICAN SAMOA	(684) 699-8188
ARIZONA	(602) 223-2413
ARKANSAS	(501) 569-2426
BRITISH COLUMBIA	(250) 387-8724
CALIFORNIA	(916) 375-2805
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New York State Department of Environmental Conservation

Division of Environmental Remediation

Site Remediation Project
Becker Electronics
Site Number:4-20-007
East Durham, New York

Site Health And Safety Plan

May 3, 2000

Tyree Organization, LTD

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Becker Electronics
Site Number 4-20-007
East Durham, New York

Prepared By: **Aldo M. Gonzalez, OHST, CSP**
Health and Safety Manager
Tyree Organization, LTD

1.0 INTRODUCTION

The purpose of this Site Health and Safety Plan (HASP) is to define the requirements and designate protocols to be followed during the Site Remediation Project at the Becker Electronics Site, East Durham, New York for the New York State Department of Environmental Conservation.

1.1 Scope and Applicability

All personnel on site shall be informed of the site emergency response procedures and any potential fire, explosion, health, or safety hazards of the operation. This plan must be reviewed and acknowledged, by all personnel prior to entering the exclusion zone or contamination reduction zone.

This plan must be reviewed and an agreement to comply with the requirements contained herein must be signed by all personnel prior to entering an Exclusion Zone or Contamination-Reduction Zone (decontamination zone) area of the project site. These areas are designated based on the potential for contact with or exposure to identified contaminants above established OSHA PELs or other applicable guidelines exists.

During development of this plan consideration was given to current safety standards as defined by EPA/OSHA/NIOSH, health effects and standards for known contaminants, and procedures designed to account for the potential for exposure to unknown substances. Specifically, the following reference sources have been consulted:

- OSHA Regulations: 29 CFR 1910 and 1926
- USEPA Standard Operating Safety Guides, June 1992
- NIOSH/OSHA/USCG/EPA "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities"
- NIOSH Pocket Guide to Chemical Hazards, June 1994
- ACGIH Threshold Limit Values for Chemical Substances and Chemical Agents
- Hazardous Waste Handbook for Health & Safety, Martin, Lippitti, Prothero, 1987
- Handbook of Toxic and Hazardous Chemicals and Carcinogens, Sittig, 1985
- New York State Right-To-Know Regulation
- NYS DEC Becker Electronics, Site Remediation Project Specifications.

In addition, to the above referenced documents, Tyree has established a comprehensive and realistic Health and Safety Program, based on past experience, sound engineering practice, employee training and enforcement of health and safety regulations to prevent unreasonable health and safety risks.

This Health and Safety Plan will be complemented by the existing Tyree Health and Safety Program. This plan will be a living document in that it will be continually updated or revised as the site conditions and knowledge of the treatment process develops further.

Tyree as part of the overall Company Health and Safety Program maintains written individual procedures for the types of hazards/issues that our employees will or could be potentially exposed. These programs will be reviewed/revised on an annual basis or as required by the respective governing OSHA Standard. Each program insofar as possible will be maintained as an independent program to avoid situations where it is unclear where responsibility for given issues belong. Effective implementation of these programs requires support from top management to every employee within the company. Written programs will be communicated to personnel that are affected by it through training.

The development and preparation of this Health and Safety Plan has been based on past experience and site specific information at the time of preparation. If actual site conditions or operations vary from the data used to prepare this Health and Safety Plan, amendments shall be made to reflect those changes.

1.2 Site Visitors/Inspectors

All visitors and inspectors entering a Contamination-Reduction Zone and Exclusion Zone at the site will be required to read and verify compliance with the provisions of this HASP. In addition, visitors will be expected to comply with relevant OSHA requirements such as medical surveillance (Section 9.0), training (Section 10), and personal protective equipment (Section 5). All visitors and inspectors will also be expected to provide their own protective equipment. In the event that a visitor or inspector does not adhere to the provisions of the HASP, he/she will be requested to leave the work area. All non-conformance incidents will be recorded in the site log by the Site Safety and Health Officer.

1.3 Site Description

The Becker Electronics site is located on the west side of New York State Route 145 in the hamlet of East Durham within the Town of Durham, Greene County, New York. Becker Electronics, Inc. manufactured high fidelity speakers and speaker components at the East Durham location from approximately 1976 to 1988. Manufacturing at this location ceased in 1988 when the company declared bankruptcy and closed the facility.

The Becker site encompasses approximately 13.7 acres and includes approximately 96,000 square feet (sq. ft.) of manufacturing and office space plus approximately 13,850 sq. ft. of support buildings including a truck garage and maintenance structure, a sawdust storage building, a chemical storage building and a small pump house. Both paved and gravel surfaced parking areas are located on the easterly side of the site adjacent to Route 145, and a fixe pond with a surface area of approximately 0.4 acres is located along the westerly border of the site. The fire pond and adjacent lands drain through a ditch which runs to the south along the westerly site border and then east along the southerly border to Route 145. Drainage from the site ultimately discharges to Catskill Creek approximately 500 feet to the east.

Several large piles of debris cover approximately one acre in the westerly portion of the site south of the fire pond. These piles contain sawdust, particle board used for the construction of speaker cabinets, scrap metal, scrap building materials and other solid wastes, The ditch which drains the fire pond passes along the westerly side of these debris piles, and some of the debris has migrated into and partially blocked the drainage channel.

The debris piles and the fire pond are located on high ground in the westerly portion of the plant site. The central and easterly portions of the site were apparently graded to create a lower, relatively level area for construction of the main manufacturing building and other buildings. This grading work resulted in the creation of a relatively steep bank which slopes sharply downward from the higher ground on which the debris piles and fire pond are located to the level area occupied by the buildings. Shale bedrock is exposed along the face of this bank, particularly in the area just east of the debris piles. A drainage swale is located along the toe of the bank and carries runoff and groundwater seeping from the exposed shale towards the south and east where it joins the drainage from the fire pond and from the westerly portions of the debris piles. This drainage swale is poorly graded and partially blocked by sediment, vegetation, and debris. As a result, water ponds along the base of the slope during periods of wet weather or snow melt.

The water supply for the site was obtained from on-site wells. Wastewater generated on the site was treated and disposed of in three separate septic systems. The leach field for one of these septic systems was located between the debris piles and the top of the bank which slopes down to the manufacturing area of the site; another was located in the south east comer of the site, and the third was in north east comer of the property.

2.0 STAFF ORGANIZATION AND RESPONSIBILITIES

While the Health and Safety Department directs and supervises the overall Health and Safety Program, the responsibility for health and safety extends throughout our

organization from top management to every employee.

The following outlines the Tyree personnel and responsibilities during the Site Remediation Project at the Becker Electronics Site:

- Health and Safety Manager: Aldo M. Gonzalez, CSP
- Certified Industrial Hygienist: Melinda Horan, MHB Associates, Inc.
- Site Health and Safety Officer: TBD
- Medical Consultant: Dr. Robert MacMillan, Environmental & Occupational Specialist
- Project Superintendent: TBD
- Project Manger: Phill Halloway

2.1 Health and Safety Manager

Responsible to the Chief Operating Officer, the Health and Safety Manager formulates, administers and coordinates programs for the company to reduce the risk of loss due to employee injury, regulatory non-compliance, general liability, fire, theft or damage. The Health and Safety Manager will develop written detailed policies and procedures covering elements in the Health and Safety Program.

2.2 Certified Industrial Hygienist

Under direction of the Health and Safety Manager, the CIH will review and oversee the implementation of the Site Health and Safety Plan (HASP), oversee initial site specific training of on site personnel, provide on-site consultation, develop and supervise the air monitoring plan, and perform safety audits and document review. Amend the HASP as site conditions change.

2.3 Site Health and Safety Officer

Under the direction of the of Health and Safety Manger and the CIH, the SHSO shall implement this HASP, coordinate remediation activities and safety activities with the Project Superintendent on a daily basis to ensure that the planned work objectives reflect adequate safety and health considerations. Conducts safety meetings and inspections. Provides written confirmation to the client and its representatives that all personnel active in the remedial action have fulfilled the Medical and Training Requirements of OSHA 1910.120, and maintains pertinent records and site control procedures at active sites. Maintains a complete copy of this plan (and its supplements and addenda) at the site during all field activities and assures that all workers and

visitors are familiar with it. Performs site specific training and briefing sessions for employee(s) prior to the start of field activities at the site and a briefing session each day before starting work. Assures the availability, use and proper maintenance of specified personal protective equipment, decontamination, and other health and safety equipment. Maintains a high level of safety awareness among team members and communicates pertinent matters to them promptly.

Responsible to the SHSO a Site Health and Safety Technicians will be assigned to each work crew during intrusive activities. He shall be responsible for air monitoring, decontamination activities, inspections and providing safety oversight on behalf of the SHSO.

2.5 Site Superintendent

The Project Superintendent has the operational responsibility for the implementation of the this HASP on this project; including establishing an attitude of concern for Safety matters by initiating prompt corrective action of hazards brought to his attention and ensuring that the project health and safety requirements are initiated and followed by all project personnel.

The Superintendent plans and require that all work be done in compliance with this HASP, the Tyree Organization's Health and Safety Program and/or the Client's safety program including all applicable local, state and federal regulations. Impress upon all subcontractors' supervisory personnel a responsibility and accountability of each individual to maintain a safe workplace and work in a safe manner. Conduct a daily "toolbox" safety meeting with site personnel and subcontractors.

2.6 Medical Consultant

Recommend appropriate medical surveillance and work closely with the Health and Safety Manager and CIH on health and safety issues for the duration of the project.

2.7 Project Manager

The Project Manager has full responsibility for ensuring that the policies and procedures outlined in the Health and Safety Program are adhered to on the project. The Project Superintendent, by example, establishes an attitude of concern for Safety matters and assists the site safety officer to recognize and resolve safety violations and items of non-compliance.

2.8 Work Force

It is the responsibility of all employees to work in a manner that will prevent injury and exposure to themselves and to other employees. Every employee is responsible for obeying safety rules and regulations, and reporting unsafe conditions or acts to their supervisors

3.0 SITE CHARACTERIZATION AND ANALYSIS

Industrial facilities and construction sites can cause a multitude of health and safety concerns any of which can result in serious injuries and/or illnesses of workers. Some hazards are a function of the physical, or chemical nature of the site itself. Others are a direct result of the work being done.

Based on information provided to Tyree, including the historical and current uses of the property, and the knowledge of the current site conditions, the overall health hazard rating assigned to the Becker Electronics site is low. The greatest risk of exposure to hazardous materials is through inhalation of volatile organic vapors, dust and contact with contaminated materials during the actual remedial construction activities.

3.1 Summary of Work

3.1.1 Site Mobilization/Establishment of Work Areas

The preparation for setting up the jobsite trailers, will include also the liquid containers and soil staging areas that will be set up. The decontamination pad and contractor equipment staging areas will be setup and constructed. Appropriate measures (e.g., barricades and temporary fencing) will be taken to physically isolate work areas at the site from the remaining portion of the property. The control of soil erosion and sedimentation will be achieved using silt fences around the perimeter of both the main soil excavation and the soil staging areas.

3.1.2 Demolition of Former Chemical Storage Building

The existing concrete block building with its associated concrete slab floor and footings will be demolished. Special care will be taken to ensure that the slab will be broken into manageable sections that can be easily loaded for subsequent transport to the onsite debris pile. Soils adhered to the pieces of concrete will be removed prior to the

concrete pieces moving to the debris pile. The debris will be moved with a loader or small dump truck to the existing onsite debris pile.

3.1.3 Excavation of Soils

The soils located below the former chemical storage building are slated for excavation. The contaminated soil under the footprint of the building will be excavated to a depth of approximately seven feet below grade within the limits detailed in the contract drawings. The excavated soils will be transferred to the staging areas. Samples will be collected from the stockpiles for laboratory analysis to determine their respective waste stream classification.

Large size boulders should they be encountered, will be cleaned of soil and returned to the excavation as backfill. The excavation will be backfilled with clean select fill brought to the site from a borrow source. The excavation will be backfilled with successive one-foot lifts of fill materials. Each lift will be compacted with a walk-behind tamper for compaction. All methods of excavation to be performed at the site will conform to OSHA regulations.

3.1.4 Debris Relocation and Capping

The material associated with the demolition of the building will be transferred to the existing debris pile onsite. The western portion of the property that includes the drainage swale will be grubbed and regraded to promote proper drainage. The cut and chipped vegetation along with the existing debris located along the western portion of the site, and miscellaneous debris will be consolidated into one large pile.

The regraded pile will be covered with a single layer of stabilization fabric. A minimum 12-inch layer of low permeability soil will be spread over the fabric and compacted. The compacted pile will be finalized with a 6-inch minimum layer of topsoil and then seeded.

The top portion of the debris cap will contain two gas vents that assist in venting out the gasses of decomposition.

3.1.5 Sampling and Analysis of Site Media

Samples for laboratory analysis will be collected from several sources during site remedial activities. Soil samples will also be collected from the excavated contaminated

soils to determine the placement into a waste category. Waste liquids generated from site activities and decontamination operations will be temporarily stored on-site in appropriate containers.

3.1.6 Monitoring Well Modification

There are 5 existing groundwater monitoring wells (MW-106D, OW-1, OW-2 and OW-4) that are to be modified and completed as recovery wells as part of the site remediation activities. These existing wells are to be redrilled to increase the nominal borehole diameter to 6-inch. Prior to drilling each well, the existing well casings will be removed. The overdrilling will be performed utilizing large diameter hollow stem augers advanced to bedrock. The bedrock section of each well is to be reamed utilizing air-rotary methods.

In sequence to the additional work being performed at the site, new pumps are to be installed in each of the five wells. The underground discharge lines and electrical conduit will be installed in trenches that will be constructed concurrently with the groundwater treatment facility. The trenches will be backfilled following line pressure testing. The soils and water generated from well modification activities will be managed according to the specifications.

3.1.7 Groundwater Treatment System

A treatment system for the groundwater will be constructed inside the existing warehouse building onsite. A portion of the existing building will be modified to accommodate the treatment facility. The building modification portion of work will be performed concurrently with the grading of the debris pile.

The building is to be partitioned to form a room of suitable size for the treatment system. Modifications include new interior walls, insulation, replacing the large sliding door with a smaller double leaf door. The concrete floor will be added to provide for secondary containment in the event of future spills and to provide drainage inside the treatment area. The piping and conduit from each of the recovery wells will be installed to the building. An effluent drain line will be installed away from the building and trenched for gravity flow to the existing drainage swale.

The system components will be installed into the building and piped as specified. The electrical components will be installed concurrently with the piping. Additional items to be installed include electrical heaters, ventilation fans, lighting, and an alarm system with telephone service for automatic dialing.

3.1.8 Transport and Disposal of Wastes

The waste streams generated at the site will be properly classified and approval from the NYSDEC for each classification will be obtained prior to offsite shipment.

3.1.9 Site Restoration

Upon completion of the excavation and debris pile cap construction activities, site restoration will take place. This will consist of fine grading and topsoil placement in both the main excavation area and the cap and grubbed areas where the surface has been disturbed.

3.2 Chemical Hazards

The primary chemicals of concern during the Site Remediation Project at the Becker Electronics will be Acetone, MEK, Methylene Chloride, 1,1 Dichloroethene, 1,1, Dichloroethane, 1,1,1 Trichloroethane, Trichloroethene, Toluene, Ethylbenzene and Xylene. **Please refer to Attachment I Material Safety Data Sheets**

As part of the plant's manufacturing operations, 1,1,1 trichloroethane (1,1,1 -TCA), 2 Butanone (MEK), and other solvents were used to remove oils from speaker magnet plates and other metal parts, to degrease mechanical machinery, to remove glues and contact cement used in the manufacture of speaker cabinets, and for general cleanup purposes. Fuel oil, diesel fuel and gasoline were also stored in tanks on the site. Discharges of solvent contaminated wastewater, poor waste handling practices and suspected accidental spills led to contamination of the soil and groundwater at the site. Maximum concentration of contaminants found on site are listed below.

Compound	Maximum Concentration Found (mg/kg)
Acetone	120
MEK	24
Methylene Chloride	70
1,1 dichloroethene	0.80
1, 1 dichloroethane	1.1
1, 1, 1 -TCA	64
Trichloroethene	3.7
Toluene	2,000
Ethylbenzene	600
Xylene (total)	3,400

The primary route of exposure at the site is the inhalation of vapors during the intrusive activities (excavation and drilling operations) at the site. Direct reading air monitoring instruments will be used to determine suspected airborne hazard exposures including, volatile organic compounds, oxygen percent concentrations, and combustible gases.

Direct contact of the skin and eyes is another important route of exposure to consider on this project. In order to protect workers against potential contact with hazardous materials, they will be required to wear appropriate personal protective clothing during remedial construction activities. Proper personal decontamination procedures are critical during remedial construction activities in reducing the potential for skin contact.

Although ingestion should be the least likely route of exposure, employees will be made aware of how this type of exposure can occur and methods to avoid such exposure. Deliberate ingestion of chemicals is unlikely and personal hygiene habits such as eating, drinking and smoking which provide a route of entry for chemicals will be restricted to specified areas where the potential for exposure is minimal. Proper decontamination procedures will help to reduce or eliminate the potential for ingesting hazardous materials. Site personnel will be required to wash their hands, face and other exposed skin areas before eating, drinking or smoking. These functions are only be permitted in designated areas.

3.3 General Site Hazards

While it is important to identify and be aware of potential physical hazards and the means by which to reduce the risks from the same, a detailed discussion of these is an insurmountable task. As such, the recognition, evaluation and control of site activities associated with the potential hazards is best accomplished by the development, use and implementation of standard operating procedures and guidelines, as well as ongoing consultation of applicable standards and regulations. The following tables describes some general site hazards that are involved in all project tasks, and specific tasks hazards and prevention are presented in **Attachment II, Task Specific Hazard Analysis.**

General Hazard	Hazard Prevention
Back strain due to work activity	Utilize proper lifting techniques and/or equipment
Heat stress	Implement heat stress management techniques such as shifting work hours, fluid intake, and monitoring employees
Cold exposure	Implement cold exposure techniques such as wearing proper clothing, having heated rest areas, and employee monitoring
Lacerations, punctures, or bruises from pinch points between equipment or objects in motion.	Proper guards and/or signs will be utilized to prevent injury and/or warn against potential hazards
Slips, trips, and falls	Be alert and observe terrain while walking to reduce slips and falls. Walkways will be kept clear of debris and/or ice.
Eye injuries caused by flying or splashing objects	Approved safety glasses with side shields, goggles and/ or face shields
Foot injuries caused by falling objects, rolling heavy equipment, or sharp objects	Steel toe and puncture resistant ANSI approved footwear.
Injuries caused by poor maintenance of equipment or operator error	Ensure all maintenance is performed on vehicles before going into the field. Only properly trained personnel will be allowed to operate equipment

3.3.1 Oxygen Deficiency

Oxygen deficiency may occur on-site during remedial activities, due to displacement of oxygen by other gases in confined spaces. The oxygen content of ambient air is 21 percent. Physiological effects of oxygen deficiency are readily apparent when the oxygen concentration decreases below 16 percent. Oxygen-deficient conditions may be controlled in the following manner:

- Monitoring air concentrations for oxygen shall be conducted in the breathing zone with an Oxygen Meter (02/LEL Meter). Monitoring can reduce risks by indicating when action levels have been exceeded.
- Supplied-air type respiratory protection shall be utilized in areas known to have oxygen concentrations below 19.5 percent.

3.3.2 Explosive Atmospheres

The potential for explosive atmospheres exists when the following conditions occur 1) the levels of combustible gases accumulate to within the explosive limit range; 2) the gas is generated in the presence of oxygen; and 3) there is a source of heat or ignition. Explosive conditions may be controlled in the following manner.

- Monitoring air concentrations for explosive gases shall be conducted in the Immediate area of source(s) with a Combustible Gas Indicator (02/LEL meter). Monitoring can reduce risks by indicating when action levels have been exceeded.
- Inert gases (nitrogen) shall be used to displace combustible gases. Intrinsically safe equipment shall be used whenever possible.
- All operations shall cease and desist if oxygen concentrations exceed 23.5 percent.

3.3.3 Heat Stress

Heat stress may be a hazard for workers wearing protective clothing even if the temperature is moderate. The same protective materials that shield the body from chemical exposure, prevent heat and moisture from dissipating. Personal protective clothing can therefore create a hazardous condition. Depending on the ambient temperature and the work being performed, heat stress can occur very rapidly - within as little as 15 minutes.

In its early stages, heat stress can cause discomfort and inattention, resulting in impaired functional abilities that can threaten the safety of both the individual and his co-workers. Personnel will be instructed to recognize the symptoms of the onset of heat stress. Project supervisory personnel will periodically check all personnel working in thermal stress areas to ensure that the symptoms are recognized. Frequency of heat stress monitoring and checks for symptoms of heat stress will increase with rises in air temperature, humidity, and the degree of exposure to high temperature areas.

Monitoring of personnel wearing impervious clothing (tyvek) will commence when the ambient temperature is 70 degrees F or above. Monitoring frequency will increase as ambient temperature exceeds 85 degrees F. Body temperatures pulse monitoring will be performed with a portable monitor. The oral temperature shall not exceed 100.4° F. If an employee's pulse rate exceeds the maximum age adjusted heart rate (0.7(220-AGE)), the employee shall be required to stop work and rest at the work site or move to an air conditioned room after proper decontamination. The affected employee may be allowed to return to work after his/her pulse rate has dropped below 100 beats per minute. Please refer to SOP-23 Heat Stress Management.

Fluids shall be provided and rest breaks will be taken. The frequency of breaks will increase with the temperature. Such things as cooling vest, portable fans and breaks in air-conditioned areas shall be used if necessary.

Any individual showing susceptibility to heat stress will be referred to a physician for evaluation. Individuals will be encouraged to increase their consumption of fruit juices to replenish lost fluids.

3.3.4 Noise

Noise is found at remediation sites in such operations as transportation and with heavy construction equipment. Noise has been defined as unwanted sounds. The human ear can tolerate a certain amount of sound without any harmful effects. The OSHA standard allows 90 dB(A) for a full 8 hours and for a lesser time when the levels exceed 90 dB(A). It is usually safe to assume that if you need to shout to be heard at arms length, the noise level is at 90 dB(A) or above. Hearing protection will be utilized by personnel operating or working around construction equipment or power tools.

3.3.5 Electrical

Overhead power lines, electrical wires, electrical fixtures, and buried cables all pose a danger of shock or electrocution if contacted or severed during site operations. A safe distance will be maintained between overhead wires. Electrical equipment used on site may also pose a hazard to workers. Whenever possible, low-voltage equipment with ground-fault interrupters and water-tight, corrosion-resistant connecting cables to minimize this hazard will be used. In addition, lightning is a hazard during outdoor operation, particularly for workers handling metal containers or equipment. In the event of a lightning storm, operations involving cranes or back-hoes will cease for the duration of the storm.

No employee shall be permitted to work in the proximity of any part of an electrical power circuit unless the person is protected against electric shock by de-energizing the circuit and grounding it, or it has been locked and tagged out. These procedures will be utilized when work has to be performed on energized equipment.

All electrical wiring and equipment shall be intrinsically safe for use in potentially explosive environments and atmospheres. Ground fault circuit interrupters shall be used in the absence of properly grounded circuitry or when portable tools must be used around wet areas.

3.3.6 Safety Hazards

A hazardous waste site may contain numerous safety hazards of which workers should be aware such as:

- Holes and ditches.
- Precariously positioned objects, such as drums or boards that may fall.
- Sharp objects, such as nails, metal shards, and broken glass.
- Slippery surfaces.
- Steep grades.
- Uneven terrain.
- Unstable surfaces, such as walls that may cave in or flooring that may give way.
- Contaminated soil, refuse and/or buried drums.

3.3.7 Slip/Trip/Hit/Fall

Slip/trip/hit/fall injuries are the most frequent of all injuries to workers. They occur for a wide variety of reasons, but can be minimized by the following prudent practices:

- Spot check the work area to identify hazards.
- Establish and utilize a pathway which is most free of slip and trip hazards.
- Beware of trip hazards such as wet floors, slippery floors, and uneven surfaces or terrain.
- Carry only loads which you can see over.
- Keep work areas clean and free of clutter, especially in storage rooms and walkways.
- Communicate hazards to on-site personnel
- Secure all loose clothing, ties, and remove jewelry while around machinery.
- Report and/or remove hazards.
- Keep a safe buffer zone between workers using equipment and tools.

3.3.8 Hand and Power Tools

Hand and power tools are used for various site activities. Procedures for using hand and power tools are as follows:

- Persons using power tools shall be trained in their use.
- Only tools in good condition shall be used.
- Tools shall be kept clean.

- Guards and shields shall be kept on all tools.
- Air coupling shall be secured.
- Non-sparking tools shall be used in hazardous areas.

3.3.9 Heavy Lifting

First, use a pushcart or other material-handling device! Second, ask a co-worker for help if no device is available! If you must lift alone here are some tips. Before starting to lift or carry anything, check your entire walkway to make sure your footing will be solid. Your shoes should give you good balance, support and traction. Keep loads as close to your body as possible. The following situations show basic lifting techniques to avoid injury:

- Keep your feet shoulder width apart to get the best footing possible.
- Grasp the object at opposite corners.
- Lift with the legs instead of the back muscles.
- Keep the back upright and avoid twisting.
- Most importantly, think before lifting.
- Bend at the knees, not at the waist.
- Tighten stomach muscles to offset the force of the load.

3.3.10 Fall Hazards

To prevent falls and injuries when employees work in areas where fall hazards cannot be eliminated by reasonable means, personnel will be required to use a full body harness or safety belt and shock absorbing lanyard. Personnel will make maximum use of primary fall protection systems, such as scaffolding and scissors lifts. These systems will be equipped with standard guard rails and safe means of access/egress.

Before any employee attempts to work in an area where a high risk of falls exists, they must equip themselves with suitable fall-arresting equipment. Personnel riding on or working from scissors lift must secure their safety lanyards to the basket at all times.

The fall protection equipment shall be properly fitted and shall not restrict the movements of the worker. Full safety harnesses or safety belts are required for any work performed over six (6) feet in elevation.

Tail lines or lanyards of the shortest workable length must be attached to a secure point in the vicinity of the work area. The line shall be long enough not to restrict the worker's movements, but short enough to prevent tripping over the line and falls beyond the

worker's extended reach for self-rescue; in any case, not over six (6) feet.

3.3.11 Excavation Hazards

In, general, the hazards encountered during soil excavation are: the sides of excavation can cave in, possibly burying or crushing workers due to (a) Absence of shoring, (b) Misjudgment of stability, (c) Defective shoring, and (d) Undercut sides; falling during access/egress, while monitoring or dismounting equipment, or stumbling into excavation. An overhead hazard can result from material, tools, rock, and/or soil falling into the excavation. Flammable atmospheres may also be encountered in excavation.

Tyree shall provide adequate shoring or sloping of sides of the excavation. Excavation/trenches will be inspected daily for changing conditions. Air monitoring for airborne contaminants shall be performed in areas where contaminated soils are encountered.

Excavation spoils will be stockpiled and covered at a designated area away from the work area. Excavation/Trenches regardless of the depth or width shall be barricaded or covered. The use of raised berms, caution signs and caution tape will be used to protect both the public and other personnel on the site. The excavation area will be delineated with caution tape during operations and barricaded/secured with safety fence at the end of each workday. Adequate means of exit, such as ladders, steps, ramps or other safe means of egress, will be provided and be within 25 feet of lateral travel.

3.3.12 Heavy Equipment Operations

Considerations for controlling the movement of personnel and equipment in a construction area are vitally important to any project, as injuries may occur while working with or adjacent to such equipment. This category includes all operations which utilize moving heavy equipment including: cranes and hoists, backhoes, loaders, graders, dozers, vacuum trucks and dump trucks. The following controls, in addition to relative standard operating procedures. Will be implemented throughout the project:

All Workers will adhere to all applicable standards and regulations while operating heavy equipment at the site. Operators will be trained and experienced in the use and maintenance of the equipment they are operating. Equipment will be inspected on a daily basis to identify any worn parts, and/or unsafe conditions, these findings will be documented on the vehicle inspection report. Any unsafe equipment will be removed from service until safety defects can be corrected. Equipment operators will not leave their machine unattended while it is running. All equipment will have electronic backup

alarms. No vehicles or equipment will be operated in a careless or unsafe manner. Personnel will wear high visibility reflective vests when working. All personnel will stay a minimum of 4 ft clear of the operational area of the equipment. Signals will be given to the operators of both equipment and vehicles in any work area by one designated person.

3.3.12 Crane Operations

Cranes play an important role when we have to move certain types of materials. OSHA permits only trained and qualified employees to use this equipment. There are two main hazards when we use cranes, one is dropping the load and the other hitting someone with the load or the equipment. We also want to avoid damaging the load or the equipment itself. These hazards are present any time we skip a step or ignore a problem at any point in the inspection, maintenance, and use of this equipment. To avoid danger to the operator and others in the crane's vicinity, we all have to understand the safety procedures and follow them closely. Anyone who works around an operating crane has to be constantly aware of its movements. Stay out of the way of the machine and its moving parts. If the operator sounds the crane's warning signal, get out of the way and fast. It's also a good idea to become familiar with the crane signalman's hand signals.

The other key to potential crane and sling hazards is the equipment rated capacity, or the maximum load it can handle safely. Cranes and slings are designed and built to help protect both operators and those in the area from hazards.

To prevent overload, the operator has to check equipment load capacity and the weight and shape of the load. Before lifting, the operator brings the hook over the load, making sure that it's not swinging. Then the operator checks that the hoist chain or rope has no kinks or twists and isn't wrapped around the load. If the load has sharp edges, it has to be padded to prevent cutting the slings. If the load is close to the rated capacity, the operator has to test the brakes by raising the load a few inches and then braking. Tools, oilcans, waste, etc., must be kept in the toolbox. The operation must be very smooth and careful, avoiding sudden starts and stops as well as any contact with other equipment, materials, or people.

3.4 Engineering Controls

The use of engineering controls for the protection of personnel is the first means of mitigation. This involves the elimination of hazards and the isolation of the workers from the hazards.

3.4.1 Sheeting, Shoring or Sloping

The use of sheeting, shoring or other means meeting OSHA Standards shall be used in excavations of five feet or deeper when a worker has to enter the excavation. Covering a trench or stockpiled material with polyethylene sheeting will separate the workers from contaminants. Forced air ventilation is another means of mitigating hazards during utility operations.

4.0 SITE CONTROL MEASURES

This section outlines site control measures to be implemented to minimize potential exposure to and accidental spread of hazardous substances during the Site Remediation project at the Becker Electronic Site. Listed below are the work zones that shall be established. The zone boundaries may be modified as necessary as new information becomes available.

4.1 Exclusion Zone (EZ)

This zone, commonly known as the Hot Zone, is where there will be direct contact with the potentially contaminated material. The level of PPE required shall be based on hazard, site condition and air monitoring performed. The outer boundary of the Exclusion Zone, called the Hotline shall be delineated with caution tape or safety fence. The level of PPE required shall be based on hazard, site condition and air monitoring performed.

The Exclusion Zone may be subdivided into different areas of contamination and different levels of personal protective equipment may be assigned based upon the expected type and degree of hazard. Modification to the size and boundary of the exclusion zone will be made in the field based on operation and wind directions. The primary EZ location will be along the inside perimeter of the site. The secondary Exclusion Zone location shall vary based on remedial activities (e.g. excavation/trenching & drilling activities).

All activities in this contaminated area should be conducted using the "buddy system". This involves a buddy who is able to provide his or her partner with assistance, observe for signs of chemical or heat exposure, check integrity of personal protective equipment and go for help when needed.

4.2 Contamination Reduction Zone (CRZ)

This zone, commonly known as the Warm Zone, is where workers and equipment shall be decontaminated. This shall minimize the spread of contaminants from the EZ into clean areas. The contamination reduction zone will be located in front of or next to the EZ so that personnel exiting the exclusion can conveniently stop at the CRZ for decontamination.

Temporary CRZs or personal decontamination stations will be setup adjacent to the hazard specific Exclusion Zones to reduce the migration of contaminated sediments to other areas. These stations provide a means for prompt removal of soiled outer PPE at a location convenient to the operation prior to entering the shower area. Please refer to **Figure 1 – Typical Personnel Decontamination Stations** for a layout the decontamination station that will be setup outside secondary exclusion zones.

4.3 Support Zone

This zone, commonly known as the Clean Zone, is considered to be uncontaminated. This area shall be used as a storage area for operations equipment and break and toilet facilities will be located.

4.5 Personal Hygiene and General Safety Requirements

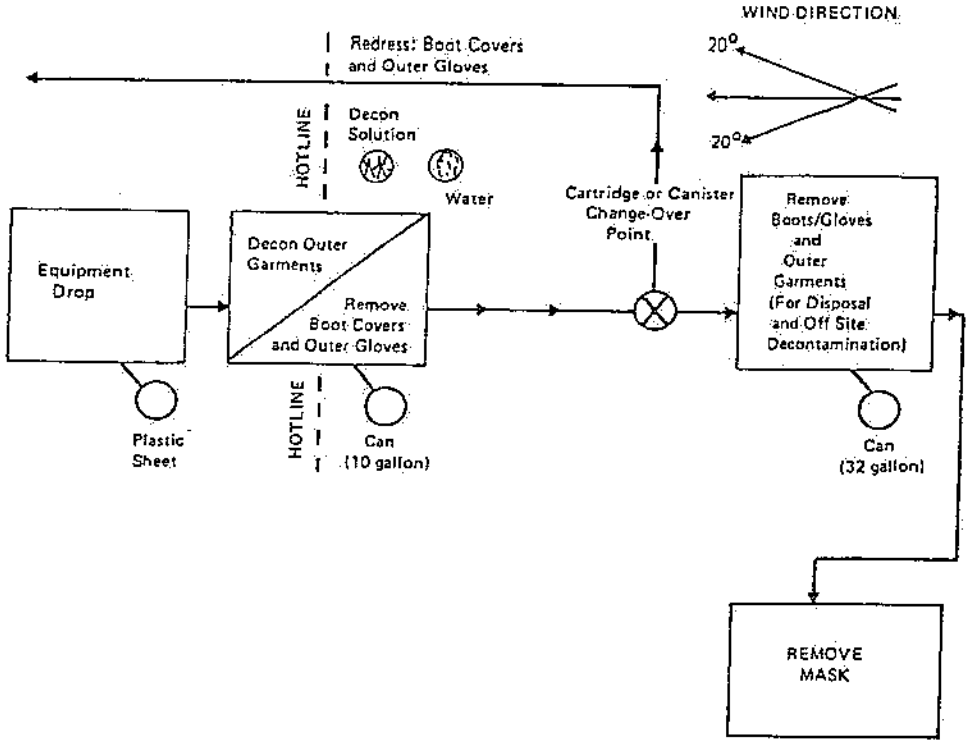
Personnel performing or supervising work within the Exclusion Zone, subject to exposure to chemical vapors, liquids, or contaminated solids, shall observe and strictly adhere to the provisions of this HASP.

Any Tyree employee, subcontractor or authorized visitor found to consistently disregard the provisions of this HASP may be barred from the site.

Eating, drinking, smoking, chewing gum or tobacco or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited, except in a designated eating area outside the exclusion and contaminant reduction zones.

Tyree employees, subcontractor employees, and service personnel are required to thoroughly decontaminate themselves prior to entering the support zone. No alcoholic beverages or controlled dangerous substances are allowed on site.

FIGURE 1 – TYPICAL PERSONNEL DECONTAMINATION STATIONS



No facial hair which interferes with the effectiveness of a respirator shall be permitted on personnel required or potentially required to wear respirators.

Personal Protective Equipment (PPE) must be utilized by on - site personnel when deemed necessary. Each individual will be responsible to properly inspect their PPE prior to entering the CRZ and exclusion zone. Hard Hats and Safety Glasses with side shields will be worn on-site at all times.

No open flames or smoking will be permitted in the Exclusion Zone or Contamination Reduction Zone unless a HotWork Permit has been initiated.

When possible, avoid contact with contaminated materials.

5.0 PERSONAL PROTECTIVE EQUIPMENT

This section provides an outline of the personal protective equipment and guidelines that will be implemented to minimize chemical, and physical exposures and accidents during activities at the site. Where engineering controls and job hazard analyses do not eliminate all job hazards, employees will (where appropriate) wear personal protective equipment (PPE).

These include items such as, hard hats, face shields, safety goggles, glasses, hearing protection, footguards, gloves etc. The project manager under the direction of the Tyree Corporate Health and Safety Manager will ensure that equipment selected will meet the following requirements:

- It will be appropriate for the particular hazard.
- It will be maintained in good condition.
- It will be properly stored when not in use, to prevent damage or loss.
- It will be kept clean, fully functional and sanitary.

Protective clothing and PPE can present additional safety hazards. Supervisors will ensure workers wear appropriate clothing and PPE. These items will be worn so as not to create additional hazards.

All PPE will be selected in accordance with 29 CFR 1910.132. Tyree will provide proper PPE to all employees. All protective clothing will be properly used, stored, selected, and maintained.

5.1 PPE Hazard Assessment

Selection of the appropriate PPE is a complex process which should take into consideration a variety of factors. Key factors involved in this process are identification of the hazards, or suspected hazards, their routes of potential hazard to employees (inhalation, skin absorption, ingestion, and eye or skin contact); and the performance of the PPE materials (and seams) in providing a barrier to these hazards. The amount of protection provided by PPE is material-hazard specific. That is, protective equipment materials will protect well against some hazardous substances and poorly, or not at all, against others. In many instances, protective equipment materials cannot be found which will provide continuous protection from the particular hazardous substance. In these cases the breakthrough time of the protective material should exceed the work durations.

Other factors in this selection process to be considered are matching the PPE to the employee's work requirements and task-specific conditions. The durability of PPE materials, such as tear strength and seam strength, should be considered in relation to the employee's tasks. The effects of PPE in relation to heat stress and task duration are a factor in selecting and using PPE. In some cases layers of PPE may be necessary to provide sufficient protection, or to protect expensive PPE inner garments, suits or equipment.

The following are guidelines which an Tyree used to select PPE. Based on the Site Characterization And Analysis performed at the Becker electronics Site a combination of PPE has been selected from the different protection levels (i.e., A, B, C, D Modified or D) as being suitable to the hazards of the work to be performed. Section 3.0 of this plan characterizes and analyses, chemical and physical hazard, specific task/operations, route of exposure, and concentrations of contaminants. Characteristic, capability and limitations are summarized in this section.

- **Level A: The** highest level of skin, eye, and respiratory protection (No preparations have been made for Level A during this project.)

- **Level B: Should** be worn when the highest level of respiratory protection is needed, but a lower level of skin protection is needed, compared to that of level A.

- **Level C: Should** be worn when the criteria for using air-purifying respirators are met, and a lesser or the same level of skin protection is needed, compared to that of level B.

- **Level D: Level** D provides minimal protection against chemical hazards. A work uniform consisting of coveralls and/or long pants and sleeves may be worn in any area without the potential for significant respiratory or skin contact hazards. "Level D modified" should be worn when respiratory protection is not warranted but minimal dermal protection is necessary.

Personal Protective Equipment alone should not be relied on to provide protection against hazards, but should be used in conjunction with guards, engineering controls, and sound manufacturing practices.

5.1.1 Head Protection

All personnel shall wear a hard hat that meets the requirements and specifications in ANSI Safety Requirements for Industrial Head Protection Z89.1-1969. Exceptions to this requirement are personnel utilizing eating/break areas.

5.1.2 Hand Protection

Outer gloves used on the site for remedial activities shall be either chemical resistant (nitrile). The appropriate glove shall be determined for a specific work task. Inner gloves shall always be chemical resistant (nitrile). General Purpose gloves or any other special type of glove are to worn over inner gloves. All hand protection will be disposed as PPE Waste or remain in the exclusion zone.

5.1.3 Eye/Face Protection

Eye/Face protection shall be worn by all personnel at the site. All eye/face protection provided shall be ANSI Z87-1989 approved.

5.1.4 Footwear

Chemical Resistant steel-toed/shank safety boots will be worn while working in the decontamination reduction or exclusion zones. Chemical Resistant Boots will resist acids, oils, greases, and chemicals and meet ANZI Z41.1.

5.1.5 Protection Clothing

Polyethylene Tyvek or equivalent outer suits with booties will be worn. Cloth coveralls will be worn beneath the protective suit. Saranex or equivalent suits may be used if excessive contact with contaminated materials is expected

5.1.6 Respiratory Protection

Only NIOSH approved Respirators shall be used. MSA Ultra-Twin Full Face Respirators with MSA GME Super Cartridges will be utilized to against the inhalation hazard during remedial activities at the Becker Electronics Site. All requirements of 29 CFR 1910.134 "Respiratory Protection will be adhered to. Each respirator shall be individually assigned and not interchanged between workers without cleaning and sanitizing. The cartridges/filters shall be changed at least daily. More frequent changes shall occur at the first sign of breakthrough based on contaminant warning properties or the user experiences excessive breathing resistance. Respirators shall be cleaned and stored in an uncontaminated atmosphere after each use.

Employees will not be assigned to tasks requiring use of respirators unless it has been

determined that they are physically able to perform the work and use the equipment. A physician shall determine what health and physical conditions are pertinent.

All employees who have the potential of wearing a respirator shall be fit tested to ensure they utilize the proper size respirator. The fit test is conducted according to the manufacturer's suggestions. The test shall consist of a taste and odorous vapor qualitative test. Personnel that are unable to pass a fit test as a result of facial hair or facial configuration shall not enter a work area where respiratory protection may be required.

5.2 Levels of Protection

The level of Personal Protective Equipment must correspond to the level of hazards known, or suspected during a specific activity.

5.6.1 Level B:

Level B equipment, used as appropriate, is as follows:

- Positive pressure, full facepiece self-contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA (NIOSH approved)
- Saranex Tyvek with hood and booties
- Site Dedicated Cotton Coveralls
- Chemical Resistant Outer gloves: nitrile
- Inner gloves: nitrile
- Chemical resistant boots over the safety shoes
- Hard hat & Safety Glasses (Face Shield As required)
- Work Gloves
- Hearing Protection (when Necessary)

5.6.2 Level C:

Level C equipment, used as appropriate, is as follows:

- Full-face, air purifying, canister equipped respirators (NIOSH approved) utilizing MSA Organic Vapor/Acid Gas and HEPA cartridges/filters.
- Site Dedicated Cotton Coveralls
- Polycoated Tyvek with hoods and booties
- Chemical Resistant Outer gloves: nitrile

- Inner gloves: nitrile
- Chemical resistant boots over the safety shoes
- Hard hat & Safety Glasses (Face Shield As required)
- Work Gloves
- Hearing Protection (when Necessary)

5.6.3 Modified Level D:

Modified Level D equipment, used as appropriate, is as follows:

- Site Dedicated Cotton Coveralls
- Polycoated Tyvek with hoods and booties
- Chemical Resistant Outer gloves: nitrile
- Inner gloves: nitrile
- Chemical resistant boots over the safety shoes
- Hard hat & Safety Glasses (Face Shield As required)
- Work Gloves
- Hearing Protection (when Necessary)

5.6.4 Level D:

Level D equipment, used as appropriate, is as follows:

- Site Dedicated Cotton Coveralls
- Hard hat and Safety glasses
- Steel-Toed/Shank Safety Boots
- Work Gloves
- Hearing Protection (when Necessary)

5.7 Initial Levels of Protection

Based upon the nature of the remedial activities to be performed at the Becker electronics Site, the initial levels of protection to be used are outlined in **Figure 2 – Initial Level of Protection.** This table provides an overview of the protection program planned for each task. This table lists each work task and the initial level of protection. The initial level of protection is defined as that level in which work commences.

Air monitoring using direct reading instruments and personal air sampling will be performed to determine if an upgrade or downgrade is warranted. Air monitoring is

addressed in Section 7.0 Air Monitoring Plan. Should a downgrade be requested, personal air monitoring (8-Hour Time-Weighted Averages) will be performed to verify that personal exposure is below Action Limits set for this site.

All decisions on the level of protection will be based upon a conservative interpretation by the Site Safety Officer of the information provided by air monitoring results, environmental results and other appropriate information by the CIH.

FIGURE 2 - INITIAL LEVELS OF PROTECTION

Task Performed	Initial Level of PPE
Mobilization	Level D
Establishment of Work Areas	Level D
Demolition of Former Chemical Storage Building	Level D Modified
Disposal of Debris in Debris Piles	Level D Modified
Excavation of Contaminated Soils	Level D Modified/Level C
Processing of Contaminated Soils	Level D Modified/Level C
Debris Relocation, Regrading and Compacting	Level D Modified
Construct Vegetation Cover System	Level D/ Level Modified
Regrade Perimeter – Create Drainage Swales	Level D/Level D Modified
Clear Vegetation – Existing Drainage Swales	Level D/ Level D Modified
Site Soil Sampling	Level D Modified/Level C
Installation/Modification Groundwater Recovery Well	Level D Modified/Level C
Modification of Existing Structure - Groundwater Treatment System	Level D Modified/ Level C**
Install recovery Well Discharge Piping	Level D Modified/ Level C
Install Groundwater treatment System.	Level D/Level D Modified
Install Gravity Discharge	Level D Modified/Level C
Transportation and Disposal of Waste (TSD)	Level D
Site Restoration/ Demobilization	Level D

The level of protection selected is based upon the type, toxicity, and measured concentration of the chemical substances that are present, or known to have been

present in the intended work areas, potential for exposure to substances in air, splashes of liquids, or other direct contact with material due to the work activity, knowledge of chemicals on-site along with properties such as toxicity, route of exposure and contaminant matrix, understanding of chemical, physical, and biological, hazards that may be encountered, knowledge of work practices associated with potential hazards to avoid injury, and in situations where the type of chemical concentration and possibilities of contact are not known, the appropriate level of protection will be selected based on professional experience and judgement of the Health and Safety Manager and the CIH until the hazards can be better characterized.

6.0 DECONTAMINATION PROCEDURES

Decontamination (Decon) is the process of removing or neutralizing potentially harmful contaminants that have accumulated on personnel and equipment in order to reduce the spread of contamination outside the work area. Decontamination is critical to the health and safety of site workers and it protects the community by minimizing the off-site migration of contaminants. One of the most important aspects of controlling contaminated material migration is the prevention of the spread of contamination. Good contamination prevention will minimize employee and public exposure. Tyree will prevent the spread of contamination through the use of engineering controls.

All personnel leaving the Exclusion Zone must be decontaminated in the Contamination Reduction Zone prior to entering the Support Zone. The decontamination process is composed of a series of steps performed in a specific sequence. The basic concept is that more heavily contaminated items will be decontaminated and removed first, followed by decontamination and removal of inner, less contaminated items.

6.1 Personal Decontamination

As the worker leaves the Exclusion Zone he approaches the first station where he places his equipment and tools. After the worker places his equipment and tools down, he proceeds to the second station, where all outside protective clothing is washed off and rinsed. This area shall consist of tubs, long handle brushes and garden sprayers/hoses. At the next area, workers are required to remove their outer boots and then outer gloves and place them in plastic garbage bag lined drums. Once outer gloves are removed, workers are to proceed to the next station where workers remove all outer garments and place them in plastic garbage bag lined drums. Once workers are fully decontaminated and all garments are removed, workers proceed and remove their respirators. Used cartridges and inner gloves are placed into plastic garbage bags. Employee will them thoroughly cleanse their hands, faces, and other exposed areas before eating, or drinking. **Please refer to Figure 1 Typical Personnel**

Decontamination Stations.

6.2 Equipment Decontamination

Nearly all contractor hardware (not consumable) is considered to be recoverable. As such, they will be decontaminated using the proper equipment, (i.e. brushes, sprayers, detergent). Should equipment become heavily soiled, then the use of a water sprayer and/or scrapers and brushes shall be used before being decontaminated. In general, the high-pressure sprayer will be used for cleaning equipment: every effort will be made to remove adhering material with brushes, and high-pressure sprayer.

6.3 Decontamination Pad

The decontamination pad for vehicles and equipment leaving the Exclusion Zone will be located within the Contamination Reduction Zone. Should equipment become heavily soiled, a water sprayer and/or scrapers and brushes shall be used before being decontaminated. In general, the high pressure steam cleaner will be used for cleaning equipment. Every effort will be made to remove adhering material with brushes and the sprayer.

6.4 Decontamination Residue

Decontamination residue consists of disposable PPE (such as tyvek, gloves, tape and cartridges) and settled solids. With the exception of liquids from the equipment decontamination pad, contaminated liquids will containerized, sampled and disposed properly.

7.0 AIR MONITORING PLAN

The purpose of air monitoring is to identify and quantify airborne contaminants in order to verify and determine the level of worker protection needed. Unlike air sampling devices, which are used to collect samples for subsequent analysis in a laboratory, direct-reading instruments provide information at the time of sampling, enabling rapid decision-making. Data obtained from the real- time monitors are used to assure proper selection of personnel protection equipment, engineering controls, and work practices. Overall, the instruments provide the user with the capability to determine if site personnel are being exposed to concentrations which exceed exposure limits or action levels for specific hazardous materials.

7.1 Direct-Reading (Real-Time) Instruments

Unlike air sampling devices, which are used to collect samples for subsequent analysis in a laboratory, direct-reading instruments provide information at the time of sampling, enabling rapid decision-making. Data obtained from the real- time monitors are used to assure proper selection of personnel protection equipment, engineering controls, and work practices. Overall, the instruments provide the user with the capability to determine if site personnel are being exposed to concentrations which exceed exposure limits or action levels for specific hazardous materials.

During remedial construction activities on-site, the HSO will continuously monitor the work area for volatile organic compounds, combustible gas, and oxygen, using real-time monitoring equipment and recorded at a minimum of every 15-minutes. Air monitoring will concentrate on the workers breathing zone. Monitoring will be performed at the perimeter air monitoring stations at least 4 times per shift. Air monitoring data will be recorded on the Daily Health and Safety Report.

7.1.1 Organic Vapor Monitoring

During the remedial activities, organic vapor levels shall be monitored with a Thermo 580 B Organic Vapor Monitor set at the appropriate span setting and equipped with an 10.6 eV. Colorimetric tubes shall be utilized if necessary. Monitoring shall emphasize the breathing zone. The organic vapor action levels listed below.

7.1.2 Colorimetric Tubes

Colorimetric tubes shall be used to aid in the identification of organic vapor based compounds. Sensidyne tubes will be use to evaluate a sustained organic vapors readings.

7.1.3 Combustible Gases/Oxygen Levels

A combination combustible gas/oxygen/hydrogen sulfide meter will be utilized to monitor for explosive and oxygen enriched/deficient atmospheres and concentrations of hydrogen sulfide. The combustible gas/oxygen/hydrogen sulfide meter will be utilized for all intrusive activities and activities where the potential for disruption of utilities exists.

7.1.4 Particulates monitoring

Monitoring for total particulates will be performed using a real-time aerosol monitor. The monitoring will be performed at any excavation activity as well as during any disturbance of contaminated soil such as staging and loading operations. The instrument will be calibrated daily according to the manufacturer's manual. The meter to be used will be a miniram model miepdm-3 or equivalent capable of monitoring dust concentrations down to 0.01 mg/m3.

Dust suppression techniques (water spray or poly sheeting) will be employed when the downwind particulate level is 150 micrograms per cubic meter greater than the upwind level. Background and upwind levels will be established daily or at the beginning of the particular task. Real-time monitoring will also be performed at the designated perimeter locations (to be established at site set up with input from the NYSDEC onsite-representative) including an upwind and downwind location.

When the wind direction changes during the course of the day, a new background level will be recorded. Downwind readings at the perimeter will be made when the 150 ug/m3 action level is exceeded at the excavation face or a minimum of twice per day. If the action level is exceeded at the perimeter locations, work will be suspended, and engineering controls will be implemented to bring concentrations down to acceptable levels.

7.2 Real-Time Air Monitoring Equipment Calibration

Real-time air monitoring equipment calibration will be checked in accordance with the manufacture's recommendation, prior to field use. Calibration information will be recorded on the Daily Health and Safety Report.

7.3 Operational Action Levels

A decision-making scheme for an upgrade in levels of protection and/or withdrawal of personnel from an area based on atmospheric hazards is outlined in the table below. In general the decision making scheme will be followed, with the decision dependent upon actual site condition and contaminants.

When 15 minute average reading at the site perimeter exceeds 5 PPM for organic vapors down wind Tyree shall notify NYSDEC Division of Air Resources in writing within 5 working days The notification shall including a description of the control measures implemented to prevent further exceedances

The selection of chemical indicators of hazards is based on the potential sources and pathways for worker exposure during on-site work and regulatory/guideline exposure standards. The primary routes of exposure to chemicals at the Becker Electronics Site are anticipated to be via inhalation of airborne volatile constituents present in soils, inhalation of dust and dermal contact with soils contaminated with low levels of the detected compounds. Inadvertent ingestion of chemicals is also possible as a result of contact with contaminated media.

Volatile Organic Compounds (Total) will be the chemical indicators of hazard with regard to inhalation of volatile organic compounds, Measurements will be taken using direct reading instruments, such as PID and colorimetric indicator tubes, on a periodic basis.

The action level for total organic vapors shall be five parts per million above background as measured on the PID. The action level for odors shall be noticeable odors. **Please refer to Figure 3 – Operational Action levels.**

FIGURE 3 - OPERATIONAL ACTION LEVELS

Contaminants	Action Level	Action to Take
Volatile Organic Compounds HNU PID	1 To 5 PPM Above Background At The Breathing Zone And Sustained For 1 Minute	Level D, Continuous Air Monitoring Test for Chemical of Concern Using Colormetric Tubes. If over PEL for Specific Chemical upgrade to Level C. Continuos Air
	5 To 100 PPM Above Background At The Breathing Zone And Sustained For 1 Minute	Upgrade To Level C, Continuous Air Monitoring
	100 To 300 PPM Above Background At The Breathing Zone And Sustained For 1 Minute	Upgrade To Level B, Continuous Air Monitoring
	> 300 PPM Above Back Ground At The Breathing Zone And Sustained For 1 Minute	Stop Work, Evacuate Work Zone And Evaluate with Continuous Air Monitoring

Combustible Gas In Air	Less Than 10% LEL	Continue With Caution And Air Monitoring
	Greater Than 10% LEL	Stop Work, Immediate Withdrawal Of Personnel, Ventilate Space With Manhole Blower
Oxygen In Air	Less Than 19.5%	Stop Work And Ventilate Or Upgrade To Level B
	19.5 To 23.5%	Level D, Continue Work With Air Monitoring
	Greater Than 23.5%	Stop Work, Immediate Withdrawal Personnel And Evaluate

7.4 Personal Air Monitoring

In addition to the real-time air monitoring performed during remedial activities, the personal air monitoring program will provide for the determination of worker's airborne exposure levels. Such a determination will be made from laboratory analysis of air samples collected from workers during an 8- hour work shift. The selection of the worker to be monitored for daily exposure will be done by the Site Health and Safety Officer based on his professional judgment of the characteristics of the job and locations in each work area. Personal sampling will be conducted in a manner representative of exposure of workers at those locations or jobs where the potential for maximum exposure is predicted.

Initially, personal air monitoring will be performed on two workers (representative) for a two-day period for each new operation started during the remedial activities. The sampling strategy will depend on results of the initial monitoring. If levels above the Action Level (one half the Permissible Exposure Limits (PELs)) are detected, additional air monitoring will be performed. Air samples will be analyzed for volatile organic compounds identified on site and submitted to an AIHA accredited laboratory for analyses. Personal air sampling data will be recorded on the Personal Air Sampling Data Sheet.

Personal air monitoring results will be used to verify personnel exposure during remedial activities and to ensure that the Level of Personal Protection Equipment is adequate for work being performed. Upgrades in Levels of Personal Protection Equipment are based on real time direct-reading instruments. Downgrades in levels of

protection will be based on 8-Hour TWA personal samples.

7.5 Perimeter Air Monitoring/Community Air Monitoring

Volatile organic compounds must be monitored daily at the downwind site perimeter at least at 2 hour intervals. If total organic vapor levels exceed 5 PPM above the background, excavation/demolition activities must be halted and monitoring continued under the provisions of the Vapor Response Plan.

7.5.1 Documentation Monitoring

Documentation monitoring will be conducted at the perimeter of the site at the established perimeter monitoring locations. The perimeter monitoring locations will include one upwind and three downwind locations and will be setup and marked during the site setup phase of the project. Monitoring will be conducted for total dust and for total volatile organic compounds. Documentation monitoring will be performed only during soil excavation, staging or removal activities.

- Total nuisance dust will be collected using a PVC collection filter and personnel sampling pump and analyzed gravimetrically according to NIOSH Method 0500. Steps will be taken to prevent generation of dust or wind erosion of soils during the removal of soils at the site. Such steps shall include wetting down dry soils before excavation and removal.

- Documentation samples will be collected at the established perimeter locations. The four locations will be selected according to site activity and expected wind direction. At the end of the sampling period, the meteorological data will be reviewed and one upwind and two downwind samples will be selected for analysis. Samples are to be collected twice a week or at the initiation of a new phase of work. The samples are to be collected during normal working hours.

- The perimeter locations will be marked with high visibility paint and flagging. The samples will be collected at a height of six feet above land surface.

- Documentation samples will be collected onsite in addition to the perimeter samples. The samples will be collected by choosing "high risk" workers to wear appropriate collection media for particulates and VOCs.

- Samples will be analyzed for VOCs according to NIOSH Methods 1501 and 1500.

7.6 Vapor Emissions Response Plan

If real-time monitoring for organic vapors exceeds 5 ppm above background levels at the perimeter of the exclusion zone, excavation/demolition activities will be stopped and air monitoring continued. If the organic vapor level decreases 5 ppm below background then excavation/demolition activities can resume but more frequent intervals of monitoring as directed by the Site Health and Safety Officer will be conducted. If the organic vapor levels are greater than 5 ppm over background but less than 25 ppm above background at the perimeter of the exclusion zone, excavation/demolition can resume provided the following:

Monitoring 200' downwind of EZ or 1/2 distance of nearest structure; if < 5 ppm, resume site activities and increase monitoring frequency. If > 5 ppm monitor within 20 ft of nearest structure, two subsequent readings of < 5 ppm suspend monitoring, if 5ppm for 30 minutes or >10 ppm continue to monitor at 30 minute frequency until two readings of 5 ppm or make emergency contacts per Site Health and Safety Plan and evacuate upwind.

8.0 EMERGENCY CONTINGENCY PLAN

This section describes the emergency response plan that shall be implemented by Tyree employees to handle emergencies. It is expected that modifications may be necessary upon actual site set-up and conditions. During the site safety meetings held periodically, all employees will be trained in and reminded of the location of this plan, the procedures outlined in this plan, the communication systems and evacuation routes used during an emergency.

On a continual basis, individual personnel should be constantly alert for indicators of potentially hazardous situations and for signs and symptoms in themselves and others that warn of hazardous conditions and exposures. Rapid recognition of dangerous situations can avert an emergency.

All on-site employees have a role in mitigating an emergency incident. The Project Super has primary responsibility for responding to and directing emergency response operations to correct emergency situations.

This includes taking appropriate measures to ensure the safety of site personnel and the public. He/She is additionally responsible for ensuring that corrective measures have been implemented, appropriate authorities notified, and follow-up reports completed.

8.1 Medical Treatment/First Aid

On-site supervisory personnel are trained in CPR and First Aid and shall have a first aid kits for use in a medical emergency. First Aid Kits and eye wash station capable of providing 15 minutes of continuos flushing will be located in the contamination reduction zone. Community emergency services (EMS, Fire, and Police) shall be notified immediately if deemed their resources are needed on site. If necessary the injured or sick party shall be taken to a local area hospital. Please refer to **Attachment III - Route to Area Hospital or** direction to the area hospital.

8.2 Emergency Alarms/Notifications and Procedures

When any emergency occurs on-site, the on-site Project Superintendent shall be notified immediately. The Project Superintendent shall notify the client and his representatives. Please refer **Attachment III - Emergency Telephone Numbers**. In the event of a medical emergency, fire or spill, personnel will notify the appropriate emergency organization.

8.3 Evacuation Routes and Procedures

In the event of an emergency which necessitates an evacuation of the site, on-site personnel shall be notified to evacuate the area by immediate emergency exit. The Project Superintendent shall control the scene until the appropriate municipal and state agencies arrive onsite. In the event of a chemical release into the atmosphere, safe distances of evacuation will be determined, based on a combination of site- and incident-specific factors.

8.4 Emergency Equipment

Equipment shall be available on-site to handle emergencies such as injuries, fires and spills. This equipment includes first aid supplies, fire extinguishers, and personal protective equipment and spill response equipment.

Each active work area will be provided with a potable emergency eye wash bottle, 2-10 lbs. ABC fire extinguishers and a first aid kit. An "Industrial" first aid kit will be located in the Support zone (Tyree Trailer). The contamination reduction zone will be equipped with 15-minute eyewash station.

8.5 Spill Confinement and Containment

Where spills, leaks or ruptures may occur adequate quantities of spill containment equipment (ground clay, vermiculite, pads, booms, pillows, etc.) shall be kept available and used in areas where minor or major spills, leaks or ruptures may occur. Once a spill has been discovered, the first step is to determine the nature of the spill, its size, and its direction of travel. The Project Superintendent shall be notified immediately and he will determine what actions will be taken to contain the spill.

Prior to entering a spill area, it is necessary to protect oneself from the adverse effects of the spilled material. Do not enter the area alone.

The decision to use confinement techniques, such as diversion, diking, and retention, should be based on the availability of time, personnel, equipment and supplies. It should also be made with a review of the potential harmful effects (review of MSDS) of the leaking material downhill and downwind of the spill.

After a spill is contained, the Project Superintendent shall determine the appropriate cleanup and disposal methods with input from the client and their representatives. Material spills could occur during line breaking and draining, removing liquids and sludges from Tanks. Additionally, equipment fueling operations could produce spills. Ultimately, a spill could contaminate sewer systems or cause a release of vapors to the air. A spill of fuel could also ignite. A small spill should be cleaned up immediately, but should not trigger activation of these procedures. Should an on site spill occur, the immediate response will include closing off the source of the spill, if possible, application of the sorbent material or sand bagging, and street sweeping, as appropriate. All spills will be investigated, and a written report will be provided to the regulatory agencies in accordance with applicable regulations (as required).

8.6 Site Communications Plan

When any emergency occurs on-site, the on-site SHSO and Project Superintendent shall be notified immediately. The Project Superintendent or the SHSO shall notify the client and his representatives. Please refer to the Emergency Telephone Numbers, in this section.

To notify any site workers of an emergency, workers can be signaled by way of hand held or mobile two-way radios or as a backup, the use of an emergency alarm (portable air horn). Any audible pattern of blasts from a portable air horn become difficult to interpret due to distance and the inhibitory effects of a respirator.

All emergency communications will flow through the radio network. Outside emergency

services will be notified, as necessary. The site evacuation alarm consists of three quick blasts on a horn, every 10 seconds. Any time the alarm system is activated, on site personnel will be notified immediately. Personnel will extinguish any nearby ignition source and prepare for emergency response activities. This alarm will also be used to alert personnel of a sudden release of hazardous materials.

The observer of the emergency condition will brief the responding personnel as to the nature and location of the incident. When they have assessed the situation, a decision whether or not to implement these procedures will be made. If these Emergency Contingency Procedures are not implemented, the "All Clear" will be given verbally by supervisory personnel. The "All Clear" will be used to indicate a return to normal (non-emergency) conditions following emergency response activities. The alarm signals will be prominently posted at the site.

8.6.1 Audible Signal

- One long blast: Evacuate the area by nearest emergency exit.
- Two short blasts: Localized problem (not dangerous to workers).
- Two long Blasts: All clear.

8.6.2 Visual Signal

- Hand clutching throat: Out of air/can't breathe.
- Hand on top of head: Need assistance.
- Thumbs up: OK/I'm all right/I understand
- Thumbs down: No/negative.

All personnel shall assemble/muster at the Contamination Reduction Zone (CRZ) or Support Zone. Access to the site will be restricted. All non-emergency radio transmissions shall cease.

8.7 Worker Injury

Any person who becomes ill or injured in the Exclusion Zone must be decontaminated to the maximum extent possible upon being removed from the EZ. If the injury or illness is minor, full decontamination should be completed and basic first aid administered prior to transport. If the patient's condition is life threatening, at least partial decontamination should be completed (i.e., complete disrobing of the victim and redressing in clean coveralls or wrapping in a blanket). First aid should be administered while awaiting an ambulance or paramedics. Removal of gross contamination and dilution with copious amounts of water should take place until medical help arrives.

DO NOT MOVE AN UNCONSCIOUS PERSON, OR A PERSON WHO APPEARS TO HAVE A BACK, NECK OR HEAD INJURY (Fall Victim) UNLESS A LIFE THREATENING EMERGENCY EXISTS.

Any person being transported to a clinic or hospital for treatment will take with them information on the chemical(s) they have been exposed to.

8.8 Fire and Explosion

In the event of a fire or explosion, the Fire Department will be summoned immediately. The phone number for the Fire department will be posted in all of the offices and vehicles. Upon their arrival, the Site Superintendent and Site Health and Safety Officer will advise the fire commander of the location, nature, and identification of the hazardous materials on-site.

Successful extinguishment of a fire depends on the following conditions being met:

- The extinguisher is properly located and in working order.
- The extinguisher is of proper type for the fire.
- The fire is discovered while still small enough for the extinguisher to be effective.
- The fire is discovered by a person ready, willing and able to use the fire extinguisher.

8.9 Accident and Injury Reporting

All injuries, accidents and first aid (including minor scratches) must be reported to the Site Health and Safety Officer. The employee's supervisor or crew foreman is responsible for completing an Incident Investigation Report Form and submitting this to the Project Manager who will in-turn submit them to the NYSDEC Project Engineer within 24-hours of the incident. All reports will be kept in a master file as well as a copy placed in the affected employee's on-site medical records file.

The cause of the incident will be reviewed, and if time permits, the appropriate corrective measures to reduce the possibility of similar incidents in the future will be discussed with the senior member of each contractor or agency prior to implementation. All accidents and incidents will be followed up with a discussion of the causes and corrective actions taken during the next safety meeting

8.10 Safe Work Practices

Tyree will post safe work practices in each on-site trailer, within the contamination reduction zone, and at the entrance to the site and shall be reviewed with all personnel on site.

9.0 MEDICAL SURVEILLANCE REQUIREMENTS

Medical monitoring programs are designed to track the physical condition of employees on a regular basis as well as survey pre-employment or baseline conditions prior to potential exposures. The medical surveillance program is a part of Tyree's Health and Safety program.

9.1 Baseline Medical Monitoring

Prior to being assigned to a hazardous or a potentially hazardous activity involving exposure to toxic materials, employee must receive a preassignment or baseline physical. The contents of the physical is to be determined by Tyree's medical consultant. The preassignment physical should categorize employees as fit- for-duty and able to wear respiratory protection.

9.2 Periodic Monitoring

In addition to a baseline physical, all employees require a periodic physical within the last 12 months unless the advising physician believes a shorter interval is appropriate.

Personnel working assigned to a hazardous or a potentially hazardous activity involving exposure to toxic materials will verify currency (within 12 months) with respect to medical monitoring.

9.3 Exposure/Injury/Medical Support

As a follow-up to an injury or possible exposure above established exposure limits, all employees are entitled to and encouraged to seek medical attention and physical testing. Depending upon the type of exposure, it is critical to perform follow-up testing within 24-48 hours.

9.4 Exit Physical

At termination of employment or reassignment to an activity or location which does not represent a risk of exposure to hazardous substances, an employee shall require an exit physical. If his/her last physical was within the last 6 months, the advising medical consultant has the right to determine adequacy and necessity of exit exam.

9.5 Medical Records

The results of medical testing and full medical records will be maintained in accordance with 29 CFR Part 1910.20. A copy of the medical certification will kept at the Division Office for each person entering the contamination reduction zone and exclusion zone.

10.0 TRAINING REQUIREMENTS

Consistent with OSHA's 29 CFR 1910.120 regulation covering Hazardous Waste Operations and Emergency Response, all site personnel who will be performing a hazardous or a potentially hazardous activity involving exposure to toxic materials, are required to be trained in accordance with the standard. At a minimum all personnel are required to be trained to recognize the hazards on-site, the provisions of this HASP, and the responsible personnel.

10.1 Initial and Annual Refresher Training

Prior to arrival on site, Tyree will certify that employees working in hazardous areas meet the requirements of preassignment training, consistent with OSHA 29 CFR 1910.120 paragraph (e)(3). Each general site worker has received 40 hours of instruction off the site. All personnel must also receive 8 hours of refresher training annually.

10.2 Site Supervisors Training

Consistent with OSHA 29 CFR 1910.120 paragraph (e)(4), individuals designated as site supervisors require an additional 8 hours of training.

10.3 Site Specific Training

All personnel working at the Becker Electronics Site during remedial activities will be required to attend a site-specific training session prior to commencing work at the site. As part of the site-specific training, an Employee/Visitor and Acknowledgment Form will be completed by each employee.

The site-specific training shall include as a minimum:

- Tyree's Safety Orientation
- Explanation of the Overall Site HASP.
- Health and Safety Personnel and Organization.
- Brief site history.
- Special attention to signs and symptoms of overexposure to known and suspected site contaminants.
- Health effects of site contaminants.
- Air monitoring description.
- Physical hazards associated with the project.
- Selection, use, and limitations of available safety equipment and proper procedures for its use.
- Personal hygiene and decontamination.
- Respirator facepiece fit testing.
- PPE fitting to determine proper size for individuals.
- Site rules and regulations.
- Work zone establishment and markings.
- Site communication and the "Buddy System".
- Emergency preparedness procedures.
- Equipment decontamination.
- Medical monitoring procedures.
- Review of Tyree's Standard Operating Procedures.

10.4 Safety Meetings

A well ordered flow of information is essential to a good safety program. Tyree, through a program of safety meetings at all levels, intends to accomplish the goals of safety awareness, education, and participation.

The SHSO shall conduct weekly safety meetings with on-site employees. An opportunity shall be provided for employees to voice safety-related concerns. The SHSO will submit a synopsis of each meeting including topics covered, safety-related concerns, action items to be addressed, status of previous items and a signed

attendance list.

10.5 Follow-Up Training

Follow-up training will be provided at least weekly and prior to each change of operation. The SHSO shall also provide initial site-specific training for replacement employees.

10.6 Visitor Training

The SHSO will be responsible for training site visitor in the hazard associated with the site, to explain emergency procedures and instruct them in the use of protective gear required during the visit. No visit or employee will be permitted in the Exclusion Zone and Contamination Reduction Zone without documented training, and evidence of enrollment in a medical surveillance program.

10.7 Training Records

Training records will be submitted to the Construction Manager before the employee starts work at the site and will be maintained in accordance with the specifications. A copy of all training certificates will be kept at the job site for each person working at the site.

10.8 Hazard Communication

In order to comply with 29 CFR 1910.1200, Hazard Communication, the following written Hazard Communication Program has been established. All employees will be briefed on this program, and have a written copy for review.

10.8.1 Container Labeling

All containers received on site will be inspected to ensure the following:

- All containers will be clearly labeled as to the contents.
- The appropriate hazard warnings will be noted and
- The name and address of the manufacturer will be listed.

All secondary containers will be labeled with either an extra copy of the original manufacturer's label or with generic labels which have a block for identification and blocks for the hazard warnings. All hazardous waste containers shall have labels that list the date when storage began in the container.

10.8.2 Material Safety Data Sheets (MSDSs)

Copies of MSDSs for all hazardous chemicals known or suspected on site will be maintained in the work area. MSDSs will be available to all employees for review during each work shift. These MSDSs will be made available to the attending physician, and emergency medical staff in the event of a medical emergency.

10.8.3 Employee Training

Prior to starting work, each employee will attend a health and safety orientation and will receive information and training on the following:

- An overview of the requirements contained in the Hazard Communication Standard, 29 CFR 1910.1200;
- Chemicals present in their workplace operations;
- Location and availability of a written hazard program;
- Physical and health effects of the hazardous chemicals;
- How to lessen or prevent exposure to these hazardous chemicals through usage of control/work practices and personal protective equipment.
- Emergency procedures to follow if they are exposed to these chemicals;
- How to read labels and review MSDSs to obtain appropriate hazard information;
- Location of MSDS file and location of hazardous chemical list.

11.0 RECORD KEEPING

Tyree will maintain logs and reports covering the implementation of the Health and Safety Plan. The format will include Training Logs, Daily Safety Logs, Air Monitoring Logs, Air Monitoring Results Reports, Weekly Safety Reports and a Closeout Safety Report. These logs and reports shall be submitted to the Engineer as specified

11.1 Training Logs

Training logs shall be completed by the Site Health and Safety Officer and submitted to maintained on site for review. These logs shall include:

- Employee's name, Social Security number, and attendance record;
- Rime allocation in the training session;
- Topics covered;
- Materials used;
- Equipment demonstrated;
- Equipment practice for each employee;
- Prohibitions covered;
- Explanation of the buddy system;
- Fit-testing performed, and results;

11.2 Daily Safety Log

Daily Safety Log shall be completed daily by the Health and Safety Officer and maintained on site for review. These logs shall include:

- Date;
- Work area(s) checked;
- Employees present in work area(s);
- Equipment being utilized by employees;
- Protective clothing being worn by employees;
- Protective devices being used by employees;
- Accidents or breaches of procedure.

11.3 Air Monitoring Report

Air Monitoring Reports shall be completed by the Health and Safety Officer and maintained on site for review. These reports shall include:

- Date of Report;
- Equipment utilized for air monitoring;
- Real-Time air monitoring results from each work location;
- Time-Weighted-Average results from perimeter monitoring stations and date of actual sampling;
- Time-Weighted-Average of personnel sampling, date of actual sampling, and personnel sampled;
- Calibration methods of equipment and results.

12.0 HEALTH AND SAFETY INSPECTIONS

Health and safety inspections will be conducted to discover through specific, methodical auditing, checking, or inspection procedures; conditions and work practices that lead to job accidents and illnesses. The Site Health and Safety Officer is responsible for inspecting your working area daily before and while you are working.

The Health and Safety Manager shall be responsible for:

- Ensuring that inspections are conducted at the frequency stated;
- Reviewing the weekly and monthly site inspections for completeness, thoroughness, and trends;
- Performing project inspections; and
- Training site personnel on proper inspection techniques.

The Health and Safety Officer shall be responsible for:

- Ensuring that weekly and monthly inspections are conducted;
- Assisting management with the weekly and monthly inspections;
- Reviewing the inspections findings and corrective actions for applicability and thoroughness;
- Providing the health and Safety Manager with summary of inspection findings each month;
- Performing informal daily inspections of the worksite.

13.0 SAFE WORK PRACTICES

13.1 Work Areas

Work sites must be clean and orderly. Spills must be reported and cleaned up immediately. All combustible scrap, debris and waste must be stored safely and removed promptly. Waste containers must be covered. Oily and paint soaked rags are combustible and should be discarded in sealable metal containers only. Make sure all pits and floor openings are either covered or otherwise guarded. Fire extinguishers must remain accessible at all times. Work sites shall be kept free of debris, floor storage and electrical cords.

13.2 Emergency Phone Numbers, OSHA Posters, Hazards Warnings

Emergency telephone numbers should be clearly posted and easily visible at all times. There should be OSHA posters prominently displayed and warning signs posted for any known or potential hazard(s) present. Material Safety Data Sheets (MSDS) must be available on the job site at all times.

13.3 First Aid Kits

First-aid kits/stations and required contents are maintained in a serviceable condition. Unit-type kits have all items in the first-aid kit individually wrapped, sealed, and packaged in comparable sized packages. First-aid stations shall be located as close as practicable to the highest concentration of personnel. First-aid stations shall be well-marked and available to personnel during all working hours. First-aid stations shall be equipped with a first-aid kit, the size of which shall be dependent upon the number of personnel normally employed at the work site. The emergency telephone numbers and addresses of doctors, hospitals and ambulance services available to the work site shall be posted at each first-aid station.

13.4 Personal Protective Equipment Clothing

Where there is a danger of flying particles or corrosive materials, employees must wear protective goggles and/or face shields. Employees are required to wear safety glasses at all times in areas where there is a risk of eye injuries. Employees who need corrective lenses are required to wear only approved safety glasses, protective goggles, or other medically approved precautionary procedures when working in areas with harmful exposures, or risk of eye injury. Employees are required to wear protective gloves, aprons, shields and other means provided in areas where they may be subject to cuts, corrosive liquids and/or harmful chemicals. Hard hats must be worn in areas subject to falling objects, and at all times while at construction sites. Appropriate footwear including steel-toed shoes must be worn in an area where there is any risk of foot injuries from hot, corrosive, poisonous substances, falling objects, and crushing or penetrating action. When necessary employees must use the approved respirators which are provided for regular and emergency use. All safety equipment must be maintained in sanitary condition and ready for use. Report any defective equipment immediately. Food may not be eaten in work areas, or in places where there is any danger of exposure to toxic materials or other health hazards. In cases of cleaning toxic or hazardous materials, protective clothing provided must be worn.

13.5 Combustible Materials

All combustible scrap, debris and waste materials (oily rags, etc.) must be stored in covered metal receptacles and removed from the work site promptly. Proper storage to minimize the risk of fire, including spontaneous combustion must be practiced. Only approved containers and tanks are to be used for the storage and handling of flammable and combustible liquids. All connections on drums and combustible liquid piping, vapor and liquid must be kept tight. All flammable liquids should be kept in closed containers when not in use (e.g., parts-cleaning tanks, pans, etc.). Liquefied petroleum gas must be stored, handled, and used in accordance with safe practices and standards. No smoking signs must be posted on liquefied petroleum gas tanks. Liquefied petroleum storage tanks should be guarded to prevent damage from vehicles. All solvent wastes and flammable liquids should be kept in fire-resistant, covered containers until they are removed from the work site. Fuel gas cylinders and oxygen cylinders must be separated by distance, fire resistant barriers, etc., while in storage. Fire extinguishers will be 20 lb. ABC and placed in areas where they are to be used. Fire extinguishers must be mounted within 75 ft. of outside areas containing flammable liquids, and within 10 ft. of any inside storage area for such materials. "NO SMOKING" rules will be enforced in areas involving storage and use of hazardous materials. "NO SMOKING" signs have been posted where appropriate in areas where flammable or combustible materials are used and/or stored. Safety cans must be used for dispensing flammable or combustible liquids at point of use. All spills of flammable or combustible liquids must be reported and cleaned up promptly.

13.6 Hazardous Substances

When hazardous substances are used in the workplace, the hazard communication program dealing with Material Safety Data Sheets (MSDS), labeling and employee training will be in operation. MSDS materials will be readily available for each hazardous substance used. A training program plus regular question and answer sessions on dealing with hazardous materials will be given to keep employees informed. The program will include an explanation of what an MSDS is and how to use and obtain one; MSDS contents for each hazardous substance or class of substances; explanation of the "Right to Know"; identification of where employees can see the employer's written hazard communication program and where hazardous substances are present in their work area; the health hazards of substances in the work area, how to detect their presence, and specific protective measures to be used; as well as informing them of hazards of non-routine tasks and unlabeled pipes.

13.7 General Fire Safety

Portable fire extinguishers are provided in adequate number and type (20 lb. ABC) and are located throughout the facility. Fire extinguishers are mounted in readily accessible locations. Fire extinguishers are recharged regularly and the date of last inspection noted on their tags. Extinguishers should be placed free from obstructions or blockage. All extinguishers must be fully charged and in their designated places unless in use. All employees are periodically instructed in the use of extinguishers and fire protection procedures.

13.8 Fueling

Where flammable liquids are used, employees will be trained to deal with spillage during fueling operations, how it is to be cleaned, the types and designs of fueling hoses and the specific types of fuel it can handle, whether fueling is being done with a nozzle that is a gravity flow system or self-closing, how to avoid spills and recognition that if a spill does occur, the safety of restarting an engine. Employees must be aware that an open flame or light near any fuel is prohibited when fueling or the transfer of fuel is occurring. "NO SMOKING" signs will be posted conspicuously.

13.9 Powder Actuated Tools

The employees using powder-actuated tools must be properly trained. All powder-actuated tools must be left unloaded until they are actually ready to be used. Each day before using, each powder-actuated tool must be inspected for obstructions or defects. The powder-actuated tool operators must have and must use appropriate personal protective equipment such as hard hats, safety goggles, safety shoes and ear protectors whenever they are using the machines.

13.10 Confined Spaces

Before entry into a confined space, all moving equipment contained in the confined space must be locked-out. Ventilation must be either natural or mechanically provided into the confined space. All confined spaces that contain inert, toxic, flammable or corrosive materials must be valved off, blanked, disconnected and separated. Atmospheric tests should be performed to check for oxygen content, toxicity and explosive concentration. Atmospheric tests must be performed on a regular basis in a confined area where entry is required. When personnel enter a confined area, assigned safety standby employees who are alert to the work being done, are able to sound an alarm if necessary and to render assistance. These standby employees must be

trained to assist in handling lifelines, respiratory equipment, CPR, first aid, and be able to employ rescue equipment that will remove the individual from the confined area.

13.11 Excavation/Trenching

Prior to excavation/trenching operations, all underground installations in the area shall be identified, located and shall be marked so that when the approximate location of the utility is reached, the exact location can be determined. Employee shall not enter excavations/trenches deeper that 5 feet unless the excavation has been sloped or shored. Excavated spoils must be placed at least 2 ft back from the edge of excavations. The degree of sloping is dependent on the type of soil and the depth of excavation. Excavation work must always be under the immediate supervision of a competent person with authority and qualifications to modify the shoring system or work methods as necessary to provide greater safety. A ladder projecting 36 in. above ground surface must be provided for access and exit. Travel distance to the ladder must not exceed 25 ft. Excavation/Trenches regardless of the depth or width shall be barricaded or covered. The use of raised berms, caution signs and caution tape will be used to protect both the public and other personnel on the site.

13.12 Machine Guarding

All equipment and machinery should be securely placed, and anchored when necessary, to prevent tipping or other movement that could result in personal injury. Electrical power to each machine shall be capable of being locked out for maintenance, repair or security. All manually operated valves and switches controlling the operation of equipment and machines must be clearly identified and readily accessible. All moving chains and gears must be properly guarded. The supervisor will instruct every employee in the work area on the methods provided to protect the operator and other employees in the machine area from hazards created by the operation of a machine, such as nip points, rotating parts, flying chips and sparks. The machinery guards must be secured and arranged so they do not present a hazard. All radial arm saws must be arranged so that the cutting head will gently return to the back of the table when released.

13.13 Lockout/Tagout Procedures

All machinery or equipment capable of movement must be de-energized or disengaged and blocked or locked out during cleaning, servicing, adjusting or setting up operations, whenever required. The lock-out procedure requires that stored energy (i.e. mechanical, hydraulic, air) be released or blocked before equipment is locked out for repairs. Appropriate employees are provided with individually keyed personal safety locks.

Employees are required to keep personal control of their key(s) while they have safety locks in use. Employees must check the safety of the lockout by attempting a start up after making sure no one is exposed. Where the power disconnector does not also disconnect the electrical control circuit, the appropriate electrical enclosures must be identified. The control circuit can also be disconnected and locked out.

13.14 Electrical

Equipment such as electrical tools or appliance must be grounded or of the double insulated type. Extension cords being used must have a grounding conductor. If ground-fault circuit interrupters are installed on each temporary AC circuit at locations where construction, demolition, modifications, alterations or excavations are being performed, temporary circuits must be protected by suitable disconnecting switches or plug connectors with permanent wiring at the junction. Personnel must be aware of the following: Exposed wiring and cords with frayed or deteriorated insulation must be repaired or replaced. Flexible cords and cables must be free of splices or taps. Clamps or other securing means must be provided on flexible cords or cables at plugs, receptacles, tools, and equipment. The cord jacket must be held securely in place. All cord, cable and raceway connections must be intact and secure. In wet or damp locations, electrical tools and equipment must be appropriate for the use or location, or otherwise protected.

13.15 Material Handling

In the handling of materials, employees must know the following: There must be safe clearance for equipment through aisles and doorways. Vehicles must be shut off and brakes must be set prior to loading or unloading. Containers of combustibles or flammable, when stacked while being moved must be separated by dunnage sufficient to provide stability. Trucks and trailers will be secured from movement during loading and unloading operations. Hand trucks must be maintained in safe operating condition. Chutes must be equipped with sideboards of sufficient height to prevent the handled materials from falling off. At the delivery end of rollers or chutes, provisions must be made to brake the movement of the handled materials. Hooks with safety latches or other arrangements will be used when hoisting materials, so that slings or load attachments won't accidentally slip off the hoist hooks. Securing chains, ropes, chokers or slings must be adequate for the job to be performed. When hoisting material or equipment, provisions must be made to assure no one will be passing under the suspended loads.

13.16 Industrial Trucks/Forklifts

When operating any industrial truck, substantial overhead protective equipment will be provided on high lift rider equipment. Each industrial truck must have a warning horn, whistle, gong or other device which can be clearly heard above the normal noise in the area where operated. Before using a forklift, check that the brakes on each industrial truck are capable of bringing the vehicle to a complete and safe stop when fully loaded. The parking brake must effectively prevent the vehicle from moving when unattended.

13.17 Driving

Drive safely. If vehicles are used during the workday, seat belts are to be worn at all times. Vehicles must be locked when unattended to avoid criminal misconduct. Do not exceed the speed limit. Vehicles must be parked in legal spaces and must not obstruct traffic. Defensive driving must be practiced by all employees. Employees should park their vehicles in well-lighted areas at/or near entrances to avoid criminal misconduct.

13.18 Portable Power Tools

Portable power tools pose a special danger to employees because they are deceptively small and light, yet they can do great bodily harm if used improperly or poorly maintained. These rules apply to all power tools, but are especially important when handling portable saws, drills and power screw drivers. Check your equipment before you use it. All grinders, saws and similar equipment should be equipped with appropriate safety guards. Power tools should not be used without the correct shield, guard, or attachment, recommended by the manufacturer. Portable circular saws must be equipped with guards above and below the base shoe. Circular saw guards should be checked periodically and before each use to assure they are not wedged up, thus leaving the lower portion of the blade unguarded. All rotating or moving parts of equipment should be guarded to prevent physical contact. All cord-connected, electrically operated tools and equipment should be effectively grounded or of the approved double insulated type. Effective guards must be in place over belts, pulleys, chains, sprockets, on equipment such as concrete mixers, air compressors, etc. If portable fans are provided, they must be equipped with full guards or screens having openings 1/2 inch or less. Do not attempt to lift heavy objects without proper equipment. Hoisting equipment will be made available for lifting heavy objects, with hoist ratings and characteristics appropriate for the task. Power tools are either battery operated or wired. If battery operated, don't under-estimate their power. A small electric drill or power screw driver can cause a severe injury if it lands in the wrong place. Typically used with extension cords, the more powerful hard wired equipment presents a double safety problem: the actual equipment plus its electrical power source. Ground-fault

circuit interrupters must be provided on all temporary electrical 15 and 20 ampere circuits used during periods of construction. Pneumatic and hydraulic hoses on power-operated tools should be checked regularly for deterioration or damage.

13.19 Tool Maintenance

Faulty or improperly used hand tools are a safety hazard. All employees shall be responsible for ensuring that tools and equipment (both company and employee-owned) used by them or other employees at their workplace are in good condition. Hand tools such as chisels, punches, etc., which develop mushroom heads during use, must be reconditioned or replaced as necessary. Broken or fractured handles on hammers, axes and similar equipment must be replaced promptly. Worn or bent wrenches should be replaced regularly. Appropriate handles must be used on files and similar tools. Check your tools often for wear or defect. Jacks must be checked periodically to assure they are in good operating condition. Tool handles must be wedged tightly into the heads of tools. Tool cutting edges should be kept sharp enough so the tool will move smoothly without binding or skipping. When not in use, tools should be stored in a dry, secure location.

13.20 Compressed Gas & Cylinders

Cylinders must be legibly marked to identify clearly the gas contained. Compressed gas cylinders should be stored only in areas which are protected from external heat sources such as flame impingement, intense radiant heat, electric arcs or high temperature lines. Cylinders must not be located or stored in areas where they will be damaged by passing or falling objects, or subject to tampering by unauthorized persons. Cylinders must be stored or transported in a manner to prevent them from creating a hazard by tipping, falling or rolling. All cylinders containing liquefied fuel gas must be stored or transported in a position so that the safety relief device is always in direct contact with the vapor space in the cylinder. Valve protectors must always be placed on cylinders when the cylinders are not in use or connected for use. All valves must be closed off before a cylinder is moved, when the cylinder is empty, and at the completion of each job.

13.21 Welding, Cutting & Brazing

Compressed gas cylinders should be regularly examined for obvious signs of defects, deep rusting, or leakage. Use care in handling and storing cylinders, safety valves, relief valves and the like, to prevent damage. Precaution must be taken to prevent mixture of air or oxygen with flammable gases, except at a burner or in a standard torch. Only

approved apparatus (torches, regulators, pressure-reducing valves, acetylene generators, manifolds) may be used. Cylinders must be kept away from sources of heat. It is prohibited to use cylinders as rollers or supports. Cylinders, cylinder valves, couplings, regulators, hoses and apparatus must be kept free of oily or greasy substances. Care must be taken not to drop or strike cylinders. Unless secured on special trucks, all regulators must be removed and valve-protection caps put in place before moving cylinders. Before a regulator is removed, the valve must be closed and gas released from the regulator.

The open circuit (No Load) voltage of arc welding and cutting machines must be as low as possible and not in excess of the recommended limits. Under wet conditions, automatic controls for reducing no-load voltage must be used. Grounding of the machine frame and safety ground connections of portable machines must be checked periodically. Electrodes must be removed from the holders when not in use. All electric power to the welder must be shut off when no one is in attendance. Suitable fire extinguishing equipment must be available for immediate use before starting to ignite the welding torch. All connecting cable lengths must have adequate insulation. When the object to be welded cannot be moved and fire hazards cannot be removed, shields must be used to confine heat, sparks and slag.

Fire watchers will be assigned when welding or cutting is performed in locations where a serious fire might develop. All combustible floors must be kept wet, or protected by fire-resistant shields. When floors are wet down, personnel should be protected from possible electrical shock. When welding is done on metal walls, precautions must be taken to protect combustibles on the other side. Before hot work is begun, used drums, barrels, tanks and other containers must be so thoroughly cleaned that no substances remain that could explode, ignite or produce toxic vapors. Employees exposed to the hazards created by welding, cutting or brazing operations must be protected with personal protective equipment and clothing. Check for adequate ventilation where welding or cutting is performed. When working in confined spaces, environmental monitoring tests should be taken and means provided for quick removal of welders in case of emergency.

13.22 Scaffolds

Scaffolds over ten feet in height will have guardrails 42" from the bottom platform with a midrail and toeboards 4" high. Screw jacks will be used to level the scaffold rather than objects such as concrete blocks, loose bricks, etc. Scaffold legs will be braced and tied to structure every 30' in length and 26' in height. Scaffolds should not have makeshift devices or ladders to increase height. Working level platforms will be fully planked between guardrails, and have a minimum of 12" overlap and extend 6" beyond supports. There should be guard netting around the scaffolding if there is a risk of

materials falling from the scaffold onto someone below and/or barricades around the scaffolding to prevent anyone from being in the zone below it.

13.23 Ladders

Check ladders each and every time before you climb. Ladders should be maintained in good condition: joints between steps and side rails should be tight; hardware and fittings securely attached; and movable parts operating freely without binding or undue play. Non-slip safety feet are provided on each ladder. Ladder rungs and steps should be free of grease and oil. Employees are prohibited from using ladders that are broken, missing steps, rungs, or cleats, or that have broken side rails or other faulty equipment. It is prohibited to place a ladder in front of doors opening toward the ladder except when the door is blocked open, locked or guarded. It is prohibited to place ladders on boxes, barrels, or other unstable bases to obtain additional height. Face the ladder when ascending or descending. Be careful when you climb a ladder. When portable rung ladders are used to gain access to elevated platforms, roofs, etc., the ladder must always extend at least 3 feet above the elevated surface and secured. It is required that when portable rung or cleat type ladders are used, the base must be so placed that slipping will not occur, unless it is lashed or otherwise held in place. All portable metal ladders must be legibly marked with signs reading "CAUTION" - "Do Not Use Around Electrical Equipment." Only adjust extension ladders while standing at a base (not while standing on the ladder or from a position above the ladder). Metal ladders should be inspected for tears and signs of corrosion. Rungs of ladders should be uniformly spaced at 12 inches, center to center.

13.24 Floor and Wall Openings

Be careful when working near floor and wall openings. All floor openings (holes) should be guarded by a cover, guardrail or equivalent barrier on all sides except at the entrance to stairways and ladders. Toe boards must be installed around the edges of a permanent floor opening. Before beginning work at a new location, inspect it to insure that all floor openings which must remain open, such as floor drains, are covered with grates or similar covers.

Attachment I
Material Safety Data Sheets

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Material Safety Data Sheets Collection:

Sheet No. 300
Acetone

Issued: 11/77 Revision: F, 9/92

Section 1. Material Identification

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Acetone (CH_3COCH_3) Description: Derived by the dehydrogenation or oxidation of isopropyl alcohol with a metallic catalyst, the oxidation of cumene, the vapor phase oxidation of butane; and as a by-product of synthetic glycerol production. Used as a solvent for paint, varnish, lacquer, fat, oil, wax, resin, rubber, plastic, and rubber cement; to clean and dry parts of precision equipment; in the manufacture of chemicals (methyl isobutyl ketone, methyl isobutyl carbinol, methyl methacrylate, bisphenol-A, acetic acid (ketene process), mesityl oxide, diacetone alcohol, chloroform, iodoform, bromoform), explosives, aeroplane dopes, rayon, photographic films, isoprene; acetylene gas storage cylinders; in purifying paraffin; in nail polish remover; in the extraction of various principles from animal and plant substances; in hardening and dehydrating tissues; in cellulose acetate (especially as spinning solvent); as a solvent for potassium iodide and permanganate; as a delusterant for cellulose acetate fibers; in the specification testing of vulcanized rubber products.

R	1
I	1
S	1*
K	3

* Slight skin absorption

NFPA: 3 / 1 0 / –

HMIS: H 1, F 3, R 0, PPE* (* Sec. 8)

Other Designations: CAS No. 67-64-1, AI3-01238, Chevron acetone, dimethylformaldehyde, dimethylketal, dimethyl ketone, β-ketopropane, methyl ketone, propanone, 2-propanone, pyroacetic acid, pyroacetic ether.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for a suppliers list.

Cautions: Acetone vapor is a dangerous fire and explosion hazard. High vapor concentrations may produce narcosis (unconsciousness). Prolonged or repeated skin contact causes dryness, irritation, and mild dermatitis.

Section 2. Ingredients and Occupational Exposure Limits

Acetone, 99.5% plus 0.5% water

1991 OSHA PELs *
8-hr TWA: 750 ppm (1800 mg/m³)
15-min STEL: 1000 ppm (2400 mg/m³)

1990 IDLH Level
20,000 ppm

1990 NIOSH REL
TWA: 250 ppm (590 mg/m³)

1992-93 ACGIH TLVs
TWA: 750 ppm (1780 mg/m³)
STEL: 1000 ppm (2380 mg/m³)

1990 DFG (Germany) MAK
1000 ppm (2400 mg/m³)
Category IV; Substances eliciting very weak effects (MAK >500 mL/m³)
Peak: 2000 ppm, 60 min, momentary value†, 3 peaks/shift

1985-86 Toxicity Data ‡
Human, eye: 500 ppm
Human, inhalation, TC_{Lo}: 500 ppm produced olfaction effects, conjunctival irritation, and other changes involving the lungs, thorax, or respiration.
Rat, oral, LD_{50}: 5800 mg/kg altered sleep time and produced tremors.
Mammal, inhalation, TC_{Lo}: 31500 µg/m³/24 hr administered to pregnant female from the 1st to 13th day of gestation produced effects on fertility (post-implantation mortality).

* In the cellulose acetate fiber industry, enforcement of the OSHA TWA for "doffers" was stayed on 9/5/89 until 9/1/90; the OSHA STEL *does not* apply to that industry.
† Momentary value is a level which the concentration should never exceed.
‡ See NIOSH, *RTECS* (AL3150000), for additional irritation, mutation, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: 133.2 °F (56.2 °C) at 760 mm Hg
Freezing Point: -139.6 °F (-95.35 °C)
Vapor Pressure: 180 mm Hg at 68 °F (20 °C), 400 mm Hg at 103.1 °F (39.5 °C)
Saturated Vapor Density (Air = 1.2 kg/m³, 0.075 lb/ft³): 1.48 kg/m³, .093 lb/ft³
Refractive Index: 1.3588 at 20 °C
Appearance and Odor: Colorless, highly volatile liquid; sweetish odor.
* Odor thresholds recorded as a range from the lowest to the highest concentration.

Molecular Weight: 58.08
Specific Gravity: 0.7899 at 20 °C/4 °C
Water Solubility: Soluble
Other Solubilities: Alcohol, benzene, dimethyl formamide, chloroform, ether, and most oils.
Odor Threshold: 47.5 mg/m³ (low), 1613.9 mg/m³ (high)*

Section 4. Fire and Explosion Data

Flash Point: 0 °F (-18 °C), CC	Autoignition Temperature: 869 °F (465 °C)	LEL: 2.6% v/v	UEL: 12.8% v/v

Extinguishing Media: *Do not* extinguish fire unless flow can be stopped. For small fires, use dry chemical, carbon dioxide (CO_2), water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Use water in flooding quantities as fog because solid streams may be ineffective. **Unusual Fire or Explosion Hazards:** Acetone is a dangerous fire and explosion hazard; it is a Class IB flammable liquid. Vapors may travel to a source of ignition and flash back, fire-exposed containers may explode, and a vapor explosion hazard may exist indoors, outdoors, or in sewers. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing provides limited protection. If feasible, remove all fire-exposed containers. Otherwise, apply cooling water to sides of containers until well after fire is extinguished. If the fire becomes uncontrollable or container is exposed to direct flame, consider evacuation of a one-third mile radius. In case of rising sound from venting safety device or any discoloration of tank during fire, withdraw immediately. For massive cargo fires, use unmanned hose holder or monitor nozzles. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Acetone is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. **Chemical Incompatibilities:** Acetone may form explosive mixtures with hydrogen peroxide, acetic acid, nitric acid, nitric acid + sulfuric acid, chromic anhydride, chromyl chloride, nitrosyl chloride, hexachloromelamine, nitrosyl perchlorate, nitryl perchlorate, permonosulfuric acid, thiodiglycol + hydrogen peroxide. Acetone reacts vigorously with oxidizing materials and ignites on contact with activated carbon, chromium trioxide, dioxygen difluoride + carbon dioxide, and potassium-*tert*-butoxide. Other incompatibles include air, bromoform, bromine, chloroform + alkalies, trichloromelamine, and sulfur dichloride. **Conditions to Avoid:** Keep acetone away from plastic eyeglass frames, jewelry, pens, pencils, and rayon garments. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of acetone can produce CO_2 and carbon monoxide (CO).

Section 6. Health Hazard Data

Carcinogenicity: The IARC,[164] NTP,[169] and OSHA[164] do not list acetone as a carcinogen. **Summary of Risks:** Acetone has been placed among solvents of comparatively low acute and chronic toxicities. In industry, the most common effects reported are headache from prolonged vapor inhalation and skin irritation resulting from its defatting action. Exposures to less than 1000 ppm acetone vapor produces only slight eye, nose, and throat irritation. Acetone does not have sufficient warning properties to prevent repeated exposures. It is narcotic at high concentrations, i.e., above 2000 ppm. Concentrations above 12000 ppm cause loss of consciousness.

Continue on next page

Section 6. Health Hazard Data, *continued*

Medical Conditions Aggravated by Long-Term Exposure: None reported. **Target Organs:** Respiratory and central nervous systems, skin. **Primary Entry Routes:** Inhalation, skin and eye contact, ingestion. Liquid acetone is slowly absorbed through the skin. **Acute Effects:** Human systemic effects by inhalation include eye, nose and throat irritation; nausea and vomiting; changes in EEG (electroencephalogram) and carbohydrate metabolism; muscle weakness; drunken behavior; mental confusion and visual disturbance. In extreme cases, breathing high concentrations may produce coma. Human systemic effects by ingestion include gastrointestinal irritation, kidney damage (often indicated by albumin and red and white blood cells in the urine), liver damage (indicated by high levels of urobilin and early appearance of bilirubin), coma, metabolic changes, and systemic effects described for inhalation. Direct eye contact by liquid acetone may produce painful burning and stinging; watering of eyes; conjuctival inflammation; and corneal injury. Skin contact produces a cold feeling, dryness, and mild irritation.
Chronic Effects: Cases of chronic poisoning resulting from prolonged exposure to low concentrations of acetone are rare. Workers exposed to 1000 ppm, 3 hrs per day for 7-15 yrs, complained of dizziness, asthenia (lack or loss of strength), and chronic inflammation of the airways, stomach, and duodenum. Prolonged or repeated skin contact with liquid acetone may defat the skin and cause eczematoid dermatitis.
FIRST AID
Eyes: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. Carefully dispose of contaminated clothing because it may pose a fire hazard. **Inhalation:** Remove exposed person to fresh air, monitor for respiratory distress, and administer 100% humidified supplemental oxygen as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have that *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting. **After first aid, get appropriate in-plant, paramedic, or community medical support.**
Note to Physicians: In symptomatic patients, monitor serum and urine acetone, fluid intake, blood glucose, and arterial pH. Because of the prolonged elimination half-life of acetone, the symptomatic patient may need medical supervision for many hours (up to 30 hrs). Patients may develop hyperglycemia and ketosis mimicking acute diabetic coma. The hyperglycemia may persist for several days following acute exposure.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate all unnecessary personnel, remove all heat and ignition sources, and provide adequate ventilation. Cleanup personnel should protect against inhalation and skin or eye contact. If feasible and without risk, stop leak. Use water spray to reduce vapor, but it may not prevent ignition in closed spaces. For small spills, take up with sand or other noncombustible absorbent material and using nonsparking tools, place into containers for later disposal. For large spills, dike far ahead of liquid spill for later disposal. Do not release to sewers or waterways. Follow applicable OSHA regulations (29 CFR 1910.120). **Environmental Toxicity:** LC_{50} *Salmo gairdneri* (rainbow trout): 5540 mg/L/96 hr at 54 °F (12 °C). LC_{50} (oral) Ring-necked pheasant: >40,000 ppm. **Environmental Degradation:** Acetone biodegrades when released into the environment. The biological oxygen demand for 5 days (BOD5) is 46-55%. **Soil Absorption/Mobility:** Acetone volatilizes, leaches, and biodegrades if released on soil. **Disposal:** Acetone is a good candidate for fluidized bed, rotary kiln incineration, or catalytic oxidation. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.33): Hazardous Waste No. U002 (Ignitability), (40 CFR 261.31): F003 (spent solvent)
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 5000 lb (2270 kg) [* per Clean Water Act, Sec. 311(b)(4)]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)
OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For concentrations < 1000 ppm, wear any chemical cartridge respirator with organic vapor cartridge(s) and wear eye protection to avoid irritation or damage. For concentrations <6250 ppm, wear any supplied-air respirator operated in a continuous-flow mode. For concentrations < 12,500 ppm, wear any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister. For concentrations < 20,000 ppm, wear any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Polyethylene/ethylene vinyl alcohol, Teflon, or butyl rubber with breakthrough times > 8 hr is recommended for PPE. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in closed containers in a cool, dry well-ventilated area away from heat, sparks, flames, and other incompatibles. Keep large stocks away from inhabited buildings. Use non-sparking tools to open containers. Keep dry chemical or CO_2 extinguishers on hand in case of fire. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. To prevent static sparks, electrically ground and bond all containers and equipment during fluid transfer. For bulk storage rooms, install electrical equipment, Class I, Group D. **Administrative Controls:** Consider preplacement and periodic medical examinations with emphasis on the skin and respiratory tract. Also consider liver and kidney function tests and urinalysis.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Acetone
DOT Hazard Class: 3
ID No.: UN1090
DOT Packaging Group: II
DOT Label: Flammable Liquid
Special Provisions (172.102): T8

Packaging Authorizations
a) Exceptions: 173.150
b) Non-bulk Packaging: 173.202
c) Bulk Packaging: 173.242

Quantity Limitations
a) Passenger, Aircraft, or Railcar: 5L
b) Cargo Aircraft Only: 60L

Vessel Storage Requirements
Vessel Stowage: B
Other: --

MSDS Collection **References:** 26, 73, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 140, 148, 149, 153, 159, 163, 164, 167, 168, 171, 174, 176, 180
Prepared by: MJ Wurth, BS; **Industrial Hygiene Review:** PA Roy, MPH, CIH; **Medical Review:** AC Darlington, MPH, MD

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Material Safety Data Sheets Collection:
Sheet No. 303
Methyl Ethyl Ketone
Issued: 9/79 Revision: D, 5/93

Section 1. Material Identification

Methyl Ethyl Ketone ($CH_3CH_2COCH_3$) Description: Derived by dehydrogenation or selective oxidation of *sec*-butyl alcohol; from mixed *n*-butylenes and sulfuric acid, followed by distillation to separate *sec*-butyl alcohol and then dehydrogenation; or by controlled oxidation of butane. Used as a solvent for printing inks and cellulose compounds (nitrocellulose in particular), constituent of dewaxing compositions; in the manufacture of acrylic and vinyl surface coatings, paint removers, cements and adhesives, artificial leather, cosmetics, lubricating oils, pharmaceuticals, smokeless powder and explosives, and cleaning fluids.

R 1
I 2
S 2*
K 4
* Skin absorption

NFPA
3
1 0
–

HMIS
H 2
F 3
R 0
PPE†
† Sec. 8

Other Designations: CAS No. 78-93-3, 2-butanone, ethyl methyl ketone, methylacetone, 2-oxobutane.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(73) for a suppliers list.
Cautions: Methyl ethyl ketone is a flammable liquid. Vapors are irritating to the eyes and respiratory tract. It potentiates the neurotoxic potential of other chemicals and some findings suggest it may be neurotoxic itself.

Section 2. Ingredients and Occupational Exposure Limits

Methyl ethyl ketone, ca 100%

1992 OSHA PELs
Transitional Limit
8-hr TWA: 200 ppm (590 mg/m³)
Final Rule Limits
8-hr TWA: 200 ppm (590 mg/m³)
15-min STEL: 300 ppm (885 mg/m³)

1992 NIOSH RELs
TWA: 200 ppm (590 mg/m³)
STEL: 300 ppm (885 mg/m³)

1993-94 ACGIH TLVs
TWA: 200 ppm (590 mg/m³)
STEL: 300 ppm (885 mg/m³)

1991 DFG (Germany) MAK
TWA: 200 ppm (590 mg/m³)
Half-Life: < 2 hr
Category II: Substances with systemic effects
Peak Exposure Limit: 400 ppm, 30 min. average value, 4/shift

1992 Toxicity Data*
Rabbit, skin: 500 mg/24 hr caused severe irritation.
Rat, oral, LD_{50}: 2737 mg/kg
Rat, inhalation, TC_{Lo}: 3000 ppm/7 hr from 6 to 15 days of pregnancy caused craniofacial abnormalities (including nose and tongue) as well as developmental abnormalities of the urogenital system and homeostasis.
Human, inhalation, TC_{Lo}: 100 ppm/5 min caused eye irritation and respiratory changes.

1990 IDLH Level
3000 ppm

* See NIOSH, *RTECS* (EL6475000), for additional irritation, mutation, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: 176 °F (80 °C)
Melting Point: -122.6 °F (-85.9 °C)
Vapor Pressure: 71.2 mm Hg at 68 °F (20 °C)
Saturated Vapor Density (Air = 0.075 lb/ft³ or 1.2 kg/m³): 0.085 lb/ft³ or 1.368 kg/m³
Bulk Density: 6.71 lb/gal
Refraction Index: 1.379 at 68 °F (20 °C)
Critical Temperature: 504 °F (262 °C)
Critical Pressure: 41 atm

Molecular Weight: 72.1
Density: 0.8045 g/mL at 68 °F (20 °C)
Water Solubility: MEK in water = 28%; water in MEK = 12.5%
Other Solubilities: Soluble in alcohol, benzene, ether, and fixed oils.
Surface Tension: 24.6 dyne/cm at 68 °F (20 °C)
Ionization Potential: 9.54 eV
Viscosity: 0.4 cP at 77 °F (25 °C)
Relative Evaporation Rate (ether = 1): 2.7
Octanol/Water Partition Coefficient: log Kow = 0.26 to 0.29

Appearance and Odor: Colorless, volatile liquid with a sweet mint or acetone-like odor. The odor threshold is 25 ppm.

Section 4. Fire and Explosion Data

Flash Point: 16 °F (-9 °C)	Autoignition Temperature: 759 °F (404 °C)	LEL: 1.4% at 200 °F (93 °C)	UEL: 11.4% at 200 °F (93 °C)

Extinguishing Media: A Class 1B flammable liquid. For small fires, use dry chemical, carbon dioxide, water spray, or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam.
Unusual Fire/Explosion Hazards: Vapors may travel to ignition source and flash back. Container may explode in fire. Burning rate = 4.1 mm/min.
Special Fire-fighting Procedures: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing provides only limited protection. If possible without risk, move container from fire area. Apply cooling water to container sides until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw and let fire burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire. Do not release runoff from fire control methods to sewers or waterways; dike for proper disposal.

Section 5. Reactivity Data

Stability/Polymerization: Methyl ethyl ketone is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Include chlorosulfonic acid, oleum (fuming sulfuric acid), potassium-*t*-butoxide, hydrogen peroxide + nitric acid, 2-propanol (forms explosive peroxides), chloroform + alkali, amines, ammonia, inorganic acids, caustics, copper, isocyanates, pyridines, and strong oxidizers. MEK will soften or dissolve some plastics.
Conditions to Avoid: Exposure to heat, ignition sources, and incompatibles.
Hazardous Products of Decomposition: Thermal oxidative decomposition of MEK can produce carbon dioxide gas and acrid smoke.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,(183) NTP,(169) and OSHA(183) do not list methyl ethyl ketone as a carcinogen.
Summary of Risks: MEK vapors are irritating to the eyes and respiratory tract. Inhalation causes varying degrees of central nervous system depression. Approximately 75% of inhaled MEK is absorbed in humans. It is absorbed readily through the skin...

Continue on next page

Section 6. Health Hazard Data, *continued*

and prolonged contact may cause dermatitis. Because of its low odor threshold, MEK's irritating properties should be sufficient to prevent overexposure. MEK appears to potentiate the neurotoxic effects of some chemicals including *n*-butyl ketone and *n*-hexane, and some studies suggest that MEK may even produce neurotoxicity itself (possibly because it is partially metabolized to methanol[139]). **Medical Conditions Aggravated by Long-Term Exposure:** Dermatitis. **Target Organs:** Respiratory tract, central nervous system, skin, and eyes. **Primary Entry Routes:** Inhalation, eyes, and skin contact/absorption. **Acute Effects:** Inhalation may cause headache, dizziness, nausea, vomiting, weakness, and unconsciousness. High concentration can cause smarting in addition to irritation of the eyes and respiratory tract. In one study, exposure to 100 ppm caused slight nose and throat irritation, 200 ppm caused mild eye irritation, and 300 ppm was "objectionable" with headache and throat irritation. In another study, short exposure to 500 ppm caused nausea and vomiting. Also, workers exposed to 300 to 600 ppm for an unspecified time period experienced numbness of the fingers and arms; one worker experienced leg numbness with a tendency to "give way under him". Direct eye contact can cause painful irritation and corneal injury. **Chronic Effects:** Repeated skin contact can cause defatting and dermatitis, apparently without irritation.

FIRST AID **Eyes:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water.
Inhalation: Remove exposed person to fresh air, administer 100% humidified supplemental oxygen and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless otherwise advised, have that *conscious and alert* person drink 1 to 2 glasses of water to dilute. *Do not* induce vomiting because of possible aspiration into the lungs.
Note to Physicians: MEK is detectable in expired air and urine. There is good correlation between urinary MEK and workplace air concentration.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off ignition sources. Cleanup personnel should protect against exposure. Take up small spills with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers. Dike far ahead of large spill for reclamation or disposal. For spills in water, use natural barriers or spill control booms to limit spill travel. Prevent entry into sewers, drains, and waterways. Follow applicable OSHA regulations (29 CFR 1910.120). **Ecotoxicity Values:** *Pimephales promelas* (fathead minnow LC_{50} = 3,220 mg/L/96 hr; *Lepomis macrochirus* (bluegill), TLm = 5,640 to 1,690 mg/L/24 to 96 hr. **Environmental Degradation:** In water MEK will evaporate with an expected half-life of 3 to 12 days in rivers and lakes, respectively. It slowly biodegrades in both fresh and salt water. It may degrade in ground water after a long acclimation period. It is not expected to bioconcentrate in aquatic organisms. On land, MEK will either evaporate or leach into the ground. In air, MEK will degrade by photochemical reaction with hydroxyl radicals (half-life = 2.3 days). Under smog conditions, degradation may be slightly faster. **Disposal:** Incineration is possible in permit-approved facilities. Steam stripping can be used to remove MEK from aqueous waste. Concentrations up to several wt % solvent in water can be handled with better than 99% removal expected. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.33): U159
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 5000 lb (2270 kg) [* per RCRA, Sec. 3001]

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 1000 ppm, use any powdered air-purifying respirator with organic vapor cartridges (OVCs) or any chemical cartridge respirator with a full facepiece and OVCs. For < 3000 ppm, use any air-purifying, full facepiece respirator (gas mask) with a chin-style, front-or-back mounted organic vapor canister. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent skin contact. Butyl rubber and Teflon with breakthrough times (BT) of > 8 hr and polyethylene/ethylene vinyl alcohol with a BT of > 4 hr are suitable PPE materials. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] Safety **Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work and street clothes and launder before reuse. Remove MEK from your shoes and clean PPE. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using MEK, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage/Handling Requirements: Prevent physical damage to containers. Store in a cool, dry, well-ventilated area away from heat, incompatibles (Sec. 5). Periodically check containers for leaks.
Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. To prevent static sparks, electrically ground and bond all equipment used with MEK.
Administrative Controls: Consider preplacement and periodic medical exams of exposed workers with emphasis on the skin and respiratory system. Inform workers that MEK is absorbed through the skin and stress the importance of wearing appropriate gloves.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Methyl ethyl ketone
DOT Hazard Class: 3
ID No.: UN1193
DOT Packing Group: II
DOT Label: Flammable liquid
Special Provisions (172.102): T8

Packaging Authorizations
a) Exceptions: 173.150
b) Non-bulk Packaging: 173.202
c) Bulk Packaging: 173.242

Quantity Limitations
a) Passenger Aircraft or Railcar: 5L
b) Cargo Aircraft Only: 60L

Vessel Stowage Requirements
a) Vessel Stowage: B
b) Other: —

MSDS Collection **References:** 26, 73, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 148, 149, 153, 159, 168, 171, 183, 186
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** RE Langford, Ph.D, CIH; **Medical Review:** T Thoburn, MD, MPH

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Material Safety Data Sheet Collection

Methylene Chloride **MSDS No. 310**

Date of Preparation: 11/77 Revision: G, 6/94

Section 1 - Chemical Product and Company Identification 44

Product/Chemical Name: Methylene Chloride
Chemical Formula: CH_2Cl_2
CAS No.: 75-09-2
Synonyms: DCM, dichloromethane, Freon 30, methylene bichloride, methylene dichloride, NCI-C50102, Solmethine
Derivation: Produced by chlorination of methane.
General Use: Used as a solvent for cellulose acetate, adhesives, food processing, and pharmaceuticals; in degreasing and cleaning fluids, paint and varnish removers, decaffeination of coffee, in propellant mixtures for aerosols; as a blowing agent in foams, dewaxing agent, component of fire extinguishing compound, chemical intermediate, low temperature heat-transfer medium, and as a fumigant. Formerly used as an anesthetic.
Vendors: Consult the latest *Chemical Week Buyers' Guide*. (73)

Section 2 - Composition / Information on Ingredients

Methylene chloride, ca < 100 % vol
Trace Impurities: Stabilizers may be added such as: amines, 4-cresol, hydroquinone, methanol, 2-methyl-2-ene, 1-naphthol, nitromethane + 1,4-dioxane, phenol, resorcinol, and thymol.

OSHA PELs
8-hr TWA: 500 ppm*
Ceiling: 1000 ppm (2000 ppm 5 min. peak in any 2 hr period)

ACGIH TLV
TWA: 50 ppm (174 mg/m^3)

NIOSH REL
Carcinogen; lowest feasible concentration.

IDLH Level
Ca [5000 ppm]

DFG (Germany) MAK
TWA: 100 ppm (360 mg/m^3)
Category II: Substances with systemic effects
Onset of Effect: < 2 hr
Half-life: 2 hr to shift length

Peak Exposure Limit:
500 ppm, 30 min. average value, 2/shift

*Proposed change to: 25 ppm (TWA); 125 ppm (STEL)

Section 3 - Hazards Identification

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Methylene chloride is a colorless, volatile liquid with a sweet odor. It is irritating to the eyes, skin, and respiratory tract. At high concentrations it can cause narcosis (unconsciousness). Methylene chloride is metabolized to carbon monoxide in the body which contributes to much of its toxicity. It can form flammable mixtures with air (forming toxic phosgene when burned) and becomes explosive when mixed with oxygen.

Wilson Risk Scale	
R	1
I	3
S	2*
K	1

*Skin absorption

HMIS	
H	2*
F	1
R	0

*Chronic Effects
PPE†
†Sec. 8

Potential Health Effects

Primary Entry Routes: Inhalation, skin and eye contact.
Target Organs: Eyes, skin, central nervous system (CNS), cardiovascular system (CVS), blood.
Acute Effects
Inhalation: Symptoms include headache, giddiness, irritability, nausea, stupor, numbness and tingling of limbs, fatigue, anemia and polymorphonuclear leukocytosis, digestive disturbances, and neurasthenic disorders (emotional and psychic disorders characterized by easy fatigue, lack of motivation, feelings of inadequacy, and psychosomatic symptoms). Many symptoms are attributed to the metabolism of methylene chloride to carbon monoxide in the body. The carbon monoxide forms carboxyhemoglobin in the blood, which unlike hemoglobin, does not have the ability to carry oxygen. This lack of oxygen leads to CNS and CVS problems. However, CNS effects *have* been seen in persons without a significantly elevated blood carbon monoxide level.
Eye: Exposure to vapors produces irritation, tearing, and conjunctivitis. Direct contact with the liquid causes severe pain, but permanent damage does not occur.
Skin: Contact is irritating and can be painful (burns) if confined to skin (i.e. trapped under gloves or clothing). Methylene chloride can be absorbed through the skin to cause systemic effects.
Ingestion: Expected to cause gastrointestinal irritation, nausea, vomiting, and systemic effects (see inhalation).
Carcinogenicity: IARC (Class 2B, possibly carcinogenic to humans with limited human and sufficient animal evidence), NTP (Class 2, reasonably anticipated to be a carcinogen with limited human and sufficient animal evidence), ACGIH (TLV-A2, suspected human carcinogen as agent is carcinogenic in animals at dose levels considered relevant to worker exposure but insufficient epidemiological studies are available to confirm an increased cancer risk), NIOSH (Class X, carcinogen defined without further categorization), EPA (Class B2, sufficient evidence from animal studies and inadequate or no data from epidemiologic studies), and DFG (MAK B, justifiably suspected of having carcinogenic potential).

Medical Conditions Aggravated by Long-Term Exposure: Skin and cardiovascular disorders.
Chronic Effects: Repeated skin contact can cause dermatitis. Liver disease has been reported. *Case Reports*: 1 yr exposure caused toxic encephalopathy (toxicity of the brain) with audio and visual delusions and hallucinations; 3 yr exposure to 300 to 1000 ppm caused memory loss, intellectual impairment, and balance disturbances.
Other: Methylene chloride will cross the placenta. The estimated lethal dose is 0.5 to 5 mL/kg. Although methylene chloride has a distinct sweetish odor, it is not recognized at levels low enough to protect from overexposure.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air, administer 100% humidified, supplemental oxygen and support breathing.
Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 min. Consult an ophthalmologist if pain or irritation persist.
Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting with Ipecac syrup. If vomiting does not occur, the decision to perform gastric lavage should be made.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Lethal blood level = 280 mg/L. Biological monitoring: carbon monoxide in expired air (nonsmokers only). Recently, methylene chloride concentrations in urine have been found to correlate well to concentrations in air.

Section 5 - Fire-Fighting Measures

Flash Point: Methylene chloride does not have a flash point by standard tests. However, it does form flammable mixtures with air.
Autoignition Temperature: 1033 °F (556 °C)
LFL: 12% v/v
UFL: 19% v/v
LEL: 15.5% (in oxygen)
UEL: 66.4% (in oxygen)

Extinguishing Media: For small fires, use dry chemical or carbon dioxide. For large fires, use water spray, fog, or regular foam.
Unusual Fire or Explosion Hazards: Creates an explosion hazard if allowed to enter a confined space. Container may explode in heat of fire.
Hazardous Combustion Products: Hydrogen chloride, carbon monoxide and phosgene.
Fire-Fighting Instructions: Apply cooling water to sides of tanks until well after fire is out. Stay away from ends of tanks. Do not release runoff from fire control methods to sewers or waterways.
Fire-Fighting Equipment: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing provides only limited protection.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off ignition sources. Cleanup personnel need to protect against inhalation and skin/eye contact.
Small Spills: Take up with earth, sand, vermiculite, or other absorbent, noncombustible material.
Large Spills
Containment: Dike far ahead of spill for later reclamation or disposal. Do not release into sewers or waterways.
Cleanup: Damp mop any residue.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Do not use near ignition sources. Wear appropriate PPE. Do not use plastic or rubber hose for unloading trucks or tank cars unless the materials have been tested and approved for methylene chloride service.
Storage Requirements: Store in a cool, dry, well-ventilated area away from heat, ignition sources, and incompatibles (Sec. 10). To minimize decomposition, all storage containers should be galvanized or lined with a phenolic coating. Indoor storage tanks should have vents piped outdoors to prevent vapors from escaping into work areas. Prevent moisture from entering tanks.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Do not use closed circuit rebreathing systems employing soda lime or other carbon dioxide absorber because of formation of toxic compounds capable of producing cranial nerve paralysis. To prevent static sparks, electrically ground and bond all equipment used with and around methylene chloride.
Ventilation: Provide general or local exhaust ventilation systems to maintain airborne levels below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.(103)

Administrative Controls: Consider preplacement and periodic medical exams of exposed workers with emphasis on skin, liver, CNS, CVS, and blood. A complete blood count should be performed and carboxyhemoglobin levels should be determined periodically. Any level above 5% should prompt investigation of employee and workplace to determine the cause (smokers will already have an increased level of carboxyhemoglobin and are at increased risk). Use less hazardous solvents where possible.
Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For any detectable concentration, use any SCBA or supplied-air respirator (with auxiliary SCBA) with a full facepiece and operated in pressure demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.
Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Polyvinyl alcohol and Viton laminated with Neoprene are suitable materials for PPE. Natural rubber, synthetic rubbers, and polyvinyl chloride *do not* provide protection against methylene chloride. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.
Safety Stations: Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.
Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder before reuse. Remove methylene chloride from your shoes and clean personal protective equipment.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using methylene chloride, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance and Odor: Colorless; volatile with a sweet odor.
Odor Threshold: 205 to 307 ppm
Vapor Pressure: 350 mm Hg at 68 °F (20 °C); 440 mm Hg at 77 °F (25 °C)
Saturated Vapor Density(Air = 1.2 kg/m^3, 0.075 lb/ft^3): 2.256 kg/m^3 or 0.141 lb/ft^3
Formula Weight: 84.9
Specific Gravity (H_2O=1, at 4 °C): 1.33 at 15 °C
Water Solubility: 2%
Octanol/Water Partition Coefficient: log Kow = 1.25
Other Solubilities: Soluble in alcohol, acetone, chloroform, carbon tetrachloride, ether, and dimethylformamide.
Boiling Point: 104 °F (40 °C)
Freezing Point: -142 °F (-97 °C)
Viscosity: 0.430 cP at 68 °F (20 °C)
Refractive Index: 1.4244 at 68 °F (20 °C/D)
Surface Tension: 0.5 to 2.3 g/L (*in oxygen*)
Bulk Density: 11.07 lb/gal at 68 °F (20 °C)
Ionization Potential: 11.32 eV
Critical Temperature: 473 °F (245 °C)
Critical Pressure: 60.9 atm

Section 10 - Stability and Reactivity

Stability: Methylene chloride is stable at room temperature in closed containers under normal storage and handling conditions. Tends to carbonize when vapor contacts steel or metal chlorides at high temperatures 572 to 842 °F (300 to 450 °C).
Polymerization: Hazardous polymerization does not occur.
Chemical Incompatibilities: Include aluminum, lithium, sodium, aluminum bromide, azides, dimethyl sulfoxide + perchloric acid, N-methyl-N-nitrosourea + potassium hydroxide, sodium-potassium alloy, potassium *t*-butoxide, dinitrogen pentoxide, dinitrogen tetraoxide, nitric acid, and oxidizers. Methylene chloride will attack some forms of plastic, rubber, and coatings. Corrodes iron, some stainless steel, copper, and nickel.
Conditions to Avoid: Exposure to heat, ignition sources, and incompatibles.
Hazardous Decomposition Products: Hydrogen chloride, carbon monoxide and phosgene.

Section 11- Toxicological Information

Toxicity Data:*

Eye Effects:
Rabbit, eye: 162 mg caused moderate irritation.
Skin Effects:
Rabbit, skin: 810 mg/24 hr caused severe irritation.
Carcinogenicity:
Rat, inhalation: 3500 ppm/2 yr (intermittently) caused endocrine tumors.
Mutagenicity:
Rat, oral: 1275 mg/kg caused DNA damage.
Human, fibroblast: 5000 ppm/1 hr (continuously) caused DNA inhibition.
Acute Inhalation Effects:
Human, inhalation, TC_{Lo}: 500 ppm/1 yr (intermittently) caused altered sleep time, somnolence, and change in heart rate.
Human, inhalation, TC_{Lo}: 500 ppm/8 hr caused euphoria.
Acute Oral Effects:
Human, oral, LD_{Lo}: 357 mg/kg caused somnolence, paresthesia, and convulsions or effect on seizure threshold.
Rat, oral, LD_{50}: 1600 mg/kg
Multiple Dose Toxicity Data:
Rat, inhalation: 8400 ppm/6 hr/13 weeks (intermittently) caused changes in liver weight.

* See NIOSH, *RTECS* (PA8050000), for additional toxicity data.

Section 12 - Ecological Information

Ecotoxicity: *Pimephales promelas* (fathead minnow), LC_{50} = 193 mg/L/96 hr; *Lepomis macrochirus* (bluegill), LC_{50} = 230 mg/L/24 hr; *Poecilia reticulata* (guppies), LC_{50} = 294 ppm/14 days. Cytotoxic to plants.

Environmental Degradation: In air, methylene chloride degrades by reaction with photochemically-produced hydroxyl radicals (half-life = a few months) but does not undergo *direct* photolysis. Degradation products include carbon monoxide, carbon dioxide, and phosgene. In water, it is removed primarily by evaporation (est. half-life = 3 to 5.6 hr under moderate mixing conditions). Some may biodegrade but it is not expected to adsorb to sediment or bioconcentrate. If released to soil most methylene chloride will rapidly evaporate. Some may leach through soil. Methylene chloride will adsorb to peat moss but not to sand.

Section 13 - Disposal Considerations

Disposal: Pour on sand or earth at a safe distance/location from occupied areas and allow to evaporate (most is transformed to carbon monoxide). A good candidate for liquid injection, rotary kiln, or fluidized bed incineration. Investigate biodegradation: methylene chloride is reported to completely biodegrade under aerobic conditions with sewage seed or activated sludge between 6 hrs. and 7 days. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: Dichloromethane
Shipping Symbols: –
Hazard Class: 6.1
ID No.: UN1593
Packing Group: III
Label: Keep away from food
Special Provisions (172.102): N36, T13

Packaging Authorizations
a) Exceptions: 173.153
b) Non-bulk Packaging: 173.203
c) Bulk Packaging: 173.241

Quantity Limitations
a) Passenger, Aircraft, or Railcar: 60 L
b) Cargo Aircraft Only: 220 L

Vessel Stowage Requirements
a) Vessel Stowage: A
b) Other: –

Section 15 - Regulatory Information

EPA Regulations:
Listed as a RCRA Hazardous Waste Number (40 CFR 261.33): U080
Listed as a CERCLA Hazardous Substance (40 CFR 302.4) per RCRA, Sec. 3001 and CWA, Sec. 307(a)
CERCLA Reportable Quantity (RQ), 1000 lb (454 kg)
Listed as a SARA Toxic Chemical (40 CFR 372.65)
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed
OSHA Regulations:
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A)

Section 16 - Other Information

References: 1, 8, 73, 103, 124, 132, 136, 148, 149, 153, 159, 187, 190, 192, 194, 195

Prepared By ..... M Gannon, BA
Industrial Hygiene Review ..... S Gilson, CIH
Medical Review ..... J Brent, MD, PhD

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Material Safety Data Sheets Collection:

Sheet No. 708
Vinylidene Chloride

Issued: 4/90

Section 1. Material Identification

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Vinylidene Chloride Description: Prepared from ethylene chloride. Also prepared from vinyl chloride by successive chlorination and dehydrochlorination steps. Used primarily as a co-monomer in producing vinylidene copolymers (Saran®, Velon®) for films and coatings. Also used in producing methyl chloroform, vinyl chloride resins, plastics, chloracetyl chloride; in adhesives; as a component of synthetic fibers; a chemical intermediate in vinylidene fluoride synthesis; and for 1,1,1-trichloroethane. A common constituent in our environment, measurable quantities of vinylidene chloride are found in poorly ventilated areas with a high concentration of plastics. It is a notable contaminant in recycled air environments such as nuclear submarines and spacecraft.
Other Designations: CAS No. 0075-35-4; $C_2H_2Cl_2$; 1,1-DCE; 1,1-dichloroethene; *asym*-dichloroethylene; VDC; vinylidene dichloride.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*[73] for a suppliers list.
Comment: At temperatures above 32 °F/0 °C and especially in the presence of oxygen or other suitable catalysts, vinylidene chloride polymerizes to a plastic. Therefore, commercial products may contain small proportions of inhibitors to preserve the monomer.

R 3
I 4
S 2
K 4

NFPA

HMIS
H 2
F 4
R 2
PPG*
* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Vinylidene chloride, ca 100%

OSHA PEL
8-hr TWA: 1 ppm, 4 mg/m³

ACGIH TLVs, 1989-90
TLV-TWA: 5 ppm, 20 mg/m³
TLV-STEL: 20 ppm, 79 mg/m³

NIOSH REL, 1987
None established

Toxicity Data*
Mouse, skin, TD_{Lo}: 4840 mg/kg has tumorigenic effects on skin, appendages, lungs, thorax, and respiration
Rat, inhalation, LC_{50}: 6350 ppm/4 hr
Human, inhalation, TC_{Lo}: 25 ppm produces changes in behavior (general anesthetic), the liver, kidney, ureter, and bladder

* See NIOSH, *RTECS* (YZ8061000), for additional mutative, reproductive, tumorigenic, and toxicity data.

Section 3. Physical Data

Boiling Point: 89.1 °F/31.7 °C at 760 mm Hg
Melting Point: -188.5 °F/-122.5 °C
Vapor Pressure: 591 mm Hg at 77 °F/25 °C
Vapor Density (Air = 1): 3.4

Molecular Weight: 96.94 g/mol
Specific Gravity (H_2O = 1 at 39 °F/4 °C): 1.2129 at 68 °F/20 °C
Water Solubility: Sparingly soluble (0.04 % wt/vol in water at 68 °F/20 °C)

Appearance and Odor: Colorless, volatile liquid with a mild, sweet odor that resembles chloroform. Most persons can detect vinylidene chloride at 1000 ppm, but others can detect it at less than 500 ppm. Neither odor is adequate to warn of excessive exposure.

Section 4. Fire and Explosion Data

Flash Point: -19 °F/-28 °C	**Autoignition Temperature:** 1058 °F/570 °C	**LEL:** 5.6% v/v	**UEL:** 11.4% v/v

Extinguishing Media: Use dry chemical, alcohol foam, or carbon dioxide. Use water to cool fire-exposed containers.
Unusual Fire or Explosion Hazards: Vinylidene chloride is a very flammable and volatile liquid with a burning rate of 2.7 mm/min. This material is a very dangerous fire hazard and moderately explosive when exposed to heat or flame. It may explode spontaneously since the vapor forms explosive mixtures with air. At elevated temperatures, polymerization may take place and containers may rupture.
Special Fire-fighting Procedures: Since vinylidene chloride may be poisonous if inhaled or absorbed through the skin, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode with a fully encapsulating suit. Keep unnecessary people away from the hazard area. Vapors may travel to an ignition source and flash back. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Vinylidene chloride is self-reactive. If stored between -40 °F/-40 °C and 77 °F/25 °C in air without an inhibitor, this material rapidly absorbs oxygen and forms a violently explosive peroxide. The heat of polymerization is -185 cal/g (inhibited). When unstable, vinylidene chloride decomposes into chlorine, hydrogen chloride, phosgene, and formaldehyde. Hazardous polymerization can occur if exposed to sunlight, air, copper, aluminum, or heat.
Chemical Incompatibilities: This material reacts violently with chlorosulfonic acid, nitric acid, and oleum; and vigorously with oxidizing materials.
Hazardous Products of Decomposition: Thermal oxidative decomposition of vinylidene chloride can produce highly toxic fumes of chlorine (Cl_2) and hydrogen chloride (HCl).

Section 6. Health Hazard Data

Carcinogenicity: Neither the NTP, IARC, nor OSHA lists vinylidene chloride as a carcinogen, although the ACGIH suggests it is a suspected carcinogen. Various animal studies suggest a high rate of cancer in species-specific testing; application to humans does not appear valid.
Summary of Risks: Vinylidene chloride is an irritant to the skin, eyes, and mucous membranes, although any inhibitor in vinylidene chloride may partly cause the irritation. VDC is narcotic at concentrations greater than 4000 ppm, and has caused liver and kidney injury in experimental animals. Solutions containing the inhibitor MEHQ (monomethyl ether of hydroquinone) may cause leucoderma (white skin) and serious eye injury.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Target Organs: Skin, eyes, central nervous system, liver, and kidneys.
Primary Entry Routes: Inhalation.
Acute Effects: Inhalation of VDC causes narcosis and respiratory irritation. Concentrations of 4000 ppm lead to symptoms of drunkenness and eventually unconsciousness if the exposure continues. In monkey studies, exposure to 200 ppm caused acute liver injury with a mechanism similar to carbon tetrachloride. Animal studies indicate acute kidney changes in high-level exposures. Eye contact may cause conjunctivitis, transient corneal injury, and iritis. VDC also causes skin and mucous membrane irritation.
Chronic Effects: With chronic inhalation, vinylidene chloride may cause hepatic and renal dysfunction. In monkey studies, long-term inhalation at a 48-ppm level caused liver and kidney damage and death.
FIRST AID
Eyes: Flush immediately, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 min.
Skin: *Quickly* remove contaminated clothing. After rinsing affected skin with flooding amounts of water, wash it with soap and water.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have a *conscious* person drink 1 to 2 glasses of water, then induce repeated vomiting until vomit is clear.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Physician's Note: Solutions containing increased MEHQ concentrations are caustic and should not be removed by emesis. There is no specific treatment for VDC intoxication, but if significant amounts have been ingested, monitor the patient for liver and kidney failure.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: *Design and practice a vinylidene chloride spill control and countermeasure plan (SCCP).* Notify safety personnel, evacuate all unnecessary personnel from hazard area, remove all heat and ignition sources, and ventilate area. Cleanup personnel should protect against inhalation and skin and eye contact. For lab spills, absorb the spill with paper towels and place in a hood to allow liquid to evaporate. For large spills, absorb bulk spill with cement powder, fly ash, sawdust, or commercial sorbents. Place waste in appropriate disposal containers. Follow applicable OSHA regulations (29 CFR 1910.120).
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
RCRA Hazardous Waste (40 CFR 261.33): Not listed
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 5000 lb (2270 kg) [* per Clean Water Act, Sec. 31 (b)(4), Sec. 307(a); per RCRA, Sec. 3001]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)
OSHA Designations
Air Contaminant (29 CFR 1910.1000, Subpart Z): Not listed

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).
Respirator: Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. Respiratory canisters containing alkaline materials should not be used because dichloro acetylene can be formed. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA.
Warning: Air-purifying respirators do *not* protect workers in oxygen-deficient atmospheres.
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact. Rubber gloves are recommended.
Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below the OSHA PEL and ACGIH TLVs (Sec. 2). Local explosion-proof exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store vinylidene chloride in tanks with nickel, glass, or baked phenolic linings at 14 °F/-10 °C in the absence of light, air, water, and other polymerization initiators under a nitrogen blanket (at 10-psi pressure and an oxygen content less than 100 ppm). Outside or detached storage is preferable. If stored inside, store in a standard flammable liquids storage cabinet separate from oxidizing materials and incompatible materials (Sec. 5).

Engineering Controls: VDC requires special handling, precautions, and employee training. Do not handle VDC without adequate ventilation and personal protective gear. Limit exposures to vinylidene chloride by improving housekeeping procedures. Keep VDC away from all heat and ignition sources. All engineering systems should be of maximum explosion-proof design, electrically grounded, and bonded.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Vinylidene chloride, inhibited
DOT Hazard Class: Flammable liquid
ID No.: UN1303
DOT Label: Flammable liquid
DOT Packaging Requirements: 173.119
DOT Packaging Exceptions: 173.118

IMO Shipping Name: Vinylidene chloride, inhibited
IMO Hazard Class: 3.1
IMO Label: Flammable liquid
IMDG Packaging Group: I
ID No.: UN1303

MSDS Collection **References:** 7, 26, 38, 53, 73, 84, 85, 87, 89, 100, 103, 124, 126, 127, 129, 134, 136
Prepared by: MJ Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD M8

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Material Safety Data Sheets Collection:

Sheet No. 830
1,1-Dichloroethane

Issued: 6/92

Section 1. Material Identification

38

1,1-Dichloroethane (CH_3CHCl_2) Description: Derived by various methods; by direct chlorination of ethane, as a side product of chloral manufacture, by treating ethylene and chlorine with calcium chloride, by action of phosphorus chloride on acetaldehyde, and the reaction of hydrogen chloride and vinyl chloride at 20 to 55 °C in the presence of an aluminum, ferric, or zinc chloride catalyst. Found as an air contaminant in submarines and space craft. Its largest industrial use is in the production of 1,1,1-trichloroethane. Also used as a cleansing agent, degreaser, solvent for plastics, oils, and fats, grain fumigant, chemical intermediate; in insecticide sprays, rubber cementing, fabric spreading, paint and varnish removers, in ore flotation, vinyl chloride production, and as a coupling agent in anti-knock gasoline. Formerly used as an anesthetic.
Other Designations: CAS No. 75-34-3; assymetrical dichloroethane; chlorinated hydrochloric ether; ethylidene chloride; ethylidene dichloride.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for a suppliers list.
Cautions: 1,1-Dichloroethane is volatile and highly flammable. It is irritating to the eyes and respiratory tract and inhalation of high concentrations causes an anesthetic effect.

R	1
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NFPA: 3 / 2 / 0 / –

HMIS
H 2
F 3
R 0
PPG*
* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

1,1-Dichloroethane, reagent grade (99.7%). Impurities consist of ethyl chloride (0.02%), trichloroethylene (0.08%), butylene oxide (0.08%), ethylene dichloride (0.01%), and unknown (0.14%).

1991 OSHA PEL
8-hr TWA: 100 ppm (400 mg/m³)

1990 IDLH Level
4000 ppm

1990 NIOSH REL
8-hr TWA: 100 ppm (400 mg/m³)

1991-92 ACGIH TLVs*
TWA: 200 ppm (810 mg/m³)
STEL: 250 ppm (1010 mg/m³)

1990 DFG (Germany) MAK
100 ppm (400 mg/m³)
Half-life: < 2hr
Peak Exposure Limit: 200 ppm/30 min. average value/maximum of 4 peaks per shift

1985-86 Toxicity Data†
Mouse, oral, TD_{Lo}: 185 g/kg administered intermittently for 78 wk produced uterine tumors.
Rat, oral, LD_{50}: 725 mg/kg; toxic effects not yet reviewed.‡
Rat, inhalation, TC_{Lo}: 6000 ppm/7 hr administered during 6 to 15 days of pregnancy caused developmental abnormalities of the musculoskeletal system.

* Notice of intended change to 100 ppm/405 mg/m³.
†See NIOSH, *RTECS* (KI0175000), for additional reproductive, tumorigenic and toxicity data.
‡ Considered a possible error since subsequent studies at higher concentrations failed to produce comparative results.[133]

Section 3. Physical Data

Boiling Point: 135 °F (57.3 °C)
Melting Point: -143 °F (-96.98 °C)
Vapor Pressure: 230 mm Hg at 77 °F (25 °C)
Saturated Vapor Density (air = 1.2 kg/m³ or 0.075 lbs/ft³): 2.076 kg/m³ or 0.129 lbs/ft³
Refraction Index: 1.4166 at 68 °F (20 °C)
Surface Tension: 24.75 dyne/cm at 68 °F (20 °C)
Molecular Weight: 98.97
Specific Gravity: 1.174 at 68 °F (20/4 °C)
Water Solubility: Slightly, 0.5%
Other Solubilities: Very soluble in alcohol and ether, soluble in acetone, benzene, and fixed and volatile oils.
Relative Evaporation Rate (BuAc=1): 11.6
Odor Threshold: 49 to 1359 ppm; odor is not sufficient to warn against overexposure

Appearance and Odor: Colorless, mobile, oily liquid with a chloroform odor and a saccharin taste.

Section 4. Fire and Explosion Data

Flash Point: 17 °F (-8.33 °C) CC*	**Autoignition Temperature:** 856 °F (493 °C)	**LEL:** 5.6% v/v	**UEL:** 11.4% v/v

Extinguishing Media: A Class IB Flammable Liquid. For small fires, use dry chemical, carbon dioxide (CO_2), or "alcohol-resistant" foam. For large fires, use fog or "alcohol-resistant" foam. Water may be ineffective unless used as a "blanket".
Unusual Fire or Explosion Hazards: Vapors may travel to an ignition source and flash back. Container may explode in heat of fire.
Special Fire-fighting Procedures: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing will provide only limited protection. If possible without risk, move container from fire area. Apply cooling water to sides of containers until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if this is impossible, withdraw from area and let fire burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire. Do not release runoff from fire control methods to sewers (explosion) or waterways.

* 22 °F (-5.5 °C), OC[148]

Section 5. Reactivity Data

Stability/Polymerization: 1,1-Dichloroethane is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Incompatible with strong oxidizers and forms acetaldehyde in contact with caustics. 1,1-Dichloroethane will attack some forms of plastics, rubber, and coatings.
Conditions to Avoid: Exposure to heat and ignition sources and contact with incompatibles.
Hazardous Products of Decomposition: Thermal oxidative decomposition of 1,1-dichloroethane can produce carbon dioxide (CO_2), irritating hydrogen chloride (HCl) and toxic phosgene ($COCl_2$) fumes.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,[164] NTP,[169] and OSHA[164] do not list 1,1-dichloroethane as a carcinogen. However, the National Cancer Institute has recommended caution due to analogy to other chloroethanes such as 1,2-dichlorothane which are shown to cause cancer in animals.
Summary of Risks: 1,1-Dichloroethane is irritating to the eyes and respiratory system. It causes varying degrees of central nervous system (CNS) disturbance depending on the concentration and duration of exposure. Liver and kidney toxicity is controversial.

Continue on next page

Section 6. Health Hazard Data, *continued*

Some sources report that severe, acute exposures can cause damage, some quote recent detailed chronic studies which indicate little capacity for damage; still others refute the possibility of acute damage even from very high exposures. In reviewing the data it appears likely that chronic exposure will not cause kidney or liver damage but acute exposures to high concentrations may. There is definite evidence that 1,1-dichloroethane produces liver damage in monkeys, dogs, and rats when exposed to 98 ppm/90 days. It is also unclear whether or not 1,1-dichloroethane is absorbed through the skin. There are reports of absorption (although not in toxic amounts) and others claiming there is no absorption. Given this controversial data it is best to take precautions as if skin absorption, and liver and kidney damage were proven to occur. **Medical Conditions Aggravated by Long-term Exposure:** Chronic respiratory and skin disease, neurological damage, and liver or kidney disorders. **Target Organs:** Skin, CNS, liver, kidney. **Primary Entry Routes:** Inhalation and skin contact. **Acute Effects:** Inhalation symptoms include eye, nose, and throat irritation, headache, dizziness, coughing, staggering, disturbed vision, irregular heartbeat (can result in sudden death), unconsciousness, narcosis, coma, and death due to cardiac or respiratory failure. There is the risk of pulmonary edema (fluid in lungs). Skin contact is irritating and causes defatting, redness and swelling. Vapor contact with the eyes causes irritation, watering eyes and lid inflammation. Splashes to the eyes produces a burning sensation, watering, and lid inflammation. **Chronic Effects:** Repeated skin contact can cause a rash and scaliness. Repeated inhalation may have neurological effects.

FIRST AID *Emergency personnel should protect against contamination.*

Eyes: Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Do *not* allow victim to rub or keep eyes tightly shut. Immediately consult an ophthamlologist. **Skin:** 1,1-Dichloroethane vaporizes easily and poses an inhalation hazard as well. *Quickly and carefully* remove contaminated clothing; *1,1-dichloroethane is flammable!* Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have that *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting. After vomiting, give 2 tbsp activated charcoal in 8 oz water to drink.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Proper ventilation is the main treatment for acute exposure. Be prepared to support respiration if needed. Monitor liver function studies, urine analysis, and creatinine with acute and chronic exposure.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Immediately notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off ignition sources. Cleanup personnel should protect against inhalation and skin contact. For small spills, take up with earth, sand, vermiculite, or other absorbent, noncombustible material and using nonsparking tools, place in a suitable container. For large spills, dike far ahead of liquid spill for disposal or reclamation. Do not allow 1,1-dichloroethane to enter confined areas such as a sewer because of potential explosion. Follow applicable OSHA regulations (29 CFR 1910.120). **Environmental Degradation:** In soil, 1,1-dichloroethane volatilizes rapidly but may leach into groundwater. In water it will volatilize from a pond, lake, or river with a half-life of 6 to 9 days, 5 to 8 days, and 24 to 32 hr, respectively. In the atmosphere it will degrade by reaction with photochemically produced hydroxyl radicals with a 62 day half-life. It may also be carried back to soil via rain.

Ecotoxicity Values: *Artemia salina*, brine shrimp, TLm 320 mg/L/24 hr; *Lagodon rhomboides*, pinperch, TLm 160 mg/L/24 hr; *Poecilia reticulata*, guppies, LC_{50} 202 ppm/7 days.

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed
Listed as a RCRA Hazardous Waste (40 CFR 261.33): No. U076
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 1000 lb (454 kg)
[* per RCRA, Sec. 3001 & CWA, Sec. 307(a)]

OSHA Designations Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH/MSHA-approved respirator. For < 1000 ppm, use any supplied-air respirator or SCBA. For < 2500 ppm, use any supplied-air respirator operated in a continuous flow mode. For < 4000 ppm, use any supplied-air respirator or SCBA with a full facepiece. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a respiratory protection program that includes at least: training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent repeated or prolonged skin contact. Polyvinyl alcohol is recommended as suitable material for PPG. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes and launder before reuse. Thoroughly decontaminate personal protective equipment. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Prevent physical damage to containers. Store in a cool, dry, well-ventilated area away from ignition sources and incompatibles (Sec. 5). Label containers to indicate the contents' high flammability. Periodically inspect containers for cracks and leaks. To prevent static sparks, electrically ground and bond all equipment used in 1,1-dichloroethane manufacture, use, storage, transfer, and shipping.

Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level.

Administrative Controls: Consider preplacement and periodic medical exams of exposed workers emphasizing the skin, CNS, liver, and kidney. Educate workers about the hazards of 1,1-dichloroethane and the necessary precautions to reduce or prevent exposure.

Transportation Data (49 CFR 172.102)

IMO Shipping Name: 1,1-Dichloroethane
IMO Hazard Class: 3.2
ID No.: UN2362
IMO Label: Flammable Liquid
IMDG Packaging Group: II

***MSDS Collection* References:** 73, 89, 101, 103, 126, 127, 131, 132, 133, 136, 140, 148, 149, 153, 159, 162, 163, 164, 167, 168, 171
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** PA Roy, MPH, CIH; **Medical Review:** AC Darlington, MPH, MD

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Material Safety Data Sheets Collection:

Sheet No. 311
Methyl Chloroform

Issued: 11/75 Revision: F, 3/92 Errata: 6/92

Section 1. Material Identification

38

Methyl Chloroform ($C_2H_3Cl_3$) Description: Derived by catalytic addition of hydrogen chloride to 1,1-dichloroethylene or by re-fluxing chlorine monoxide with carbon tetrachloride and chloroethane. Available in technical and solvent grades which differ only in the amount of stabilizer added to prevent metal parts corrosion. Used as a solvent for oils, waxes, tars, cleaning precision instruments, and pesticides; as a component of inks and drain cleaners; in degreasing metals, and textile processing. In recent years, methyl chloroform has found widespread use as a substitute for carbon tetrachloride.

R	1
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S	2*
K	1

Genium

HMIS
H 2
F 1
R 1
PPG*
* Sec. 8

Other Designations: CAS No. 71-55-6; α-trichloroethane; Inhibisol; 1,1,1-trichloroethane; Strobane.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for a suppliers list.
Cautions: Methyl chloroform is a skin, eye, and respiratory tract irritant and can become narcotic with an anesthetic effect at high concentrations.
* Data on skin absorption via methyl chloroform is conflicting.[133] Some studies show definite absorption where others don't.

Section 2. Ingredients and Occupational Exposure Limits

Methyl chloroform, ca 92 to 97%*

1990 OSHA PELs
8-hr TWA: 350 ppm (1900 mg/m³)
15-min STEL: 450 ppm (2450 mg/m³)

1990 IDLH Level
1000 ppm

1990 NIOSH REL
15-min Ceiling: 350 ppm (1900 mg/m³)

1991-92 ACGIH TLVs
TWA: 350 ppm (1910 mg/m³)
STEL: 450 ppm (2460 mg/m³)

1990 DFG (Germany) MAKs
TWA: 200 ppm (1080 mg/m³)
Half-life: 2 hr to shift length
Peak Exposure Limit: 1000 ppm/30 min (average value)/2 per shift

1985-86 Toxicity Data†
Human, oral, TD_{Lo}: 670 mg/kg produced diarrhea, nausea, and vomiting
Human, inhalation, LC_{Lo}: 27 g/m³/10 min; toxic effects not yet reviewed
Man, eye: 450 ppm/8 hr produced irritation
Rat, inhalation, TC_{Lo}: 2100 ppm/24 hr for 14 days prior to mating and from 1 to 20 days of pregnancy produced specific developmental abnormalities of the musculoskelatal system

* Methyl chloroform usually contains inhibitors (3 to 8%) to prevent corrosion of aluminum and some other metals. Typical inhibitors are nitromethane, butylene oxide, secondary butyl alcohols, ketones, and glycol diesters.
† See NIOSH, *RTECS* (KJ2975000), for additional irritation, mutation, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: 165 °F (75 °C)
Freezing Point: -22 °F (-30 °C)
Vapor Pressure: 100 mm Hg at 68 °F (20 °C)
Vapor Density (air = 1): 4.55
Corrosivity: Readily corrodes aluminum and its alloys
Refraction Index: 1.43765 at 69.8 °F (21 °C)
Viscosity: 0.858 cP at 68 °F (20 °C)
Molecular Weight: 133.42
Density: 1.3376 at 68/39.8 °F (20/4 °C)
Water Solubility: Insoluble
Other Solubilities: Soluble in acetone, alcohol, ether, benzene, carbon tetrachloride, and carbon disulfide
% in Saturated Air: 16.7% at 77 °F (25 °C)
Relative Evaporation Rate (butyl acetate = 1): 12.8
Appearance and Odor: Colorless liquid with a sweetish, chloroform-like odor. The odor threshold is 44 ppm.

Section 4. Fire and Explosion Data

Flash Point: None (in conventional CC tests)	Autoignition Temperature: 932 °F (500 °C)	LEL: 7% v/v	UEL: 16% v/v

Extinguishing Media: *Noncombustible liquid* whose *vapor* burns in the presence of excess oxygen or a strong ignition source. For small fires, use dry chemical or carbon dioxide (CO_2). For large fires use fog or regular foam. If these materials are unavailable, a water spray may be used but be aware that water reacts slowly with methyl chloroform to release hydrochloric acid.
Unusual Fire or Explosion Hazards: Vapors are heavier than air and may travel to a strong ignition source and flash back. Air/vapor mixtures may explode when heated. Container may explode in heat of fire. Exposure to open flames or arc welding can produce hydrogen chloride and phosgene.
Special Fire-fighting Procedures: Methyl chloroform's burning rate is 2.9 mm/min. Since fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing provides limited protection. Wear clothing specifically recommended by the manufacturer for use in fires involving methyl chloroform. Apply cooling water to container sides until after fire is extinguished. Stay away from ends of tanks. Isolate area for 1/2 mile if fire involves tank, truck, or rail car. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Methyl chloroform is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization can occur in contact with aluminum trichloride.
Chemical Incompatibilities: Methyl chloroform is incompatible with sodium hydroxide, nitrogen tetroxide, oxygen (liquid or gas), strong oxidizers, and chemically active metals like aluminum, zinc, and magnesium powders; reacts violently with caustics to form dichloroacetylene; reacts slowly with water to form hydrochloric acid; forms shock sensitive mixtures with potassium; and polymerizes in contact with aluminum trichloride.
Conditions to Avoid: Exposure to moisture, strong ignition sources, and arc-welding units, and contact with incompatibles.
Hazardous Products of Decomposition: Thermal oxidative decomposition (temperatures >500 °F; contact with hot metals, or under UV rays) of methyl chloroform can produce carbon dioxide (CO_2) and toxic dichloroacetylene, hydrogen chloride, and phosgene gases.

Section 6. Health Hazard Data

Carcinogenicity: The IARC (Class 3, inadequate evidence),[164] NTP,[142] and OSHA[64] do not list methyl chloroform as a carcinogen.
Summary of Risks: Methyl chloroform is considered one of the least toxic of the liquid chlorinated hydrocarbons. It is irritating to eyes, skin, and respiratory tract. Although low in systemic toxicity, methyl chloroform is an anesthetic capable of causing death at high concentrations (>15,000 ppm), generally in poorly ventilated, enclosed areas. Quick and complete recovery is observed after prompt removal of unconscious persons from area of exposure. Like many other solvents, methyl chloroform sensitizes the heart to epinephrine (blood pressure-raising hormone) and may induce cardiac arrhythmias and arrest.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Target Organs: Skin, eyes, central nervous (CNS) and cardiovascular (CVS) systems.

Continue on next page

Section 6. Health Hazard Data, *continued*

Primary Entry Routes: Inhalation, skin contact. **Acute Effects:** Methyl chloroform defats the skin causing irritation, redness, dryness, and scaling. Contact with eyes produces irritation and mild conjunctivitis. Vapor inhalation can cause headache, dizziness, equilibrium disturbances, and in high concentrations may lead to CNS depression, unconsciousness, and coma. During a 60-min exposure period these effects are observed: 100 ppm is the observed odor threshold, at 500 ppm there is obvious odor and decreased reaction time, 1000 ppm causes slight equilibrium loss, at 5000 ppm there is definite incoordination, and 20,000 ppm produces surgical strength anesthesia with possible death. Mild liver and kidney dysfunction may occur after CNS depression recovery. Although unlikely, if ingestion occurs, symptoms include nausea, vomiting, diarrhea, and possible esophageal burns. The acute lethal human dose is ~500 to 5000 mg/kg. **Chronic Effects:** None reported.

FIRST AID

Eyes: Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. *Do not* allow victim to rub or keep eyes tightly shut. Consult a physician immediately. **Skin:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center, and unless otherwise advised, have that *conscious and alert* person drink 1 to 2 glasses of water to dilute. When deciding whether to induce vomiting, carefully consider amount ingested, time since ingestion, and availability of medical help. If large amounts are recently ingested (absorption into the body is not yet likely to have occurred), and medical help or transportation to a medical facility is not readily available, induce vomiting. Otherwise, vomiting is not recommended since aspiration of vomitus can produce chemical pneumonitis. **Note to Physicians:** Do not use adrenaline or sympathomimetic amines in treatment because of the increased cardiac sensitivity involved.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Immediately notify safety personnel, isolate area, deny entry, and stay upwind. Shut off all ignition sources. If possible without risk, shut off leak. Cleanup personnel should wear fully encapsulating vapor-protective clothing. For small spills, take up with earth, sand, vermiculite, or other absorbent, noncombustible material. Using nonsparking tools, place in suitable containers for disposal or reclamation. For large spills, dike far ahead of liquid spill for later disposal or reclamation. Report any release in excess of 1000 lb. Follow applicable OSHA regulations (29 CFR 1910.120).
Environmental Transport: In water, methyl chloroform's half-life is hours to weeks depending on wind and mixing conditions. It is very persistent in groundwater. On land it volatilizes due to its high vapor pressure and leaches extensively. When released to the atmosphere, methyl chloroform can be transported long distances and returned to earth via rain. It is slowly degraded by reaction with hydroxyl radicals and has a half-life of 6 months to 25 years. The Natural Resources Defenses Council reported recently that methyl chloroform depletes ozone.
Ecotoxicity Values: *Pimephales promelas* (fathead minnow), LC_{50}: 52.8 mg/L/96 hr; *Poecilia reticulata* (guppy), LC_{50}: 133 ppm/7 day.
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.33): No. U226
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Reportable Quantity (RQ), 1000 lb (454 kg) [* per RCRA, Sec. 3001, CWA, Sec. 307(a), and CAA, Sec. 112]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear splash-proof, protective chemical safety goggles or faceshields, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a respiratory protection program that includes at least: training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.
Other: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent repeated or prolonged skin contact. Viton and butyl rubber [with breakthrough times (BTs) of >8 hr and 4 to 7.9 hr, respectively] are recommended materials for protective gear. *Do not use* neoprene, polyvinyl chloride (PVC), natural rubber, or polyethylene because these materials have a BT of <1 hr.
Ventilation: Provide general and local exhaust (in some cases, explosion-proof) ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean personal protective equipment.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Prevent physical damage to containers. Store in cool, dry, well-ventilated (use pressure-vacuum ventilation) area away from ignition sources, arc-welding operations, and incompatibles (Sec. 5). Regularly monitor inhibitor levels. *Do not* store in aluminum containers or use pressure-spraying equipment when methyl chloroform is involved.
Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. To prevent static sparks, electrically ground and bond all equipment used in methyl chloroform manufacturing, use, storage, transfer, and shipping.
Administrative Controls: Consider preplacement and periodic medical exams of exposed workers that emphasize CNS, CVS, liver and skin.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: 1,1,1-Trichloroethane
DOT Hazard Class: ORM-A
ID No.: UN2831
DOT Label: None
DOT Packaging Exceptions: 173.505
DOT Packaging Requirements: 173.605

IMO Shipping Name: 1,1,1-Trichloroethane
IMO Hazard Class: 6.1
ID No.: UN2831
IMO Label: St. Andrews Cross
IMDG Packaging Group: III

MSDS Collection **References:** 26, 38, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 148, 153, 159, 162, 163, 164
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** D Wilson, CIH; **Medical Review:** AC Darlington, MPH, MD; **Edited by:** JR Stuart, MS

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Sheet No. 312
Trichloroethylene

Issued: 7/79 Revision: F, 9/92

Section 1. Material Identification

Trichloroethylene (C_2HCl_3) Description: Derived by treating tetrachloroethane with lime or other alkali in the presence of water, or by thermal decomposition of tetrachloroethane followed by steam distillation. Stabilizers such as epichlorohydrin, isobutanol, carbon tetrachloride, chloroform, benzene, or pentanol-2-triethanolamine are then added. Used as a degreasing solvent in electronics and dry cleaning, a chemical intermediate, a refrigerant and heat-exchange liquid, and a diluent in paint and adhesives; in oil, fat, and wax extraction and in aerospace operations (flushing liquid oxygen). Formerly used as a fumigant (food) and anesthetic (replaced due to its hazardous decomposition in closed-circuit apparatus).

Other Designations: CAS No. 79-01-6; acetylene trichloride; Algylen; Anamenth; Benzinol; Cecolene; Chlorylen; Dow-Tri; ethylene trichloride; Germalgene; Narcogen; Triasol; trichloroethene; TCE; 1,1,3-trichloroethylene.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for a suppliers list.

R 1
I 2
S 2*
K 3
* Skin absorption

NFPA
2 / 2 0 / -

HMIS
H 2†
F 2
R 0
PPE‡
† Chronic Effects
‡ Sec. 8

Cautions: TCE is irritating and toxic to the central nervous system (CNS). Inhalation of high concentrations have lead to death due to ventricular fibrillation. Chronic exposure may lead to heart, liver, and kidney damage. The liquid is absorbed through the skin. Although it has a relatively low flash point, TCE burns with difficulty.

Section 2. Ingredients and Occupational Exposure Limits

Trichloroethylene, < 100% [contains stabilizers (Sec. 1)].

1991 OSHA PELs
8-hr TWA: 50 ppm (270 mg/m³)
15-min STEL: 200 ppm (1080 mg/m³)

1990 IDLH Level
1000 ppm

1990 NIOSH REL
10-hr TWA: 25 ppm (~135 mg/m³)

1992-93 ACGIH TLVs
TWA: 50 ppm (269 mg/m³)
STEL: 200 ppm (1070 mg/m³)

1990 DFG (Germany) MAK
Ceiling: 50 ppm (270 mg/m³)
Category II: Substances with systemic effects
Half-life: 2 hr to shift length
Peak Exposure Limit: 250 ppm, 30 min average value; 2 peaks/shift

1985-86 Toxicity Data*
Human, inhalation, TC_{Lo}: 160 ppm/83 min caused hallucinations and distorted perceptions.
Human, lymphocyte: 5 mL/L caused DNA inhibition.
Rabbit, skin: 500 mg/24 hr caused severe irritation.
Rabbit, eye: 20 mg/24 hr caused moderate irritation.
Mouse, oral, TD_{Lo}: 455 mg/kg administered intermittently for 78 weeks produced liver tumors.

* See NIOSH, *RTECS* (KX4550000), for additional irritation, mutation, reproductive, tumorigenic and toxicity data.

Section 3. Physical Data

Boiling Point: 189 °F (87 °C)
Freezing Point: -121 °F (-85 °C)
Viscosity: 0.0055 Poise at 77 °F (25 °C)
Molecular Weight: 131.38
Density: 1.4649 at 20/4 °C
Refraction Index: 1.477 at 68 °F (20 °C/D)
Odor Threshold: 82 to 108 ppm (*not an effective warning*)

Vapor Pressure: 58 mm Hg at 68 °F (20 °C); 100 mm Hg at 32 °F (0 °C)
Saturated Vapor Density (Air = 0.075 lbs/ft³; 1.2 kg/m³): 0.0956 lbs/ft³; 1.53 kg/m³
Water Solubility: Very slightly soluble; 0.1% at 77 °F (25 °C)
Other Solubilities: Highly soluble in organic solvents (alcohol, acetone, ether, carbon tetrachloride, & chloroform) and lipids.
Surface Tension: 29.3 dyne/cm

Appearance and Odor: Clear, colorless (sometimes dyed blue), mobile liquid with a sweet chloroform odor.

Section 4. Fire and Explosion Data

Flash Point: 90 °F (32 °C) CC **Autoignition Temperature:** 788 °F (420 °C) **LEL:** 8% (25 °C); 12.5% (100 °C) **UEL:** 10% (25 °C); 90% (100 °C)

Extinguishing Media: A Class 1C Flammable Liquid. Although it has a flash point of 90 °F, TCE burns with difficulty. For small fires, use dry chemical, carbon dioxide, water spray, or regular foam. For large fires, use water spray, fog, or regular foam. **Unusual Fire or Explosion Hazards:** Vapor/air mixtures may explode when ignited. Container may explode in heat of fire. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing provides only limited protection against TCE. Apply cooling water to sides of container until well after fire is out. Stay away from ends of tanks. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: TCE slowly decomposes in the presence of light and moisture to form corrosive hydrochloric acid. Hazardous polymerization cannot occur. **Chemical Incompatibilities:** Include alkalis (sodium hydroxide), chemically active metals (aluminum, beryllium, lithium, magnesium, sodium, potassium, and titanium), epoxides, and oxidants (nitrogen tetraoxide, perchloric acid). Contact with 1-chloro-2,3-epoxy propane or the mono and di 2,3-epoxypropyl ethers of 1,4-butanediol + 2,2-bis-4(2',3'-epoxypropoxy)-phenylpropane can, in the presence of catalytic quantities of halide ions, cause dehydrochlorination of TCE to explosive dichloroacetylene. **Conditions to Avoid:** Exposure to light, moisture, ignition sources, and incompatibles. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of TCE (above 300 °C) or exposure to ultraviolet light can produce carbon dioxide (CO_2) and toxic dichloro acetylene (explosive), chlorine, hydrogen chloride, and phosgene gas.

Section 6. Health Hazard Data

Carcinogenicity: The following agencies have rated TCE's carcinogenicity: IARC (Class 3, limited animal evidence & insufficient human data), Germany MAK (Class B, justifiably suspected of having carcinogenic potential), & NIOSH (Class X, carcinogen defined with no further categorization). **Summary of Risks:** TCE vapor is irritating to the eyes, nose, and respiratory tract and inhalation of high concentrations can lead to severe CNS effects such as unconsciousness, ventricular arrythmias, and death due to cardiac arrest. Mild liver dysfunction was also seen at levels high enough to produce CNS effects. Contact with the liquid is irritating to the skin and can lead to dermatitis by defatting the skin. Chronic toxicity is observed in the victims increasing intolerance to alcohol characterized by 'degreasers flush', a transient redness of the face, trunk, and arms. The euphoric effect of TCE has led to craving, and habitual sniffing of its vapors.

Continue on next page

Section 6. Health Hazard Data, *Continued*

TCE crosses the placental barrier and thus exposes the fetus (any effects are yet unknown). There are increased reports of menstrual disorders in women workers and decreased libido in males at exposures high enough to cause CNS effects. TCE is eliminated unchanged in expired air and as metabolites (trichloroacetic acid & trichloroethanol) in blood and urine. **Medical Conditions Aggravated by Long-Term Exposure:** Disorders of the nervous system, skin, heart, liver, and kidney. **Target Organs:** Respiratory, central & peripheral nervous, and cardiovascular (heart) systems, liver, kidney, and skin. **Primary Entry Routes:** Inhalation, skin and eye contact, and ingestion (rarely). **Acute Effects:** Vapor inhalation can cause eye, nose, and throat irritation, nausea, blurred vision, overexcitement, headache, drunkenness, memory loss, irregular heartbeat (resulting in sudden death), unconsciousness, and death due to cardiac failure. Skin contact with the liquid can cause dryness and cracking and prolonged exposure (generally if the victim is unconscious) can cause blistering. Eye contact can cause irritation and watering, with corneal epithelium injury in some cases. Ingestion of the liquid can cause lip, mouth, and gastrointestinal irritation, irregular heartbeat, nausea and vomiting, diarrhea (possibly blood-stained), drowsiness, and risk of pulmonary edema (fluid in lungs). **Chronic Effects:** Effects may persist for several weeks or months after repeated exposure. Symptoms include giddiness, irritability, headache, digestive disturbances, mental confusion, intolerance to alcohol (degreasers flush), altered color perception, loss or impairment of sense of smell, double vision, and peripheral nervous system function impairment including persistent neuritis, temporary loss of sense of touch, and paralysis of the fingers from direct contact with TCE liquid.

FIRST AID Eyes: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center and unless otherwise advised, have that *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting. Do not give milk, as its fat content (TCE is lipid soluble) may inhance gastrointestinal absorption of TCE. **Note to Physicians:** TCE elimination seems to be triphasic with half lives at 20 min, 3 hr, and 30 hr. Some success is seen in treating patients with propranolol, atropine, and disulfiram. Monitor urine and blood (lethal level = 3 to 110 µg/mL) metabolites. BEI = 100 mg/g creatinine (trichloroacetic acid) in urine, *sample at end of workweek.* BEI = 4 mg/L (trichloroethanol) in blood, *sample at end of shift at end of the workweek.* These tests are not 100% accurate indicators of exposure; monitor TCE in expired air as a confirmatory test.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Immediately notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off all ignition sources. For small spills, take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable container for later disposal. For large spills, flush to containment area where density stratification will form a bottom TCE layer which can be pumped and containerized. Report any release in excess of 1000 lbs. Follow applicable OSHA regulations (29 CFR 1910.120). **Ecotoxicity Values:** Bluegill sunfish, LC_{50} = 44,700 µg/L/96 hr; fathead minnow (*Pimephales promelas*), LC_{50} = 40.7 mg/L/96 hr. **Environmental Degradation:** In air, TCE is photooxidized with a half-life of 5 days and reported to form phosgene, dichloroacetyl chloride, and formyl chloride. In water it evaporates rapidly in minutes to hours. TCE rapidly evaporates and may leach since it does not absorb to sediment. **Soil Absorption/Mobility:** TCE has a Log K_{oc} of 2, indicating high soil mobility. **Disposal:** Waste TCE can be poured on dry sand and allowed to vaporize in isolated location, purified by distillation, or returned to supplier. A potential candidate for rotary kiln incineration at 1508 to 2912 °F (820 to 1600 °C) with an acid scrubber to remove halo acids. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)
Listed as a RCRA Hazardous Waste (40 CFR 261.33 & 261.31): No. U228 & F002 (*spent solvent*)
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 100 lb (45.4 kg) [* per RCRA, Sec. 3001, CWA Sec. 311 (b)(4), & CWA Sec. 307 (a)]

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear chemical safety goggles (cup-type or rubber framed, equipped with impact-resistant glass), per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. At any detectable concentration, wear a SCBA with a full facepiece operated in pressure demand or other positive pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets made from Viton or Neoprene to prevent skin contact. *Do not* use natural rubber or polyvinyl chloride (PVC). **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes and launder before reuse. Remove this material from your shoes and clean personal protective equipment. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Prevent physical damage to containers. Store in steel drums, in a cool, dry, well-ventilated area away from sunlight, heat, ignition sources, and incompatibles (Sec. 5). Store large quantities in galvanized iron, black iron, or steel containers; small amounts in dark (amber) colored glass bottles. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. Design processes so that the operator is not directly exposed to the solvent or its vapor. Do not use open electric heaters, high-temperature processes, arc-welding or open flames in TCE atmospheres. **Administrative Controls:** Consider preplacement and periodic medical exams of exposed workers with emphasis on skin, respiratory, cardiac, central and peripheral nervous systems, and liver and kidney function. Employ air and biological monitoring (BEIs). Instruct employees on safe handling of TCE.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Trichloroethylene
DOT Hazard Class: 6.1
ID No.: UN1710
DOT Packing Group: III
DOT Label: Keep Away From Food
DOT Special Provisions (172.102): N36, T1

Packaging Authorizations
a) Exceptions: 173.153
b) Non-bulk Packaging: 173.203
c) Bulk Packaging: 173.241

Quantity Limitations
a) Passenger Aircraft or Railcar: 60L
b) Cargo Aircraft Only: 220L

Vessel Stowage Requirements
a) Vessel Stowage: A
b) Other: 40

MSDS Collection **References:** 26, 73, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 140, 148, 149, 153, 159, 163, 164, 167, 168, 171, 174, 175, 176, 180.
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** D Wilson, CIH; **Medical Review:** AC Darlington, MD

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Material Safety Data Sheets Collection:
Sheet No. 317
Toluene
Issued: 8/79 Revision: E, 9/92 Errata: 2/94

Section 1. Material Identification

Toluene ($C_6H_5CH_3$) Description: Derived from petroleum i.e., dehydrogenation of cycloparaffin fractions followed by the aromatization of saturated aromatic hydrocarbons or by fractional distillation of coal-tar light oil and purified by rectification. Used widely as a solvent (replacing benzene in many cases) for oils, resins, adhesives, natural rubber, coal tar, asphalt, pitch, acetyl celluloses, cellulose paints and varnishes; a diluent for photogravure inks; raw material for organic synthesis (benzoyl & benzilidene chlorides, saccharine, TNT, toluene diisocyanate, and many dyestuffs), in aviation and high octane automobile gasoline, as a nonclinical thermometer liquid and suspension solution for navigational instruments.
Other Designations: CAS No. 108-88-3, Methacide, methylbenzene, methylbenzol, phenylmethane, toluol, Tolu-sol.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for a suppliers list.

Cautions: Toluene is an eye, skin, and respiratory tract irritant becoming narcotic at high centrations. Liver and kidney damage has occurred. Pregnant women chronically exposed to toluene have shown teratogenic effects. Toluene is highly flammable.

R 1
I 3
S 2*
K 3
* Skin absorption

NFPA

HMIS
H 2 - Chronic effects
F 3
R 0
PPE-Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Toluene, < 100%; may contain a small amount of benzene (~ 1%), xylene, and nonaromatic hydrocarbons.

1991 OSHA PELs
8-hr TWA: 100 ppm (375 mg/m³)
15-min STEL: 150 ppm (560 mg/m³)

1990 IDLH Level
2000 ppm

1990 NIOSH RELs
TWA: 100 ppm (375 mg/m³)
STEL: 150 ppm (560 mg/m³)

1992-93 ACGIH TLV (Skin)
TWA: 50 ppm (188 mg/m³)

1990 DFG (Germany) MAK*
TWA: 100 ppm (380 mg/m³)
Half-life: 2 hr to end of shift
Category II: Substances with systemic effects
Peak Exposure Limit: 500 ppm, 30 min average value, 2/shift

1985-86 Toxicity Data†
Man, inhalation, TC_{Lo}: 100 ppm caused hallucinations, and changes in motor activity and changes in psychophysiological tests.
Human, oral, LD_{Lo}: 50 mg/kg; toxic effects not yet reviewed
Human, eye: 300 ppm caused irritation.
Rat, oral, LD_{50}: 5000 mg/kg
Rat, liver: 30 µmol/L caused DNA damage.

* Available information suggests damage to the developing fetus is probable.
†See NIOSH, *RTECS* (XS5250000), for additional irritation, mutation, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: 232 °F (110.6 °C)
Melting Point: -139 °F (-95 °C)
Molecular Weight: 92.15
Density: 0.866 at 68 °F (20/4 °C)
Surface Tension: 29 dyne/cm at 68 °F (20 °C)
Viscosity: 0.59 cP at 68 °F (20 °C)
Refraction Index: 1.4967 at 20 °C/D

Water Solubility: Very slightly soluble, 0.6 mg/L at 68 °F (20 °C)
Other Solubilities: Soluble in acetone, alcohol, ether, benzene, chloroform, glacial acetic acid, petroleum ether, and carbon disulfide.
Vapor Pressure: 22 mm Hg at 68 °F (20 °C); 36.7 mm Hg at 86 °F (30 °C)
Saturated Vapor Density (Air = 0.075 lb/ft³ or 1.2 kg/m³): 0.0797 lb/ft³ or 1.2755 kg/m³
Odor Threshold (range of all referenced values): 0.021 to 69 ppm

Appearance and Odor: Colorless liquid with a sickly sweet odor.

Section 4. Fire and Explosion Data

Flash Point: 40 °F (4.4 °C) CC	**Autoignition Temperature:** 896 °F (480 °C)	**LEL:** 1.27% v/v	**UEL:** 7.0% v/v

Extinguishing Media: Toluene is a Class 1B flammable liquid. To fight fire, use dry chemical carbon dioxide, or 'alcohol-resistant' foam. Water spray may be ineffective as toluene floats on water and may actually spread fire. **Unusual Fire or Explosion Hazards:** Concentrated vapors are heavier than air and may travel to an ignition source and flash back. Container may explode in heat of fire. Toluenes' burning rate = 5.7 mm/min and its flame speed = 37 cm/sec. Vapor poses an explosion hazard indoors, outdoors, and in sewers. May accumulate static electricity. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing provides only limited protection. Apply cooling water to sides of tanks until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from fire and let burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire because a BLEVE (boiling liquid expanding vapor explosion) may be imminent. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Toluene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization can't occur. **Chemical Incompatibilities:** Strong oxidizers, concentrated nitric acid, nitric acid + sulfuric acid, dinitrogen tetroxide, silver perchlorate, bromine trifluoride, tetranitromethane, and 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione. **Conditions to Avoid:** Contact with heat, ignition sources, or incompatibles. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of toluene can produce carbon dioxide, and acrid, irritating smoke.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,[164] NTP,[169] and OSHA[164] do not list toluene as a carcinogen. **Summary of Risks:** Toluene is irritating to the eyes, nose, and respiratory tract. Inhalation of high concentrations produces a narcotic effect sometimes leading to coma as well as liver and kidney damage. 93% of inhaled toluene is retained in the body of which 80% is metabolized to benzoic acid, then to hippuric acid and excreted in urine. The remainder is metabolized to *o*-cresol and excreted or exhaled unchanged. Toluene metabolism is inhibited by alcohol ingestion and is synergistic with benzene, asphalt fumes, or chlorinated hydrocarbons (i.e. perchloroethylene). Toluene is readily absorbed through the skin at 14 to 23 mg/cm²/hr. Toluene is absorbed quicker during exercise than at rest and appears to be retained longer in obese versus thin victims; presumably due to its lipid solubility. There is inconsistent data on toluene's ability to damage bone marrow; chronic poisoning has resulted in anemia and leucopenia with biopsy showing bone marrow hypo-plasia. These reports are few and some authorities argue that the effects may have been due to benzene contaminants. Chronic inhalation during pregnancy has been associated with teratogenic effects on the fetus including microcephaly, CNS dysfunction, attentional deficits, developmental delay + language impairment, growth retardation, and physical defects including a small midface, short palpebral fissures, with deep-set eyes, low-set ears, flat nasal bridge with a small nose, micrognathia, and blunt fingertips. There is some evidence that toluene causes an autoimmune illness in which the body produces antibodies that cause inflammation of its own kidney.

Continue on next page

Section 6. Health Hazard Data

Medical Conditions Aggravated by Long-Term Exposure: Alcoholism and CNS, kidney, skin, or liver disease. **Target Organs:** CNS, liver, kidney, skin. **Primary Entry Routes:** Inhalation, skin contact/absorption. **Acute Effects:** Vapor inhalation causes respiratory tract irritation, fatigue, weakness, confusion, dizziness, headache, dilated pupils, watering eyes, nervousness, insomnia, parasthesis, and vertigo progressing to narcotic coma. Death may result from cardiac arrest due to ventricular fibrillation with catecholamines loss. Liquid splashed in the eye causes conjunctival irritation, transient corneal damage and possible burns. Prolonged skin contact leads to drying and fissured dermatitis. Ingestion causes GI tract irritation and symptoms associated with inhalation. **Chronic Effects:** Symptoms include mucous membrane irritation, headache, vertigo, nausea, appetite loss and alcohol intolerance. Repeated heavy exposure may result in encephalopathies (cerebellar ataxia and cognitive dysfunction), liver enlargement, and kidney dystrophy (wasting away). Symptoms usually appear at workdays end, worsen at weeks end and decrease or disappear over the weekend. **FIRST AID Eyes:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult an ophthalmologist immediately. **Skin:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center and unless otherwise advised, have that *conscious and alert* person drink 1 to 2 glasses of water to dilute. *Do not* induce vomiting because of danger of aspiration into the lungs. Gastric lavage may be indicated if large amounts are swallowed; potential toxicity needs to be weighed against aspiration risk when deciding for or against gastric lavage. **Note to Physicians:** Monitor cardiac function. If indicated, use epinephrine and other catecholamines carefully, because of the possibility of a lowered myocardial threshold to the arrhythmogenic effects of such substances. Obtain CBC, electrolytes, and urinalysis. Monitor arterial blood gases. If toluene has > 0.02% (200 ppm) benzene, evaluate for potential benzene toxicity. BEI: hippuric acid in urine, sample at shift end (2.5 g/g creatinine); Toluene in venous blood, sample at shift end (1.0 mg/L).

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Cleanup personnel protect against inhalation and skin/eye contact. Use water spray to cool and disperse vapors but it may not prevent ignition in closed spaces. Cellosolve, hycar absorbent materials, and fluorocarbon water can also be used for vapor suppression/containment. Take up small spill with earth, sand, vermiculite, or other absorbent, noncombustible material. Dike far ahead of large spills for later reclamation or disposal. For water spills, (10 ppm or greater) apply activated carbon at 10X the spilled amount and remove trapped material with suction hoses or use mechanical dredges/lifts to remove immobilized masses of pollutants and precipitates. Toluene can undergo fluidized bed incineration at 842 to 1796 °F (450 to 980 °C), rotary kiln incineration at 1508 to 2912 °F (820 to 1600 °C), or liquid injection incineration at 1202 to 2912 °F (650 to 1600 °C). Follow applicable OSHA regulations (29 CFR 1910.120). **Ecotoxicity Values:** Blue gill, LC_{50} = 17 mg/L/24 hr; shrimp (*Crangonfracis coron*), LC_{50} = 4.3 ppm/96 hr; fathead minnow (*Pimephales promelas*), LC_{50} = 36.2 mg/L/96 hr. **Environmental Degradation:** If released to land, toluene evaporates and undergoes microbial degradation. In water, toluene volatilizes and biodegrades with a half-life of days to several weeks. In air, toluene degrades by reaction with photochemically produced hydroxyl radicals. **Disposal:** Treat contaminated water by gravity separation of solids, followed by skimming of surface. Pass through dual media filtration and carbon absorption units (carbon ratio 1 kg to 10 kg soluble material). Return waste water from backwash to gravity separator. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.33): No. U220
SARA Extremely Hazardous Substance (40 CFR 355), TPQ: Not listed
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 1000 lb (454 kg)
[* per RCRA, Sec. 3001; CWA, Sec. 311 (b)(4); CWA, Sec. 307 (a)]
Listed as a SARA Toxic Chemical (40 CFR 372.65): Not listed

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses with shatter-resistant glass and side-shields or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 1000 ppm, use any chemical cartridge respirator with appropriate organic vapor cartridges, any supplied-air respirator (SAR), or SCBA. For < 2000 ppm, use any SAR operated in continuous-flow mode, any SAR or SCBA with a full facepiece, or any air-purifying respirator with a full facepiece having a chin-style, front or back mounted organic vapor canister. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent skin contact. Polyvinyl alcohol with a breakthrough time of > 8 hr, Teflon and Viton are recommended as suitable materials for PPE. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes and launder before reuse. Remove toluene from your shoes and clean PPE. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Prevent physical damage to containers. Store in a cool, dry, well-ventilated area away from ignition sources and incompatibles. Outside or detached storage is preferred. If stored inside, use a standard flammable liquids warehouse, room, or cabinet. To prevent static sparks, electrically ground and bond all equipment used with toluene. Do not use open lights in toluene areas. Install Class 1, Group D electrical equipment. Check that toluene is free of or contains < 1% benzene before use. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. **Administrative Controls:** Adopt controls for confined spaces (29 CFR 1910.146) if entering areas of unknown toluene levels (holes, wells, storage tanks). Consider preplacement and periodic medical exams of exposed workers that emphasize the CNS, liver, kidney, and skin. Include hemocytometric and thrombocyte count in cases where benzene is a contaminant of toluene. Monitor air at regular intervals to ensure effective ventilation.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Toluene
DOT Hazard Class: 3
ID No.: UN1294
DOT Packing Group: II
DOT Label: Flammable Liquid
Special Provisions (172.102): T1

Packaging Authorizations
a) Exceptions: 150
b) Non-bulk Packaging: 202
c) Bulk Packaging: 242

Quantity Limitations
a) Passenger Aircraft or Railcar: 5L
b) Cargo Aircraft Only: 60L

Vessel Stowage Requirements
Vessel Stowage: B
Other: --

MSDS Collection **References:** 26, 73, 100, 101, 103, 124, 126, 127, 132, 140, 148, 153, 159, 163, 164, 167, 169, 171, 174, 175, 176, 180.
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** PA Roy, CIH, MPH; **Medical Review:** AC Darlington, MD, MPH

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Material Safety Data Sheets Collection:

Sheet No. 318
Xylene *(Mixed Isomers)*

Issued: 11/80 Revision: E, 9/92 Errata: 12/94

Section 1. Material Identification

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Xylene (Mixed Isomers) (C_8H_{10}) Description: The commercial product is a blend of the three isomers [*ortho*-(*o*-), *meta*-(*m*-), *para*-(*p*-)] with the largest proportion being *m*-xylene. Xylene is obtained from coal tar, toluene by transalkylation, and pseudocumene. Used in the manufacture of dyes, resins, paints, varnishes, and other organics; as a general solvent for adhesives; a cleaning agent in microscope technique; as a solvent for Canada balsam microscopy; as a fuel component; in aviation gasoline, protective coatings, sterilizing catgut, hydrogen peroxide, perfumes, insect repellants, pharmaceuticals, and the leather industry; in the production of phthalic anhydride, isophthalic, and terephthalic acids and their dimethyl esters which are used in the manufacture of polyester fibers; and as an indirect food additive as a component of adhesives. Around the home, xylene is found as vehicles in paints, paint removers, degreasing cleaners, lacquers, glues and cements and as solvent/vehicles for pesticides.

R	1
I	2
S	2
K	3

NFPA: 2 / 3 / 0 / –

HMIS
H 2†
F 3
R 0
PPE ‡

† Chronic Effects
‡ Sec. 8

Other Designations: CAS No. 1330-20-7 [95-47-6; 108-38-3; 106-42-3 (*o*-, *m*-, *p*-isomers)], dimethylbenzene, methyltoluene, NCI-C55232, Violet 3, xylol.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for a suppliers list.

Cautions: Xylene is an eye, skin, and mucous membrane irritant and may be narcotic in high concentrations. It is a dangerous fire hazard.

Section 2. Ingredients and Occupational Exposure Limits

Xylene (mixed isomers): the commercial product generally contains ~ 40% *m*-xylene; 20% each of *o*-xylene, *p*-xylene, and ethylbenzene; and small quantities of toluene. Unpurified xylene may contain pseudocumene.

1991 OSHA PELs
8-hr TWA: 100 ppm (435 mg/m³)
15-min STEL: 150 ppm (655 mg/m³)

1990 IDLH Level
1000 ppm

1990 NIOSH RELs
TWA: 100 ppm (435 mg/m³)
STEL: 150 ppm (655 mg/m³)

1992-93 ACGIH TLVs
TWA: 100 ppm (434 mg/m³)
STEL: 150 ppm (651 mg/m³)
BEI (Biological Exposure Index): Methylhippuric acids in urine at end of shift: 1.5 g/g creatinine

1990 DFG (Germany) MAK
TWA: 100 ppm (440 mg/m³)
Category II: Substances with systemic effects
Half-life: < 2 hr
Peak Exposure: 200 ppm, 30 min, average value, 4 peaks per shift

1985-86 Toxicity Data*
Human, inhalation, TC_{Lo}: 200 ppm produced olfaction effects, conjunctiva irritation, and other changes involving the lungs, thorax, or respiration.
Man, inhalation, LC_{Lo}: 10000 ppm/6 hr; toxic effects not yet reviewed.
Human, oral, LD_{Lo}: 50 mg/kg; no toxic effect noted.
Rat, oral, LD_{50}: 4300 mg/kg; toxic effect not yet reviewed.
Rat, inhalation, LC_{50}: 5000 ppm/4 hr; toxic effects not yet reviewed.

* See NIOSH, *RTECS* (XE2100000), for additional toxicity data.

Section 3. Physical Data

Boiling Point Range: 279 to 284 °F (137 to 140 °C)*
Boiling Point: *ortho:* 291 °F (144 °C); *meta:* 281.8 °F (138.8 °C); *para:* 281.3 °F (138.5 °C)
Freezing Point/Melting Point: *ortho:* -13 °F (-25 °C); *meta:* -53.3 °F (-47.4 °C); *para:* 55 to 57 °F (13 to 14 °C)
Vapor Pressure: 6.72 mm Hg at 70 °F (21 °C)
Saturated Vapor Density (Air = 1.2 kg/m³): 1.23 kg/m³, 0.077 lbs/ft³
Appearance and Odor: Clear, sweet-smelling liquid.
* Materials with wider and narrower boiling ranges are commercially available.

Molecular Weight: 106.16
Specific Gravity: 0.864 at 20 °C/4 °C
Water Solubility: Practically insoluble
Other Solubilities: Miscible with absolute alcohol, ether, and many other organic liquids.
Octanol/Water Partition Coefficient: logKow = 3.12-3.20
Odor Threshold: 1 ppm
Viscosity: <32.6 SUS

Section 4. Fire and Explosion Data

Flash Point: 63 to 77 °F (17 to 25 °C) CC | **Autoignition Temperature:** 982 °F (527 °C) (*m*-) | **LEL:** 1.1 (*m*-, *p*-); 0.9 (*o*-) | **UEL:** 7.0 (*m*-, *p*-); 6.7 (*o*-)

Extinguishing Media: For small fires, use dry chemical, carbon dioxide (CO_2), water spray or regular foam. For large fires, use water spray, fog or regular foam. Water may be ineffective. Use water spray to cool fire-exposed containers. **Unusual Fire or Explosion Hazards:** Xylene vapors or liquid (which floats on water) may travel to an ignition source and flash back. The heat of fire may cause containers to explode and/or produce irritating or poisonous decomposition products. Xylene may present a vapor explosion hazard indoors, outdoors, or in sewers. Accumulated static electricity may occur from vapor or liquid flow sufficient to cause ignition. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing will provide limited protection. If feasible and without risk, move containers from fire area. Otherwise, cool fire-exposed containers until well after fire is extinguished. Stay clear of tank ends. Use unmanned hose holder or monitor nozzles for massive cargo fires. If impossible, withdraw from area and let fire burn. Withdraw immediately in case of any tank discoloration or rising sound from venting safety device. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Xylene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Xylene is easily chlorinated, sulfonated, or nitrated. **Chemical Incompatibilities:** Incompatibilities include strong acids and oxidizers and 1,3-dichloro-5,5-dimethyl-2,4-imidazolidindione (dichlorohydrantoin). Xylene attacks some forms of plastics, rubber, and coatings. **Conditions to Avoid:** Avoid heat and ignition sources and incompatibles. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of xylene can produce carbon dioxide, carbon monoxide, and various hydrocarbon products.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,[164] NTP,[169] and OSHA[164] do not list xylene as a carcinogen. **Summary of Risks:** Xylene is an eye, mucous membrane, and respiratory tract irritant. Irritation starts at 200 ppm; severe breathing difficulties which may be delayed in onset can occur at high concentrations. It is a central nervous system (CNS) depressant and at high concentrations can cause coma. Kidney and liver damage can occur with xylene exposure. With prolonged or repeated cutaneous exposure, xylene produces a defatting dermatitis. Chronic toxicity is not well defined, but it is less toxic than benzene. Prior to the 1950s, benzene was often found as a contaminant of xylene and the effects attributed to xylene such as blood dyscrasias are questionable. Since the late 1950s, xylenes have been virtually benzene-free and blood dyscrasias have not been associated with xylenes. Chronic exposure to high concentrations of xylene in animal studies have demonstrated mild reversible decrease in red and white cell counts as well as increases in platelet counts.

Continue on next page

Section 6. Health Hazard Data, *continued*

Menstrual irregularity was reported in association with workplace exposure to xylene perhaps due to effects on liver metabolism. Xylene crosses the human placenta, but does not appear to be teratogenic under conditions tested to date. **Medical Conditions Aggravated by Long-Term Exposure:** CNS, respiratory, eye, skin, gastrointestinal (GI), liver and kidney disorders. **Target Organs:** CNS, eyes, GI tract, liver, kidneys, and skin. **Primary Entry Routes:** Inhalation, skin absorption (slight), eye contact, ingestion. **Acute Effects:** Inhalation of high xylene concentrations may cause dizziness; nausea, vomiting, and abdominal pain; eye, nose, and throat irritation; respiratory tract irritation leading to pulmonary edema (fluid in lung); drowsiness; and unconsciousness. Direct eye contact can result in conjunctivitis and corneal burns. Ingestion may cause a burning sensation in the oropharynx and stomach and transient CNS depression. **Chronic Effects:** Repeated or prolonged skin contact may cause drying and defatting of the skin leading to dermatitis. Repeated eye exposure to high vapor concentrations may cause reversible eye damage, peripheral and central neuropathy, and liver damage. Other symptoms of chronic exposure include headache, fatigue, irritability, chronic bronchitis, and GI disturbances such as nausea, loss of appetite, and gas.

FIRST AID *Emergency personnel should protect against exposure.* **Eyes:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. Carefully dispose of contaminated clothing as it may pose a fire hazard. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. Monitor exposed person for respiratory distress. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center and unless otherwise advised, *do not induce vomiting!* If spontaneous vomiting should occur, keep exposed person's head below the hips to prevent aspiration (breathing liquid xylene into the lungs). *Aspiration of a few millimeters of xylene can cause chemical pneumonitis, pulmonary edema, and hemorrhage.* **Note to Physicians:** Hippuric acid or the ether glucuronide of *ortho*-toluic acid may be useful in diagnosis of *meta-*, *para-* and *ortho*-xylene exposure, respectively. Consider gastric lavage if a large quantity of xylene was ingested. Proceed gastric lavage with protection of the airway from aspiration; consider endotracheal intubation with inflated cuff.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate all unnecessary personnel, remove all heat and ignition sources, and ventilate spill area. Cleanup personnel should protect against vapor inhalation and skin or eye contact. If feasible and without undue risk, stop leak. Use appropriate foam to blanket release and suppress vapors. Water spray may reduce vapor, but does not prevent ignition in closed spaces. For small spills, absorb on paper and evaporate in appropriate exhaust hood or absorb with sand or some non-combustible absorbent and place in containers for later disposal. For large spills dike far ahead of liquid to contain. Do not allow xylene to enter a confined space such as sewers or drains. On land, dike to contain or divert to impermeable holding area. Apply water spray to control flammable vapor and remove material with pumps or vacuum equipment. On water, contain material with natural barriers, booms, or weirs; apply universal gelling agent; and use suction hoses to remove spilled material. Report any release in excess of 1000 lb. Follow applicable OSHA regulations (29 CFR 1910.120). **Environmental Transport:** Little bioconcentration is expected. Biological oxygen demand 5 (after 5 days at 20 °C): 0.64 (no stated isomer). **Ecotoxicity values:** LD_{50}, Goldfish, 13 mg/L/24 hr, conditions of bioassay not specified, no specific isomer. **Environmental Degradation:** In the atmosphere, xylenes degrade by reacting with photochemically produced hydroxyl radicals with a half-life ranging from 1-1.7 hr. in the summer to 10-18 hr in winter or a typical loss of 67-86% per day. Xylenes are resistant to hydrolysis. **Soil Absorption/Mobility:** Xylenes have low to moderate adsorption to soil and when spilled on land, will volatilize and leach into groundwater. **Disposal:** As a hydrocarbon, xylene is a good candidate for controlled incineration. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)
Listed as a RCRA Hazardous Waste (40 CFR 261.33): No. U239, F003 (spent solvent)
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 1000 lb (454 kg) [* per Clean Water Act, Sec. 311(b)(4); per RCRA, Sec. 3001]

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For concentrations >1000 ppm, use any chemical cartridge respirator with organic vapor cartridges; any powered, air-purifying respirator with organic vapor cartridges; any supplied-air respirator; or any self-contained breathing apparatus. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent all skin contact. With breakthrough times > 8 hr, consider polyvinyl alcohol and fluorocarbon rubber (Viton) as materials for PPE. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean PPE. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in clearly labelled, tightly closed, containers in a cool, well-ventilated place, away from strong oxidizing materials and heat and ignition sources. During transferring operations, electrically ground and bond metal containers. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. Use hermetically sealed equipment, transfer xylene in enclosed systems, avoid processes associated with open evaporating surfaces, and provide sources of gas release with enclosures and local exhaust ventilation. Use Class I, Group D electrical equipment. **Administrative Controls:** Establish air and biological monitoring programs and evaluate regularly. Consider preplacement and periodic medical examinations including a complete blood count, a routine urinalysis, and liver function tests. Consider hematologic studies if there is any significant contamination of the solvent with benzene. If feasible, consider the replacement of xylene by less toxic solvents such as petrol (motor fuel) or white spirit. Before carrying out maintenance and repair work, steam and flush all equipment to remove any xylene residues.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Xylenes
DOT Hazard Class: 3
ID No.: UN1307
DOT Packing Group: II
DOT Label: Flammable Liquid
Special Provisions (172.102): T1

Packaging Authorizations
a) Exceptions: 173.150
b) Nonbulk Packaging: 173.202
c) Bulk Packaging: 173.242

Quantity Limitations
a) Passenger, Aircraft, or Railcar: 5L
b) Cargo Aircraft Only: 60L

Vessel Stowage Requirements
a) Vessel Stowage: B
b) Other: –

***MSDS Collection* References:** 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 140, 148, 149, 153, 159, 163, 164, 167, 171, 174, 176, 180.
Prepared by: MJ Wurth, BS; **Industrial Hygiene Review:** PA Roy, MPH, CIH; **Medical Review:** W Silverman, MD

Attachment II
Job Hazard Analysis

TASK SPECIFIC HAZARD ANALYSIS

Work Activity	Potential Hazard	Recommended Control
Mobilization	Electrical Hazards	Proper Wiring/Grounding, Lock Out/Tag Out, Refer to Sec. 3.3.6, 13.13 & SOP-04/16
	Hand & Power Tools	Safety Training, Personal Awareness & Safety Device, Refer to Sec. 3.3.9, 13.18 & 13.19
	Heavy Lifting/Back Strain	Training Proper Lifting Techniques, Refer to Sec. 3.3.10
	Slip, Trip And Cuts	Protective Barriers And Safety Training, Refer to Sec. 3.3.8
	Noise Environment	Hearing Conservation Program, & Hearing Protection, Refer to Sec. 3.3.5
	Eye/Face/Head Hazard	Eye/Face/Head Protective Equipment Refer to Sec. 5.0 & SOP-08
	Toe/Foot Hazard	Steel Toed Boots & Personal Awareness, Refer to Sec. 50 & SOP-08
	Heavy Equipment	Safety Training & Personal Awareness, Refer to Sec 3.3.12 & SOP-22
Establishment of Work Area	Heavy Lifting/Back Strain	Training Proper Lifting Techniques, Refer to Sec. 3.3.10
	Slip, Trip And Cuts	Protective Barriers And Safety Training, Refer to Sec. 3.3.8
	Noise Environment	Hearing Conservation Program, & Hearing Protection, Refer to Sec. 3.3.5
	Eye/Face/Head Hazard	Eye/Face/Head Protective Equipment, Refer to Sec. 5.0 & SOP-08
	Toe/Foot Hazard	Steel Toed Boots & Personal Awareness, Refer to Sec. 5.0 & SOP-08
	Vehicle Traffic	Safety Training, Personal Awareness & Safety Device, Refer to SOP-12
	Heavy Equipment	Safety Training & Personal Awareness, Refer to Sec 3.3.12 & SOP-22
Demolition of Former Chemical Storage Building	Chemical Hazards	Safety Training, PPE, Decon & Air Monitoring, Refer to Sec. 3.2, 5.0, 6.0 & 7.0 & SOP-08/13
	Hand & Power Tools	Safety Training, Personal Awareness & Safety Device, Refer to Sec. 3.3.9, 13.18 & 13.19
	Heavy Lifting/Back Strain	Training Proper Lifting Techniques, Refer to Sec. 3.3.10
	Slip, Trip And Cuts	Protective Barriers And Safety Training, Refer to Sec. 3.3.8
	Noise Environment	Hearing Conservation Program, & Hearing Protection, Refer to Sec. 3.3.5
	Eye/Face/Head Hazard	Eye/Face/Head Protective Equipment, Refer to Sec. 5.0 & SOP-08
	Toe/Foot Hazard	Steel Toed Boots & Personal Awareness, Refer to Sec. 5.0 & SOP-08
	Vehicle Traffic	Safety Training, Personal Awareness & Safety Device, Refer to SOP-12
	Electrical Hazards	Proper Wiring/Grounding, & Safe Distance, Refer to Sec. 3.3.6 & SOP-04/16
	Underground Utilities	Pre-excavation Survey & Call Before You Dig Permit, Refer to Sec. 3.3.12/3.4.1 & SOP-06
	Excavation Hazard	Competent Person, Slope/Shoring & Safety Training, Refer to Sec. 3.3.12/3.4.1 & SOP-06
	Heavy Equipment	Safety Training & Personal Awareness, Refer to Sec 3.3.12 & SOP-22

Work Activity	Potential Hazard	Recommended Control
Disposal of Debris in Debris Pile	Chemical Hazards	Safety Training, PPE, Decon & Air Monitoring, Refer to Sec. 3.2, 5.0, 6.0 & 7.0 & SOP-08/13
	Hand & Power Tools	Safety Training, Personal Awareness & Safety Device, Refer to Sec. 3.3.9, 13.18 & 13.19
	Heavy Lifting/Back Strain	Training Proper Lifting Techniques, Refer to Sec. 3.3.10
	Slip, Trip And Cuts	Protective Barriers And Safety Training, Refer to Sec. 3.3.8
	Noise Environment	Hearing Conservation Program, & Hearing Protection, Refer to Sec. 3.3.5
	Eye/Face/Head Hazard	Eye/Face/Head Protective Equipment, Refer to Sec. 5.0 & SOP-08
	Toe/Foot Hazard	Steel Toed Boots & Personal Awareness, Refer to Sec. 5.0 & SOP-08
	Vehicle Traffic	Safety Training, Personal Awareness & Safety Device, Refer to SOP-12
	Explosive/Fire Hazard	Air Monitoring, Fire Prevention/Protection & Training, Refer to Sec. 3.3.2/7.0 & SOP-02
	Excavation Hazard	Competent Person, Slope/Shoring & Safety Training, Refer to Sec. 3.3.12/3.4.1 & SOP-06
	Heavy Equipment	Safety Training & Personal Awareness, Refer to Sec 3.3.12 & SOP-22
Excavation of Contaminated Soils	Chemical Hazards	Safety Training, PPE, Decon & Air Monitoring, Refer to Sec. 3.2, 5.0, 6.0 & 7.0 & SOP-08/13
	Hand & Power Tools	Safety Training, Personal Awareness & Safety Device, Refer to Sec. 3.3.9, 13.18 & 13.19
	Heavy Lifting/Back Strain	Training Proper Lifting Techniques, Refer to Sec. 3.3.10
	Slip, Trip And Cuts	Protective Barriers And Safety Training, Refer to Sec. 3.3.8
	Noise Environment	Hearing Conservation Program, & Hearing Protection, Refer to Sec. 3.3.5
	Eye/Face/Head Hazard	Eye/Face/Head Protective Equipment, Refer to Sec. 5.0 & SOP-08
	Toe/Foot Hazard	Steel Toed Boots & Personal Awareness, Refer to Sec. 5.0 & SOP-08
	Vehicle Traffic	Safety Training, Personal Awareness & Safety Device, Refer to SOP-12
	Electrical Hazards	Proper Wiring/Grounding, & Safe Distance, Refer to Sec. 3.3.6 & SOP-04/16
	Oxygen Deficiency	Confined Space PPE, Air Monitoring & Training, Refer to Sec. 3.3.1, 5.0, 7.0, & SOP-03/08
	Underground Utilities	Pre-excavation Survey & Call Before You Dig Permit, Refer to Sec. 3.3.12/3.4.1 & SOP-06
	Excavation Hazard	Competent Person, Slope/Shoring & Safety Training, Refer to Sec. 3.3.12/3.4.1 & SOP-06
	Heavy Equipment	Safety Training & Personal Awareness, Refer to Sec 3.3.12 & SOP-22

Work Activity	Potential Hazard	Recommended Control
Processing of Contaminated Soils (Loading, Staging etc.)	Chemical Hazards	Safety Training, PPE, Decon & Air Monitoring, Refer to Sec. 3.2, 5.0, 6.0 & 7.0 & SOP-08/13
	Hand & Power Tools	Safety Training, Personal Awareness & Safety Device, Refer to Sec. 3.3.9, 13.18 & 13.19
	Heavy Lifting/Back Strain	Training Proper Lifting Techniques, Refer to Sec. 3.3.10
	Slip, Trip And Cuts	Protective Barriers And Safety Training, Refer to Sec. 3.3.8
	Noise Environment	Hearing Conservation Program, & Hearing Protection, Refer to Sec. 3.3.5
	Eye/Face/Head Hazard	Eye/Face/Head Protective Equipment, Refer to Sec. 5.0 & SOP-08
	Toe/Foot Hazard	Steel Toed Boots & Personal Awareness, Refer to Sec. 5.0 & SOP-08
	Vehicle Traffic	Safety Training, Personal Awareness & Safety Device, Refer to SOP-12
	Oxygen Deficiency	Confined Space PPE, Air Monitoring & Training, Refer to Sec. 3.3.1, 5.0, 7.0, & SOP-03/08
	Excavation Hazard	Competent Person, Slope/Shoring & Safety Training, Refer to Sec. 3.3.12/3.4.1 & SOP-06
	Heavy Equipment	Safety Training & Personal Awareness, Refer to Sec 3.3.12 & SOP-22
Debris Relocation, Regrading and Compacting	Chemical Hazards	Safety Training, PPE, Decon & Air Monitoring, Refer to Sec. 3.2, 5.0, 6.0 & 7.0 & SOP-08/13
	Hand & Power Tools	Safety Training, Personal Awareness & Safety Device, Refer to Sec. 3.3.9, 13.18 & 13.19
	Heavy Lifting/Back Strain	Training Proper Lifting Techniques, Refer to Sec. 3.3.10
	Slip, Trip And Cuts	Protective Barriers And Safety Training, Refer to Sec. 3.3.8
	Noise Environment	Hearing Conservation Program, & Hearing Protection, Refer to Sec. 3.3.5
	Eye/Face/Head Hazard	Eye/Face/Head Protective Equipment, Refer to Sec. 5.0 & SOP-08
	Toe/Foot Hazard	Steel Toed Boots & Personal Awareness, Refer to Sec. 5.0 & SOP-08
	Vehicle Traffic	Safety Training, Personal Awareness & Safety Device, Refer to SOP-12
	Explosive/Fire Hazard	Air Monitoring, Fire Prevention/Protection & Training, Refer to Sec. 3.3.2/7.0 & SOP-02
	Heavy Equipment	Safety Training & Personal Awareness, Refer to Sec 3.3.12 & SOP-22
Construct vegetation Cover System	Heavy Lifting/Back Strain	Training Proper Lifting Techniques, Refer to Sec. 3.3.10
	Slip, Trip And Cuts	Protective Barriers And Safety Training, Refer to Sec. 3.3.8
	Noise Environment	Hearing Conservation Program, & Hearing Protection, Refer to Sec. 3.3.5
	Eye/Face/Head Hazard	Eye/Face/Head Protective Equipment, Refer to Sec. 5.0 & SOP-08
	Toe/Foot Hazard	Steel Toed Boots & Personal Awareness, Refer to Sec. 5.0 & SOP-08
	Vehicle Traffic	Safety Training, Personal Awareness & Safety Device, Refer to SOP-12
	Heavy Equipment	Safety Training & Personal Awareness, Refer to Sec 3.3.12 & SOP-22

Work Activity	Potential Hazard	Recommended Control
Regrade perimeter – Create Drainage Swales.	Heavy Lifting/Back Strain	Training Proper Lifting Techniques, Refer to Sec. 3.3.10
	Slip, Trip And Cuts	Protective Barriers And Safety Training, Refer to Sec. 3.3.8
	Noise Environment	Hearing Conservation Program, & Hearing Protection, Refer to Sec. 3.3.5
	Eye/Face/Head Hazard	Eye/Face/Head Protective Equipment, Refer to Sec. 5.0 & SOP-08
	Toe/Foot Hazard	Steel Toed Boots & Personal Awareness, Refer to Sec. 5.0 & SOP-08
	Vehicle Traffic	Safety Training, Personal Awareness & Safety Device, Refer to SOP-12
	Heavy Equipment	Safety Training & Personal Awareness, Refer to Sec 3.3.12 & SOP-22
Clear Vegetation – Existing Drainage Swales	Heavy Lifting/Back Strain	Training Proper Lifting Techniques, Refer to Sec. 3.3.10
	Slip, Trip And Cuts	Protective Barriers And Safety Training, Refer to Sec. 3.3.8
	Noise Environment	Hearing Conservation Program, & Hearing Protection, Refer to Sec. 3.3.5
	Eye/Face/Head Hazard	Eye/Face/Head Protective Equipment, Refer to Sec. 5.0 & SOP-08
	Toe/Foot Hazard	Steel Toed Boots & Personal Awareness, Refer to Sec. 5.0 & SOP-08
	Vehicle Traffic	Safety Training, Personal Awareness & Safety Device, Refer to SOP-12
	Heavy Equipment	Safety Training & Personal Awareness, Refer to Sec 3.3.12 & SOP-22
Site Soil Sampling	Chemical Hazards	Safety Training, PPE, Decon & Air Monitoring, Refer to Sec. 3.2, 5.0, 6.0 & 7.0 & SOP-08/13
	Hand & Power Tools	Safety Training, Personal Awareness & Safety Device, Refer to Sec. 3.3.9, 13.18 & 13.19
	Heavy Lifting/Back Strain	Training Proper Lifting Techniques, Refer to Sec. 3.3.10
	Slip, Trip And Cuts	Protective Barriers And Safety Training, Refer to Sec. 3.3.8
	Noise Environment	Hearing Conservation Program, & Hearing Protection, Refer to Sec. 3.3.5
	Eye/Face/Head Hazard	Eye/Face/Head Protective Equipment, Refer to Sec. 5.0 & SOP-08
	Toe/Foot Hazard	Steel Toed Boots & Personal Awareness, Refer to Sec. 5.0 & SOP-08
	Vehicle Traffic	Safety Training, Personal Awareness & Safety Device, Refer to SOP-12

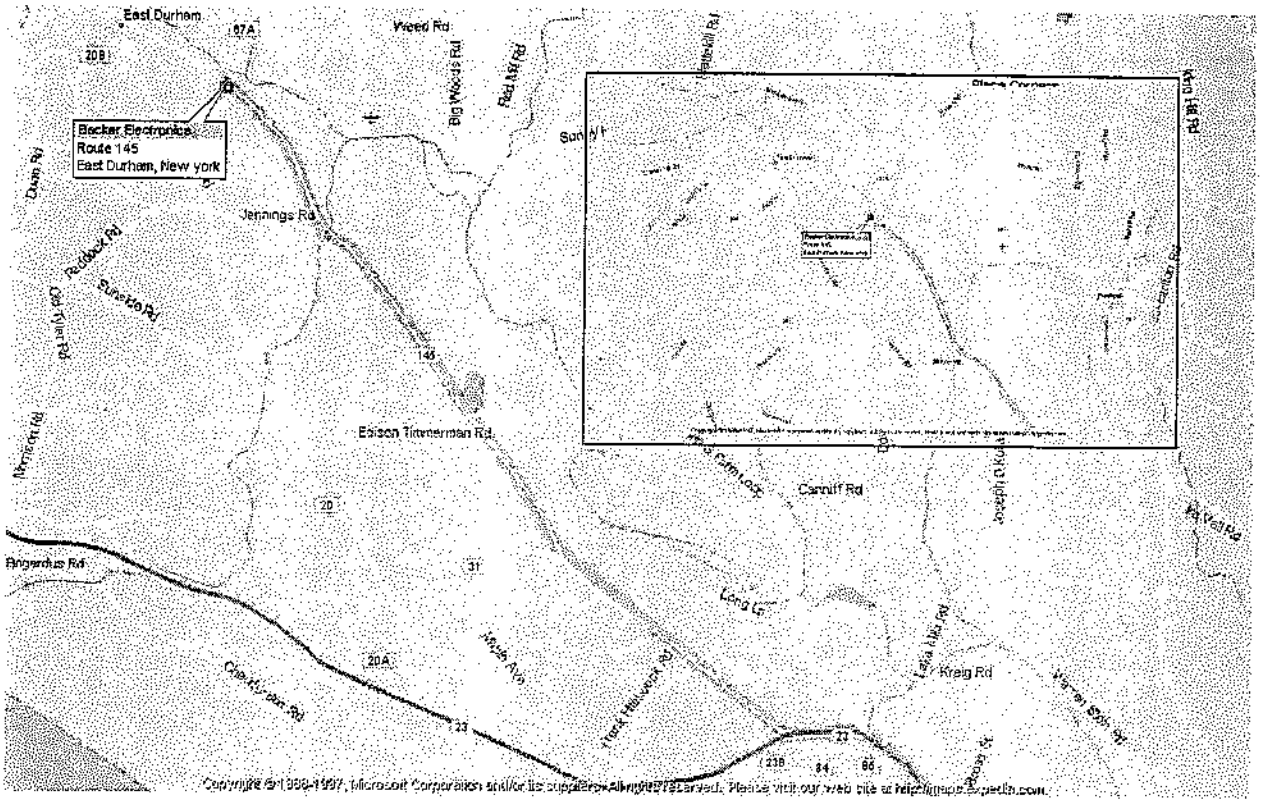
Work Activity	Potential Hazard	Recommended Control
Installation and Modification of Groundwater recovery wells	Chemical Hazards	Safety Training, PPE, Decon & Air Monitoring, Refer to Sec. 3.2, 5.0, 6.0 & 7.0 & SOP-08/13
	Hand & Power Tools	Safety Training, Personal Awareness & Safety Device, Refer to Sec. 3.3.9, 13.18 & 13.19
	Heavy Lifting/Back Strain	Training Proper Lifting Techniques, Refer to Sec. 3.3.10
	Slip, Trip And Cuts	Protective Barriers And Safety Training, Refer to Sec. 3.3.8
	Noise Environment	Hearing Conservation Program, & Hearing Protection, Refer to Sec. 3.3.5
	Eye/Face/Head Hazard	Eye/Face/Head Protective Equipment, Refer to Sec. 5.0 & SOP-08
	Toe/Foot Hazard	Steel Toed Boots & Personal Awareness, Refer to Sec. 5.0 & SOP-08
	Oxygen Deficiency	Confined Space PPE, Air Monitoring & Training, Refer to Sec. 3.3.1, 5.0, 7.0, & SOP-03/08
	Underground Utilities	Pre-excavation Survey & Call Before You Dig Permit, Refer to Sec. 3.3.12/3.4.1 & SOP-06
	Heavy Equipment	Safety Training & Personal Awareness, Refer to Sec 3.3.12 & SOP-22
Modification of Existing Structure Groundwater Treatment System	Chemical Hazards	Safety Training, PPE, Decon & Air Monitoring, Refer to Sec. 3.2, 5.0, 6.0 & 7.0 & SOP-08/13
	Hand & Power Tools	Safety Training, Personal Awareness & Safety Device, Refer to Sec. 3.3.9, 13.18 & 13.19
	Heavy Lifting/Back Strain	Training Proper Lifting Techniques, Refer to Sec. 3.3.10
	Slip, Trip And Cuts	Protective Barriers And Safety Training, Refer to Sec. 3.3.8
	Noise Environment	Hearing Conservation Program, & Hearing Protection, Refer to Sec. 3.3.5
	Eye/Face/Head Hazard	Eye/Face/Head Protective Equipment, Refer to Sec. 5.0 & SOP-08
	Toe/Foot Hazard	Steel Toed Boots & Personal Awareness, Refer to Sec. 5.0 & SOP-08
	Electrical Hazards	Proper Wiring/Grounding, & Safe Distance, Refer to Sec. 3.3.6 & SOP-04/16
	Heavy Equipment	Safety Training & Personal Awareness, Refer to Sec 3.3.12 & SOP-22
Install recovery Well Discharge Piping	Chemical Hazards	Safety Training, PPE, Decon & Air Monitoring, Refer to Sec. 3.2, 5.0, 6.0 & 7.0 & SOP-08/13
	Hand & Power Tools	Safety Training, Personal Awareness & Safety Device, Refer to Sec. 3.3.9, 13.18 & 13.19
	Heavy Lifting/Back Strain	Training Proper Lifting Techniques, Refer to Sec. 3.3.10
	Slip, Trip And Cuts	Protective Barriers And Safety Training, Refer to Sec. 3.3.8
	Noise Environment	Hearing Conservation Program, & Hearing Protection, Refer to Sec. 3.3.5
	Eye/Face/Head Hazard	Eye/Face/Head Protective Equipment, Refer to Sec. 5.0 & SOP-08
	Toe/Foot Hazard	Steel Toed Boots & Personal Awareness, Refer to Sec. 5.0 & SOP-08
	Vehicle Traffic	Safety Training, Personal Awareness & Safety Device, Refer to SOP-12
	Oxygen Deficiency	Confined Space PPE, Air Monitoring & Training, Refer to Sec. 3.3.1, 5.0, 7.0, & SOP-03/08
	Underground Utilities	Pre-excavation Survey & Call Before You Dig Permit, Refer to Sec. 3.3.12/3.4.1 & SOP-06
	Excavation Hazard	Competent Person, Slope/Shoring & Safety Training, Refer to Sec. 3.3.12/3.4.1 & SOP-06
	Heavy Equipment	Safety Training & Personal Awareness, Refer to Sec 3.3.12 & SOP-22

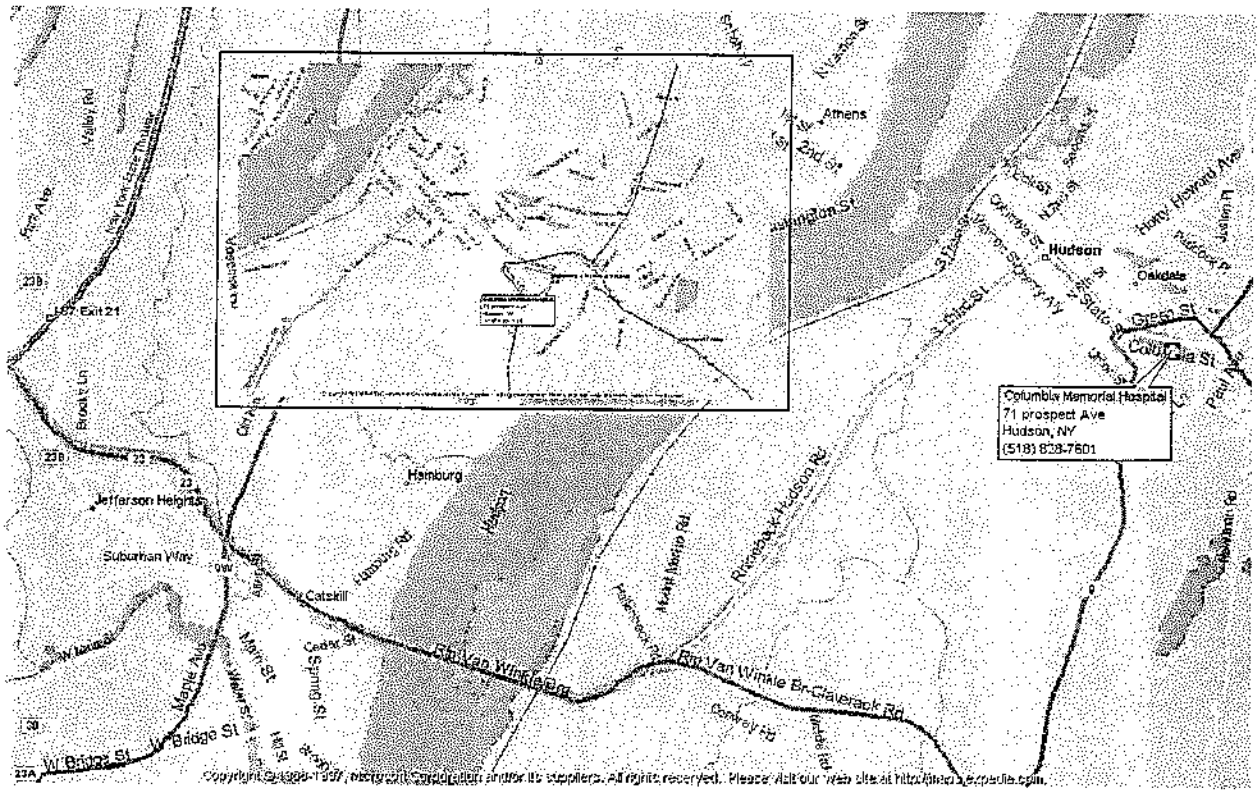
Work Activity	Potential Hazard	Recommended Control
Install Groundwater Treatment System	Chemical Hazards	Safety Training, PPE, Decon & Air Monitoring, Refer to Sec. 3.2, 5.0, 6.0 & 7.0 & SOP-08/13
	Hand & Power Tools	Safety Training, Personal Awareness & Safety Device, Refer to Sec. 3.3.9, 13.18 & 13.19
	Heavy Lifting/Back Strain	Training Proper Lifting Techniques, Refer to Sec. 3.3.10
	Slip, Trip And Cuts	Protective Barriers And Safety Training, Refer to Sec. 3.3.8
	Noise Environment	Hearing Conservation Program, & Hearing Protection, Refer to Sec. 3.3.5
	Eye/Face/Head Hazard	Eye/Face/Head Protective Equipment, Refer to Sec. 5.0 & SOP-08
	Toe/Foot Hazard	Steel Toed Boots & Personal Awareness, Refer to Sec. 5.0 & SOP-08
	Electrical Hazards	Proper Wiring/Grounding, & Safe Distance, Refer to Sec. 3.3.6 & SOP-04/16
	Heavy Equipment	Safety Training & Personal Awareness, Refer to Sec 3.3.12 & SOP-22
Install Gravity Discharge	Chemical Hazards	Safety Training, PPE, Decon & Air Monitoring, Refer to Sec. 3.2, 5.0, 6.0 & 7.0 & SOP-08/13
	Hand & Power Tools	Safety Training, Personal Awareness & Safety Device, Refer to Sec. 3.3.9, 13.18 & 13.19
	Heavy Lifting/Back Strain	Training Proper Lifting Techniques, Refer to Sec. 3.3.10
	Slip, Trip And Cuts	Protective Barriers And Safety Training, Refer to Sec. 3.3.8
	Noise Environment	Hearing Conservation Program, & Hearing Protection, Refer to Sec. 3.3.5
	Eye/Face/Head Hazard	Eye/Face/Head Protective Equipment, Refer to Sec. 5.0 & SOP-08
	Toe/Foot Hazard	Steel Toed Boots & Personal Awareness, Refer to Sec. 5.0 & SOP-08
	Vehicle Traffic	Safety Training, Personal Awareness & Safety Device, Refer to SOP-12
	Electrical Hazards	Proper Wiring/Grounding, & Safe Distance, Refer to Sec. 3.3.6 & SOP-04/16
	Oxygen Deficiency	Confined Space PPE, Air Monitoring & Training, Refer to Sec. 3.3.1, 5.0, 7.0, & SOP-03/08
	Underground Utilities	Pre-excavation Survey & Call Before You Dig Permit, Refer to Sec. 3.3.12/3.4.1 & SOP-06
	Excavation Hazard	Competent Person, Slope/Shoring & Safety Training, Refer to Sec. 3.3.12/3.4.1 & SOP-06
	Heavy Equipment	Safety Training & Personal Awareness, Refer to Sec 3.3.12 & SOP-22
Site Restoration Demobilization	Heavy Lifting/Back Strain	Training Proper Lifting Techniques, Refer to Sec. 3.3.10
	Slip, Trip And Cuts	Protective Barriers And Safety Training, Refer to Sec. 3.3.8
	Noise Environment	Hearing Conservation Program, & Hearing Protection, Refer to Sec. 3.3.5
	Eye/Face/Head Hazard	Eye/Face/Head Protective Equipment, Refer to Sec. 5.0 & SOP-08
	Toe/Foot Hazard	Steel Toed Boots & Personal Awareness, Refer to Sec. 5.0 & SOP-08
	Vehicle Traffic	Safety Training, Personal Awareness & Safety Device, Refer to SOP-12
	Heavy Equipment	Safety Training & Personal Awareness, Refer to Sec 3.3.12 & SOP-22

Attachment III

Route to The Area Hospital
Emergency Telephone Numbers

Route to The Area Hospital





Emergency Telephones Numbers

Police Department:	911
Fire Department:	911
Ambulance Services:	911
Area Hospital: Columbia Memorial Hospital	518-828-7601
Tyree Organization, LTD Health and Safety Manager: Aldo M. Gonzalez Certified Industrial Hygienist: Melinda Horan Project Manager: Phill Halloway Project Superintendent: Site Health and Safety Officer:	 516-249-3150 914-753-5579 518-786-3200 518-786-3200
NY State Department of Environmental Conservation: Lech Dolata	518-457-9285
Poison Control Center	800-366-6997
CHEMTREC	800-424-9555
National Response Center	800-424-8802
EPA Emergency Response Team	908-321-6660
NYS Health Department	800-458-1158

Attachment IV
Health and Safety Forms

Tyree Organization, Ltd.
Becker Electronics – Site Specific Training
Health and Safety Plan Acknowledgement

Print Name:	Signature	Date:

Person Conducting Training	Title
Signature	**Date**

Tyree Organization, Ltd.
Becker Electronics Site Daily Safety Log

Date:	**Weather Condition:**

Summary of Day's Work Activity:

Equipment Utilized By Safety Monitor:

Protective Clothing and Equipment Being Used by Task:

Physical Condition of Workers (any heat or cold stress or other medical problems):

Accidents or Breach of Procedures:

Description of Monitoring and Air sampling Taken:

Miscellaneous:

Name:	**Title:**
Signature:	Date:

Tyree Organization, Ltd.
Air Monitoring Form

Date:	Duration of Monitoring

Work Location and Task:

Instrument:		Instrument:		Instrument:	
Reading	**Time**	**Reading**	**Time**	**Reading**	**Time**
Calibration:		**Calibration:**		**Calibration:**	

Perimeter Samples Collected:

Personnel Samples Collected:

Perimeter and Personnel Sample Results From Previous Day (Provide Data when Received):

Comments:

Name:	Title:
Signature:	Date:

Tool-Box Safety Briefing Sheet

Date:	Weather/Temp:
Crew Chief:	Project:

Topics of Toolbox Safety Meeting

- ☐ Hardhats and Safety Shoes
- ☐ Eye & Ear Protection
- ☐ Work Zones and Site Control
- ☐ Heat and Cold Stress
- ☐ Designated Smoking Zone
- ☐ Review Previous Accidents
- ☐ Accident Reporting/Investigation
- ☐ Other_____
- ☐ Other_____

- ☐ Ladder for Excavation
- ☐ Entering Excavation
- ☐ Confined Space Entry
- ☐ Ground Fault Interrupters
- ☐ First Aid and Fire Protection
- ☐ Hazardous Communication
- ☐ Fall Protection (6 Foot Rule)
- ☐ Other_____
- ☐ Other_____

Attendees

Tyree Employees	Subcontractors & Visitors

Daily Operations

Crew Chief/Super Signature: