FINAL

REVISED REMEDIAL DESIGN / REMEDIAL ACTION PLAN
ENARC-O MACHINE PRODUCTS
LIMA, NEW YORK
NYSDEC REGISTRY NO. 8-26-011

by

Haley & Aldrich of New York
Rochester, New York

for

Kaddis Manufacturing Corporation
Rochester, New York

File No. 70372-050
September 1998
REVISED JANUARY 1999

HALEY & ALDRICH

UNDERGROUND
ENGINEERING &
ENVIRONMENTAL
SOLUTIONS

Haley & Aldrich of New York
189 North Water Street
Rochester, NY 14604-1151
Tel: 716.232.7386
Fax: 716.232.6768
Email: ROC@HaleyAldrich.com

HALEY & ALDRICH

Revised 12 January 1999
16 October 1999
File No. 70372-050

New York State Department of
Environmental Conservation
Division of Hazardous Waste Remediation
Bureau of Western Remedial Action, Room 348
50 Wolf Road
Albany, New York 12233-7010

Attention: Michael J. Ryan, P.E.

Subject: **Revised** Remedial Design/Remedial Action Plan
Enarc-O Machine Products, Inc.
Lima, New York
NYSDEC Registry No. 8-26-011

Gentlemen:

Attached are five copies of the **Revised** Remedial Design/Remedial Action Plan, prepared by Haley and Aldrich of New York on behalf of Kaddis Manufacturing Corporation. This document, originally provided to you on 16 October 1998, has been revised to address NYSDEC comments contained in your letter to Kaddis, dated 10 November 1998.

This RDRAP presents a detailed description of the proposed remedy, including design elements, implementation strategy, and a post-construction monitoring program. The system has been designed in general accordance with findings of the feasibility study performed for the site and presented in a report dated 5/16/97.

As we did with the original RD/RAP report, we are forwarding you five copies for distribution to the other appropriate government agencies. This revised report supersedes the 16 October 1998 report. As such, we request that you *discard the original reports*.

OFFICES

JAN
DIVISION

If you need any additional information please do not hesitate to contact us.

Sincerely yours,
HALEY & ALDRICH of NEW YORK

Mark N. Ramsdell, P.E.
Senior Engineer

Robert J. Mahoney, P.G.
Senior Environmental Geologist

Vincent B. Dick
Vice President

:/G:\PROJECTS\70372\050\RDRAPFIN.WPF

Enclosures

c: Ronald Iannucci, Sr., Kaddis Manufacturing Corp.
William H. Helferich, III, Harter Secrest & Emery

HALEY & ALDRICH

TABLE OF CONTENTS

LIST OF FIGURES

I. INTRODUCTION AND PROJECT BACKGROUND

This report presents the **Revised** Remedial Design and Remedial Action Plan (RDRAP) for the Enarc-O Machine Products facility site in Lima, New York. An initial RDRAP was developed and submitted to NYSDEC for review. This revised plan incorporates changes requested by NYSDEC's comment letter of 10 November 1998.

The site is a 6-acre property located at 1175 Bragg Street in Lima, New York, in the northeastern portion of Livingston County as shown on Figure 1. The Enarc-O facility is a one-story slab-on-grade building, located in the northern half of the site. Enarc-O manufactures precision screw products.

The facility is on the New York State Department of Environmental Conservation (NYSDEC) Inactive Hazardous Waste Site Registry (Site No. 8-26-011). In accordance with 6NYCRR Part 375, a remedial investigation (RI) was performed by Haley & Aldrich of New York. The results and findings were summarized in a report entitled "Report on Remedial Investigation, Enarc-O Machine Products, Lima, New York, NYSDEC Registry No. 8-26-011", dated January 1996.

The investigation identified the presence of chlorinated volatile organic compounds in soil and groundwater at the site, primarily in the source area, located beneath the facility's courtyard and a portion of the building. Specifically, trichlorethene, tetrachloroethane, 1,1,1-trichloroethane, and cis 1,2-dichloroethene were present at greatest concentrations in the source area.

The RI was followed by a feasibility study (FS), which evaluated numerous potential remedial techniques in light of the known contaminant presence, site conditions and constraints and designated cleanup goals. The FS was summarized in a report entitled "Report on Feasibility Study, Enarc-O Machine Products, Lima, New York, NYSDEC Registry No. 8-26-011", dated May 1997, prepared by Haley & Aldrich of New York. The FS report selected a combination of response actions to address the presence of contaminants in source-area soils.

Refer to the RI and FS reports for detailed discussions on site conditions and remedial response actions.

Based on these investigations and reports, NYSDEC prepared a Proposed Remedial Action Plan (PRAP, dated June 1997), which presented a description of the proposed remedial actions to be taken at the site. After a public comment period, the PRAP was followed up by a Record of Decision (ROD, dated February 1998), which finalized NYSDEC acceptance of the proposed remedy. The remediation will focus on contaminants in the site's source-area soils.

This RDRAP presents a detailed description of the proposed remedy, including design elements, implementation strategy, and a post-construction monitoring program. The work will be performed in accordance with a Consent Order for remediation, which is to be executed between Kaddis Manufacturing and NYSDEC.

II. SOURCE AREA DESCRIPTION

Figure 2 shows the Enarc-O building and courtyard configuration. Based on the results of the remedial investigation, the apparent source area has been delineated to include an area beneath the floor slab in the vicinity of the former degreaser and in the courtyard south of the degreaser area.

Contaminants in source area soils are generally concentrated in a limited area in the vicinity of the former indoor degreaser and former outdoor above-ground storage tank. VOCs in soil vapor were detected at levels indicative of a source area at shallow depths within the building near the degreaser and just outside the south building wall in the courtyard. In the courtyard area, TCE and other VOCs are present in an irregular pattern with respect to depth and distance from the degreaser location.

Remedial action will be limited to this source area, in accordance with the findings of the RI/ FS.

III. REMEDIAL DESIGN

3.1 Feasibility Study Conclusions

The FS evaluated a number of potential remedial response actions. Based on the criteria used in the evaluation and the identified site conditions, it was concluded that a combination of response actions was appropriate to address contamination presence in the source area. The remedial response combination includes: 1) excavation/disposal (as solid waste) of shallow (<4 ft.) courtyard soils; 2) control/isolation by covering the courtyard with a low-permeability cap; and 3) separation/treatment using vapor extraction for soils left in place.

The planned sequence for implementing these combined remedial actions is summarized below:

a) Divert roof drainage, if present, away from courtyard area;

b) excavate and disposal of courtyard soils in a permitted landfill;

c) Install angled vapor extraction wells through a building foundation wall; the wells will extend into a portion of the source area located beneath the building in the former degreaser area;

d) Install horizontal vapor extraction piping in the courtyard area, to access contaminants remaining in soils beneath those excavated from the courtyard;

e) Install a vapor barrier over the extraction piping;

f) Return the courtyard to previous grade with clean backfill soil;

g) Connect vapor extraction wells and piping to exhaust piping and turbines, which will be located atop the existing building; and

h) Cover the courtyard with asphalt pavement as a low-permeability cap material; and

i) Initiate monitoring program.

3.2 Health and Safety Plan

All activities associated with installation and operation of the remedial system will be performed in accordance with the Health and Safety Plan, which is included in Appendix A. The requirements in the Plan will apply to employees of Kaddis Manufacturing, Enarc-O Machine Products, and contractors.

3.3 Soil Excavation and Disposal

As stated above, shallow courtyard soils will be excavated and disposed offsite as part of the remedial action. Laboratory analytical data for soil samples from the courtyard were submitted to NYSDEC, in Haley & Aldrich's report entitled "Report on TAGM 3028, Soil Sampling and Results, Enarc-O Machine Products, Inc., Lima, New York, NYSDEC Registry No. 8-26-011", dated December 1996. The report concluded with a request for determination with regard to potential disposal. NYSDEC reviewed the data in the context of guidance provided in its TAGM 3028 document, and subsequently issued a determination, dated January 6, 1997, stating contaminants were present at concentrations low enough to allow disposal of the soil at an approved solid waste landfill. Based on this determination, written approval was obtained from Waste Management of New York (WMNY) to dispose of the soil at WMNY's High Acres Landfill in Fairport, New York. Copies of correspondence related to NYSDEC's determination and landfill approval are included in Appendix B.

Based on the courtyard dimensions and an anticipated maximum depth of excavation of 4 ft., an estimated 250 cubic yards of soil will be removed and disposed.

Excavation activities will be monitored with a photoionization detector (PID) for health and safety purposes and to allow screening of contaminated soil as it is excavated. If soil staining, odors or PID readings are observed during excavation that indicate contamination extends beyond the presumed limits, representative of "hot spots" that should be removed, the excavation will be extended appropriately. This does not include soil beneath the building.

Since pre-approval for disposal has been obtained, soil will be loaded directly into trucks for transport. The soil will be transported by a NYS-licensed waste hauler.

Care will be taken to protect and maintain the existing groundwater monitoring wells (MW-201S and MW-201D). An existing SPDES system vault and piping located in the courtyard must also be maintained or replaced in kind. These elements will remain after completion of the work.

3.4 Vapor Extraction System Installation

A. Angled Extraction Wells and Horizontal Piping

Upon completion of the excavation, two angled vapor extraction wells will be installed beneath the building, at the approximate locations shown on Drawing P-1 (Appendix C). The wells will utilize pre-packed, 0.20-inch slotted PVC well screens consisting of a 3-in. diameter inner well screen inside a 5-in. diameter outer screen. The annular space between the screens will be filled with a Ricci "No. 0" or equivalent sand pack.

The wells will be installed with a rotary drill rig, using 6-1/4 in. inside-diameter augers. The augers will be advanced to the target depth, and the prepacked well screen installed inside the augers. An outer sand pack will be placed in the borehole as the augers are withdrawn to fill the void created by the auger flights and to

minimize collapse of the borehole around the screen. Since the wells are intended for vapor extraction, no fluids will be introduced into the borehole during installation; accordingly, sand will be placed by gravity flow, and tremie methods will not be employed.

The angle of installation of the wells will depend on field constraints and drilling equipment capability; however, the wells will be installed at the lowest angle practicable to maximize the lateral penetration beneath the building floor slab. At this time, we anticipate the well angle will be in the range of 20° to 25° from horizontal, which will provide for approximately 27 to 30 ft. of horizontal penetration, based on an assumed depth to bedrock of 12 ft.

Both the inner and outer screens will be terminated inside the foundation wall, and a 3-in PVC riser section will be extended through the foundation wall. The wall penetration will be sealed with cement, and the 3-in. section coupled to the 4-in. riser pipes.

If possible, the westernmost well will be installed beneath the former degreaser. This proposed configuration will depend on the depth of the degreaser concrete base and the final depth of excavation in the courtyard, which will affect drill rig positioning. If the well cannot be installed beneath the former degreaser pit, it will be located as close as practicable.

Two vapor extraction pipes will be installed along the bottom of the excavated area shown on Drawing P-1. The entire excavated area will be covered with a base of 4-in. of DOT No. 2 Crushed Stone. After this base layer is created two lengths of slotted, 4-in corrugated polyethylene pipe (CPEP) shall be placed as shown in Drawing P-1. The lengths of the piping will be determined in the field based on the extent of affected soils, as observed during excavation. The remainder of the stone will be placed around and above the pipe so that the total uniform depth of stone will be 12 inches. A separating vapor barrier of 30 mil PVC geomembrane sheeting will then be placed over the stone before the area is backfilled. The vapor barrier will be sealed around penetrations and protected from damage during construction.

The wells and horizontal piping will be connected to riser pipes as described below.

B. Riser Pipe, Turbines, and Sampling Ports

The vapor extraction pipes and wells will be adapted to 4-in schedule 40 PVC pipe which will extend vertically for venting. The 4-in pipe will extend to approximately one foot below the existing roof elevation of the existing buildings. The 4-in schedule 40 PVC will be adapted to 8-in schedule 40 PVC and extended 24 in. above the roof level to 8-in. turbine ventilators.

The 8-in turbines shall be externally braced ventilators as supplied from Grainger, No. 2C529, or approved equal.

The piping shall be braced, as required, to the building walls and roof while ensuring no damage to the connecting surfaces. Sampling ports will be 1/4-in diameter and shall be placed on the vertical risers approximately 5 feet above the new pavement grade.

3.5 Backfill and Asphalt Paving

Upon completion of the vapor extraction system piping and vapor barrier, the courtyard will be backfilled to original grade with clean soil from an offsite source. The soil will be placed in lifts approximately one-ft. in thickness and compacted with mechanical tamping equipment.

The upper six inches of fill will consist of a base course of crushed stone, over which will be placed a minimum of four inches of NYSDOT type 3 asphalt. The joints between the asphalt and existing building walls will be sealed with an impervious material.

The new asphalt shall match the elevation of existing asphalt and shall slope at a 2% grade away from the building, to promote runoff out of the source area, as shown in Drawing P-1.

IV. SYSTEM OPERATION AND MONITORING

4.1 Quality Assurance Project Plan

A copy of the Quality Assurance Project Plan (QAPP) is included in Appendix C. The QAPP presents requirements for field and laboratory procedures to produce data of the quality to meet project objectives. All activities performed as part of the remedial system installation and operation will be performed in accordance with QAPP.

4.2 Monitoring

Contaminant concentrations in the system air stream will be monitored in the field and in the lab. The following schedule of sampling and analysis will be performed:

A. Soil Vapor

On a monthly basis, readings of total volatile organic (VOC) concentrations will be taken from the sampling ports installed in the risers, using a PID. Readings will be recorded on a System Operation Log Sheet (see example, Appendix E) and entered into a database. Air flow will be measured using a TSI Velocicalc® Plus air velocity meter, which will directly read flow rate thru the piping. These readings will also be recorded on the log sheets.

During these monthly events, the system will be monitored to insure the turbines are operational and no damage has occurred.

On a semi-annual basis, air samples will be obtained from the sampling ports, using Tedlar air sampling bags, and submitted to a NYS-certified laboratory for analysis. The samples will be analyzed for VOCs using USEPA Method 8010 , with the exception of Well 201D, which will be analyzed using Method 8260.

B. Groundwater:

On a semi-annual basis, a groundwater sample will be obtained from seven on-site wells (MW-1, MW-2, MW-3, MW-4, MW-5, MW-201D, MW-202), the former Enarc-O supply well, two off-site wells (7880 Martin Rd., 1167 Bragg St.), and one off-site sump (7883 Martin Rd.). Groundwater samples shall be analyzed for VOCs using USEPA Method 8260.

4.3 Maintenance

Inspect and perform maintenance activities (as specified by the manufacturer) on a yearly basis (minimum).

Maintenance items to include but are not limited to:

- Oil bearings on turbines;
- Inspect riser pipes and turbine housings for cracks, breaks etc.; and
- Inspect wall connections for damage or for damage to building by connections.

4.4 Reporting

A final engineering report will be prepared upon completion of system construction. The report will certify the installation as described, and will include the stamp of a New York State-registered professional engineer. The report will contain "as-built drawings" of the system, and details such as manufacturer's identification of key system elements, locations of sampling points, etc. Included in the report will be an Operation and Maintenance (O&M) manual for the system, as described in this work plan, including heath and safety and quality assurance measures to be followed during O&M.

Semi-annual summary reports will be prepared and submitted to NYSDEC. The reports will summarize monitoring data, sampling activities, laboratory analyses, and will include tabulations of analytical results for vapor and groundwater.

In addition, any modifications or repairs to the system performed during the reporting period will be summarized.

Regarding reporting to the public, NYSDEC will issue Fact Sheets announcing the beginning and completion of construction. The Fact Sheets will provide an overview of the remediation program, construction activities, and future monitoring.

V. SCHEDULE

Construction of the remedial system will commence within approximately one month of the approval of the RDRAP by NYSDEC. It is anticipated that the construction will be completed within approximately two weeks. System monitoring will commence immediately upon completion. Semi-annual permits for reporting shall run from the date of construction completion.

VI. SUMMARY

This Remedial Design / Remedial Action Plan has been prepared as a component of the ongoing environmental investigation at the Enarc-O facility. The work will be performed in accordance with a consent order for remediation; this document will be an integral part of the consent order. The remedial actions are designed to focus on source-area contaminant reduction and protection of groundwater from further contamination.

G:\PROJECTS\70372\050\RDRAPFIN.WPF

APPENDIX A

Health and Safety Plan

ENVIRONMENTAL HEALTH & SAFETY PLAN

ENARC-O MACHINE PRODUCTS REMEDIATION IMPLEMENTATION, OPERATION AND MAINTENANCE

LIMA, NEW YORK

by

Haley & Aldrich of New York
Rochester, New York

for

Kaddis Manufacturing, Inc.

File No. 70372-050
December 1998

ENVIRONMENTAL HEALTH AND SAFETY REQUIREMENTS

TABLE OF CONTENTS

* Task-specific pages are non-paginated to allow for duplication.

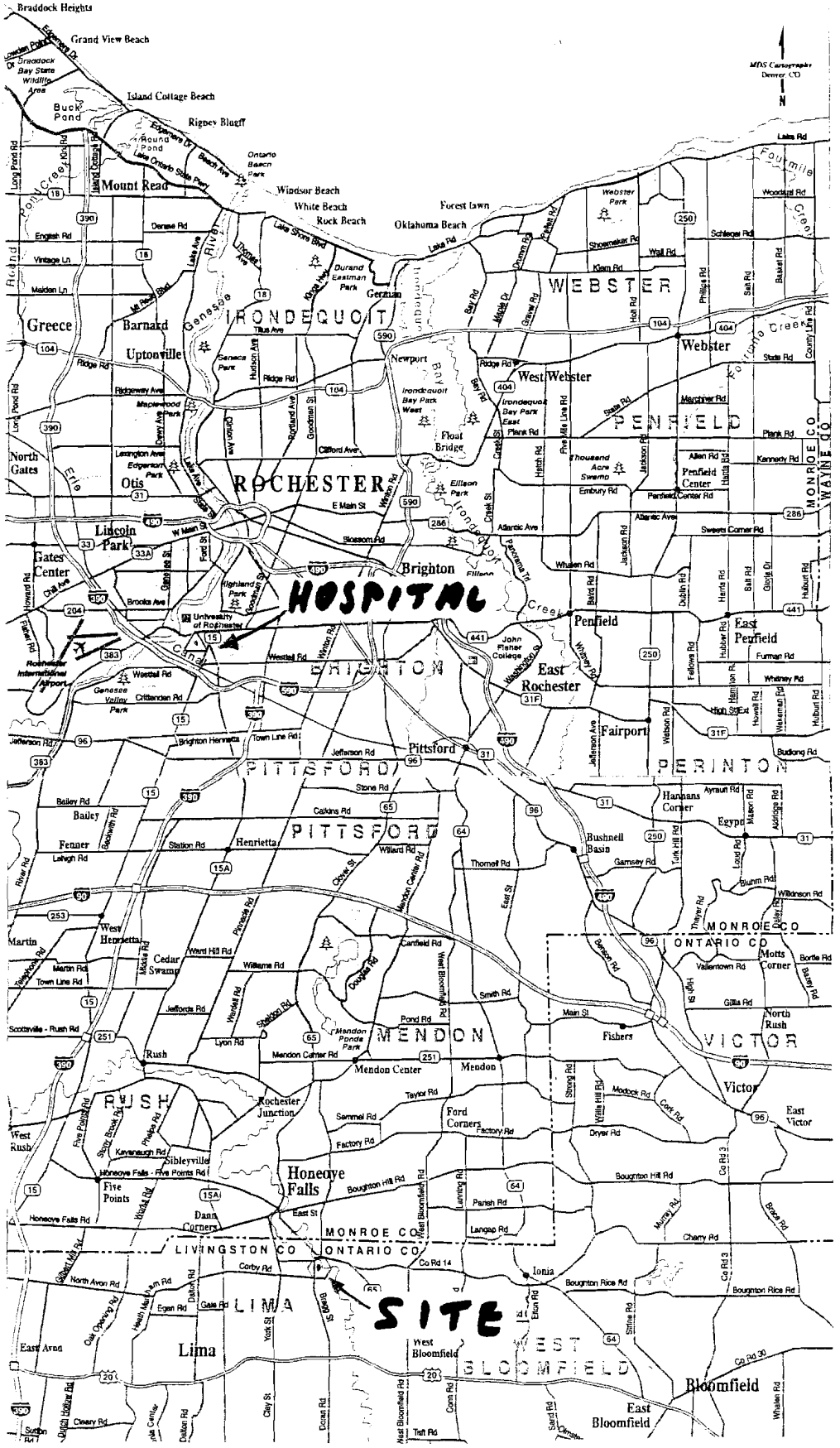
TABLE OF CONTENTS (Cont.)

TABLE OF CONTENTS (Cont.)

EMERGENCY PHONE NUMBERS

Livingston County Emergency Services	**911**
Ambulance Service	**911**
Fire Department	**911**
Police Department	**911**
H&A of New York Project Manager	
Robert J. Mahoney	**327-5535**
Vincent B. Dick	**327-5507**
H&A of New York Health & Safety Representative	
Gregory N. Ertel	**327-5530**
Kaddis Manufacturing Corp. Project Manager	
Ronald Iannucci, Sr.	**465-9000**
Enarc-O Machine Products, Inc. H&S Representative	
Bruce Whitmore	**716-624-3070**
Occupation Health Physician	**275-7795**
Dr. Kenneth Dodgeson	
Strong Memorial Hospital	
601 Elmwood Avenue	
Rochester, New York	
CHEMTREC (CHEMICAL TRANSPORTATION EMERGENCY CENTER)	**1-800-424-9300**
Hospital - Strong Memorial Hospital	**275-4511**
601 Elmwood Ave.	
Rochester, New York	
Emergency Dept. (map next page)	
Poison Control	**275-5151**
Strong Memorial Hospital	
New York State Department of Health	423-8071
David Napier	
Livingston County Health Department	243-7280
Ralph van Houten	
New York State Department of Environmental Conservation	
- Region 8 Office, Avon, NY	716-226-2466
- Albany Div. Haz. Waste Remed. - Mike Ryan, P.E.	518-457-4343

Map to Hospital
(attach below)



TASK MODIFICATIONS AND PLAN APPROVAL

LIST BELOW EACH MODIFICATION TO THIS PLAN AND DATE MODIFIED

1.

2.

THE FOLLOWING SIGNATURES CONSTITUTE APPROVAL OF THIS HEALTH & SAFETY PLAN. THIS PLAN SHOULD NOT BE DEVIATED FROM WITHOUT PRIOR WRITTEN OR VERBAL APPROVAL.

THIS PLAN APPROVED BY: **REVISIONS:**

CORPORATE HEALTH & SAFETY MANAGER — 2/12/99	DATE	INITIAL/DATE	INITIAL/DATE
H&A BRANCH HEALTH & SAFETY MANAGER — 2/12/99	DATE	INITIAL/DATE	INITIAL/DATE
PROJECT MANAGER — 2/12/99	DATE	INITIAL/DATE	INITIAL/DATE

HEALTH AND SAFETY BRIEFING:

I HAVE READ, UNDERSTOOD AND AGREE TO FOLLOW THIS HEALTH & SAFETY PLAN.

			REVISIONS:	
NAME	SIGNATURE	DATE	INITIAL/DATE	INITIAL/DATE
NAME	SIGNATURE	DATE	INITIAL/DATE	INITIAL/DATE
NAME	SIGNATURE	DATE	INITIAL/DATE	INITIAL/DATE
NAME	SIGNATURE	DATE	INITIAL/DATE	INITIAL/DATE
NAME	SIGNATURE	DATE	INITIAL/DATE	INITIAL/DATE
NAME	SIGNATURE	DATE	INITIAL/DATE	INITIAL/DATE
NAME	SIGNATURE	DATE	INITIAL/DATE	INITIAL/DATE

I. INTRODUCTION

This document presents the Enarc-O Machine Products Environmental Health and Safety Plan, to be followed by authorized contractors, Haley & Aldrich of New York, and other persons engaged in field activities associated with environmental projects conducted at the Enarc-O Machine Products site. The scope of work covered by this Health and Safety Plan (HSP) includes, but is not limited to, such projects as: soil excavation, well installation, groundwater sampling, soil and groundwater remediation, and remedial system operation and maintenance.

The provisions of this HSP are mandatory for all personnel assigned to the activities described in the work plan for this project. The Health and Safety procedures contained in this document have been developed for the activities associated with this project and will be periodically reviewed and revised as necessary to keep them current and technically correct.

The requirements set forth in this HSP are minimum health and safety protocols and duties to be adhered to and enforced during environmental investigation activities described in the following sections.

Plan Organization

Occupational Safety and Health Administration (OSHA) regulations under 29 CFR 1910.120 require that a project specific health and safety plan be developed for RCRA and CERCLA related hazardous materials/waste investigations and activities. This plan has been developed to meet these requirements and related OSHA criteria such as, but not limited to, respiratory protection, eye and hearing protection, trenching/excavation safety and confined space entry. This plan includes hazard evaluation, engineering controls, administrative controls, personal protective equipment (PPE), monitoring procedures, decontamination procedures, and emergency response provisions to meet the OSHA requirements above.

The plan is organized into two parts. The first part (Section II) contains task-specific health and safety procedures. It is intended to be updated and revised as new tasks are added to the project or new information becomes available which modifies task-specific health & safety needs. The second part (Section III) describes general health and safety procedures and information that applies to all tasks. Personal exposure limits (PELs), odor thresholds and hazardous compound physical properties appear in Table 1. Monitoring instrument action levels and appropriate level of protection responses appear in Table 2. **EMERGENCY CONTACTS AND PHONE NUMBERS ARE LISTED IMMEDIATELY FOLLOWING THE TABLE OF CONTENTS.**

II. TASK SPECIFIC HEALTH & SAFETY PROCEDURES

2.1 MASTER TASK LIST

This section describes health & safety procedures specific to individual tasks associated with the project. Additional task description sheets shall be developed and added to this section as necessary.

A master list of the tasks included in this section is provided below.

	Task Name
1	Excavate Courtyard Soil/Place Backfill
2	Install Angled Extraction Wells, Horizontal Extraction Piping and vent pipes/turbines
3	Operation and Maintenance of Remediation System
4	
5	
6	
7	
8	
9	

2.2 TASK-SPECIFIC HEALTH AND SAFETY REQUIREMENTS

_x_ Initial

___ Revision

Task Name(s)*: **1. Excavate Courtyard Soil / Place Backfill**

Task Description: **Excavate courtyard area to approximately 4 ft. depth; transport soil to landfill, place clean backfill (after piping installation).**

Duration:

Media Affected: _x_ air _x_ soil ___ surface water ___ waste ___ groundwater

Area Within Site Where Task(s) to be performed:

Source area (courtyard)

2.2.1 **HAZARD EVALUATION** (check all that apply)

CHEMICAL HAZARDS:**

CHARACTERISTICS:
- ___ FLAMMABLE/COMBUSTIBLE
- ___ CORROSIVE
- ___ REACTIVE
- _x_ TOXIC
- _x_ VOLATILE
- ___ EXPLOSIVE
- ___ RADIOACTIVE
- ___ UNKNOWN
- ___ OTHER _____

TYPE:
- _x_ SOLID/DUST
- ___ LIQUID/MIST
- ___ SLUDGE
- _x_ GAS/VAPOR/FUMES
- _x_ ORGANIC
- ___ HEAVY METAL
- ___ INORGANIC
- ___ PESTICIDE
- ___ PCB
- ___ ACID
- ___ BASE
- ___ CARCINOGEN
- ___ FUEL/PETROLEUM PRODUCT
- ___ OTHER

PHYSICAL HAZARDS:

- _x_ ACTIVE CONSTRUCTION SITE
- ___ CONFINED SPACE ENTRY
- ___ ELECTRICAL EQUIPMENT
- _x_ EXCAVATION/TRENCHING
- _x_ UNDERGROUND UTILITIES
- ___ OVERHEAD UTILITIES
- ___ OPEN WATER
- ___ TEMPERATURE EXTREMES
- _x_ NOISE
- ___ ASBESTOS
- ___ OTHER _____

* May include individual or related tasks for which hazards and health and safety requirements are common. Refer to General Health and Safety Procedures (Section III) as necessary.

** Verify that compounds that may be encountered are listed in Table 1.

2.2.2 PROTECTIVE AND CONTROL MEASURES

ENGINEERING CONTROLS:
EQUIPMENT:

___ VENTILATE AREA
___ DISCONNECT/CLEANOUT LINES
___ SLOPE EXCAVATION
___ SHORE EXCAVATION
_x_ ELIMINATE IGNITION SOURCES
_x_ TAPE OFF AREA
___ POST WORK/WARNING SIGNS
___ PLASTIC SHEETING IN AREA
_x_ DESIGNATE NO SMOKING AREA
___ ESCAPE LADDER
_x_ UTILITY CLEARANCES OBTAINED (DIG SAFE CONTACTED)
_x_ PRIVATE UTILITIES CLEARED
___ LINES SHIELDED/DE-ENERGIZED LOCKED & TAGGED OUT
___ LIFE JACKETS/BARRICADES NEAR WATER
___ HEAT OR AIR CONDITIONING SOURCE FOR TEMPERATURE EXTREMES
___ OTHER _____

LEVEL OF PROTECTION:

_x_ MODIFIED D (HOW MODIFIED) tyvek suits
___ LEVEL D
___ MODIFIED C (HOW MODIFIED) _____
___ LEVEL C
___ MODIFIED B (HOW MODIFIED) _____
___ LEVEL B

PERSONAL PROTECTIVE

_x_ SAFETY GLASSES
___ EYE/FACE SHIELD
_x_ GLOVES (CIRCLE TYPES) INNER LATEX INNER COTTON, BUTYL, NEOPRENE, BUTYL, PVC NITRILE, SILVER SHIELD, OTHER _____
___ DUCT TAPE
___ EAR PROTECTION (CIRCLE TYPE) EAR PLUGS, EAR PHONES
_x_ BOOTS (CIRCLE TYPE) STEEL TOE, DISPOSABLE COVERS, LATEX, WADERS, OTHER _____
_x_ TYVEK COVERALL
___ SARANEX COVERALL
_x_ HARD HAT
___ RESPIRATOR (INDICATE TYPE OF CARTRIDGE) GMC-H
___ FIRE EXTINGUISHER
_x_ FIRST AID KIT
___ LOUD SIGNALING DEVICE (CIRCLE TYPE) AIR HORN, WHISTLE
___ FLASHLIGHT
___ SAFETY SHOWER/EYE WASH
___ WALKIE-TALKIE
___ OTHER: _____

2.2.3 ENVIRONMENTAL MONITORING

Equipment:	Action Thresholds*	Level of Protection
___ HNU (CIRCLE ONE) 10.2 EV 11.7 EV		
_x_ PHOTOVAC MIRCROTIP (10.6 EV)		
___ OVA		
___ EXPLOSIMETER/O_2 METER		
___ RADIATION METER		
___ HYDROGEN CYANIDE METER		
___ PHOTOVAC GC		
___ DRAEGER TUBE _____		
RESPIRABLE DUST MONITOR		
___ OTHER _____		

Frequency

___ BREATHING ZONE
___ PERIMETER

* List only those differing from or in addition to Table 2.

_x_ Initial

___ Revision

Task Name(s)*: **2. Install Angled Extraction Wells, Horizontal Extraction Piping and vent pipes/turbines**

Task Description: **Drill and install angled wells through foundation wall, after courtyard excavation is complete (containerize or stockpile/cover contaminated soil); install horizontal piping on base of excavation; connect riser piping and turbines.**

Duration: 1 week

Media Affected: _x_ air _x_ soil ___ surface water ___ waste ___ groundwater

Area Within Site Where Task(s) to be performed:

Source area (courtyard)

2.2.1 **HAZARD EVALUATION** (check all that apply)

CHEMICAL HAZARDS:**

CHARACTERISTICS:
- ___ FLAMMABLE/COMBUSTIBLE
- ___ CORROSIVE
- ___ REACTIVE
- _x_ TOXIC
- _x_ VOLATILE
- ___ EXPLOSIVE
- ___ RADIOACTIVE
- ___ UNKNOWN
- ___ OTHER _____

TYPE:
- ___ SOLID/DUST
- ___ LIQUID/MIST
- ___ SLUDGE
- _x_ GAS/VAPOR/FUMES
- _x_ ORGANIC
- ___ HEAVY METAL
- ___ INORGANIC
- ___ PESTICIDE
- ___ PCB
- ___ ACID
- ___ BASE
- ___ CARCINOGEN
- ___ FUEL/PETROLEUM PRODUCT
- ___ OTHER

PHYSICAL HAZARDS:

- _x_ ACTIVE CONSTRUCTION SITE
- ___ CONFINED SPACE ENTRY
- ___ ELECTRICAL EQUIPMENT
- ___ EXCAVATION/TRENCHING
- _x_ UNDERGROUND UTILITIES
- ___ OVERHEAD UTILITIES
- ___ OPEN WATER
- ___ TEMPERATURE EXTREMES
- _x_ NOISE
- ___ ASBESTOS
- ___ OTHER _____

* May include individual or related tasks for which hazards and health and safety requirements are common. Refer to General Health and Safety Procedures (Section III) as necessary.

** Verify that compounds that may be encountered are listed in Table 1.

2.2.2 PROTECTIVE AND CONTROL MEASURES

ENGINEERING CONTROLS:
EQUIPMENT:

___ VENTILATE AREA
___ DISCONNECT/CLEANOUT LINES
___ SLOPE EXCAVATION
___ SHORE EXCAVATION
_x_ ELIMINATE IGNITION SOURCES
_x_ TAPE OFF AREA
___ POST WORK/WARNING SIGNS
___ PLASTIC SHEETING IN AREA
_x_ DESIGNATE NO SMOKING AREA
___ ESCAPE LADDER
_x_ UTILITY CLEARANCES OBTAINED (DIG SAFE CONTACTED)
_x_ PRIVATE UTILITIES CLEARED
___ LINES SHIELDED/DE-ENERGIZED LOCKED & TAGGED OUT
___ LIFE JACKETS/BARRICADES NEAR WATER
___ HEAT OR AIR CONDITIONING SOURCE FOR TEMPERATURE EXTREMES
___ OTHER _____

LEVEL OF PROTECTION:

_x_ MODIFIED D (HOW MODIFIED) tyvek suits
___ LEVEL D
___ MODIFIED C (HOW MODIFIED) _____
___ LEVEL C
___ MODIFIED B (HOW MODIFIED) _____
___ LEVEL B

PERSONAL PROTECTIVE

_x_ SAFETY GLASSES
___ EYE/FACE SHIELD
_x_ GLOVES (CIRCLE TYPES) INNER LATEX INNER COTTON, BUTYL, NEOPRENE, BUTYL, PVC NITRILE, SILVER SHIELD, OTHER _____
___ DUCT TAPE
___ EAR PROTECTION (CIRCLE TYPE) EAR PLUGS, EAR PHONES
_x_ BOOTS (CIRCLE TYPE) STEEL TOE, DISPOSABLE COVERS, LATEX, WADERS, OTHER _____
_x_ TYVEK COVERALL
___ SARANEX COVERALL
_x_ HARD HAT
___ RESPIRATOR (INDICATE TYPE OF CARTRIDGE) GMC-H
___ FIRE EXTINGUISHER
_x_ FIRST AID KIT
___ LOUD SIGNALING DEVICE (CIRCLE TYPE) AIR HORN, WHISTLE
___ FLASHLIGHT
___ SAFETY SHOWER/EYE WASH
___ WALKIE-TALKIE
___ OTHER: _____

2.2.3 ENVIRONMENTAL MONITORING

Equipment:	Action Thresholds*	Level of Protection
___ HNU (CIRCLE ONE) 10.2 EV 11.7 EV		
_x_ PHOTOVAC MIRCROTIP (10.6 EV)		
___ OVA		
___ EXPLOSIMETER/O_2 METER		
___ RADIATION METER		
___ HYDROGEN CYANIDE METER		
___ PHOTOVAC GC		
___ DRAEGER TUBE _____		
RESPIRABLE DUST MONITOR		
___ OTHER _____		

Frequency

___ BREATHING ZONE		
___ PERIMETER		

* List only those differing from or in addition to Table 2.

_x_ Initial

___ Revision

Task Name(s)*: **3. Operation and Maintenance of Remediation System**

Task Description: **Perform periodic monitoring (air sampling), maintenance and repair of system. Air sampling involves drawing vapor from sampling ports in PVC riser piping.**

Duration: 1 week

Media Affected: _x_ air ___ soil ___ surface water ___ waste ___ groundwater

Area Within Site Where Task(s) to be performed:

Courtyard

2.2.1 **HAZARD EVALUATION** (check all that apply)

CHEMICAL HAZARDS:**

CHARACTERISTICS:
- ___ FLAMMABLE/COMBUSTIBLE
- ___ CORROSIVE
- ___ REACTIVE
- _x_ TOXIC
- _x_ VOLATILE
- ___ EXPLOSIVE
- ___ RADIOACTIVE
- ___ UNKNOWN
- ___ OTHER _____

TYPE:
- ___ SOLID/DUST
- ___ LIQUID/MIST
- ___ SLUDGE
- _x_ GAS/VAPOR/FUMES
- _x_ ORGANIC
- ___ HEAVY METAL
- ___ INORGANIC
- ___ PESTICIDE
- ___ PCB
- ___ ACID
- ___ BASE
- ___ CARCINOGEN
- ___ FUEL/PETROLEUM PRODUCT
- ___ OTHER

PHYSICAL HAZARDS:

- ___ ACTIVE CONSTRUCTION SITE
- ___ CONFINED SPACE ENTRY
- ___ ELECTRICAL EQUIPMENT
- ___ EXCAVATION/TRENCHING
- ___ UNDERGROUND UTILITIES
- ___ OVERHEAD UTILITIES
- ___ OPEN WATER
- ___ TEMPERATURE EXTREMES
- ___ NOISE
- ___ ASBESTOS
- ___ OTHER _____

* May include individual or related tasks for which hazards and health and safety requirements are common. Refer to General Health and Safety Procedures (Section III) as necessary.

** Verify that compounds that may be encountered are listed in Table 1.

2.2.2 PROTECTIVE AND CONTROL MEASURES

ENGINEERING CONTROLS:
EQUIPMENT:

___ VENTILATE AREA
___ DISCONNECT/CLEANOUT LINES
___ SLOPE EXCAVATION
___ SHORE EXCAVATION
-x- ELIMINATE IGNITION SOURCES
___ TAPE OFF AREA
___ POST WORK/WARNING SIGNS
___ PLASTIC SHEETING IN AREA
-x- DESIGNATE NO SMOKING AREA
___ ESCAPE LADDER
___ UTILITY CLEARANCES OBTAINED (DIG SAFE CONTACTED)
___ PRIVATE UTILITIES CLEARED
___ LINES SHIELDED/DE-ENERGIZED LOCKED & TAGGED OUT
___ LIFE JACKETS/BARRICADES NEAR WATER
___ HEAT OR AIR CONDITIONING SOURCE FOR TEMPERATURE EXTREMES
___ OTHER _____

LEVEL OF PROTECTION:

___ MODIFIED D (HOW MODIFIED) _____
-x- LEVEL D
___ MODIFIED C (HOW MODIFIED) _____
___ LEVEL C
___ MODIFIED B (HOW MODIFIED) _____
___ LEVEL B

PERSONAL PROTECTIVE

-x- SAFETY GLASSES
___ EYE/FACE SHIELD
-x- GLOVES INNER LATEX ~~INNER COTTON, BUTYL, NEOPRENE, BUTYL, PVC NITRILE, SILVER SHIELD, OTHER~~ _____
___ DUCT TAPE
___ EAR PROTECTION (CIRCLE TYPE) EAR PLUGS, EAR PHONES
___ BOOTS (CIRCLE TYPE) STEEL TOE, DISPOSABLE COVERS, LATEX, WADERS, OTHER _____
___ TYVEK COVERALL
___ SARANEX COVERALL
___ HARD HAT
___ RESPIRATOR (INDICATE TYPE OF CARTRIDGE) GMC-H
___ FIRE EXTINGUISHER
-x- FIRST AID KIT
___ LOUD SIGNALING DEVICE (CIRCLE TYPE) AIR HORN, WHISTLE
___ FLASHLIGHT
___ SAFETY SHOWER/EYE WASH
___ WALKIE-TALKIE
___ OTHER: _____

2.2.3 ENVIRONMENTAL MONITORING

Equipment:	Action Thresholds*	Level of Protection
___ HNU (CIRCLE ONE) 10.2 EV 11.7 EV		
-x- PHOTOVAC MIRCROTIP (10.6 EV)		
___ OVA		
___ EXPLOSIMETER/O_2 METER		
___ RADIATION METER		
___ HYDROGEN CYANIDE METER		
___ PHOTOVAC GC		
___ DRAEGER TUBE _____		
RESPIRABLE DUST MONITOR		
___ OTHER _____		

Frequency

___ BREATHING ZONE
___ PERIMETER

* List only those differing from or in addition to Table 2.

TABLE 2

MONITORING METHOD, ACTION LEVELS AND PROTECTIVE MEASURES

INSTRUMENT	HAZARD	ACTION LEVEL[1]	ACTION RESPONSE
Respirable Dust Monitor	Contaminant Particles	> 0.05 mg/m^3	Level C Protection
OVA, HNU[2], Photovac Microtip	Organic Vapors	Background 3 ppm > background or lowest OSHA permissible exposure limit, whichever is lower, or as modified for this task (see Section 2.2.3) 50 ppm over background unless lower values required due to respirator protection factors	Level D Level C, site evacuation may be necessary for specific compounds (see Section 2.2.3) Level B[3]
Explosimeter[4]	Explosive Atmosphere	10% Scale Reading 10-15% Scale Reading > 15% Scale Reading	Proceed with work Monitor with extreme caution Evacuate site
O_2 Meter[5]	Oxygen Deficient Atmosphere	19.5% O_2 19.5% - 25% O_2 < 19.5% O_2 > 22% O_2	Monitor with caution Continue with caution Evacuate site; oxygen deficient Evacuate site; fire hazard
Radiation Meter[6]	Ionizing Radiation	0.1 Millirem/Hour ≥ 1 Millirem/Hour	If > 0.1, radiation sources may be present[7] Evacuate site; radiation hazard
Draeger Tube	Vapors/Gases	Species Dependent > 1 ppm Vinyl Chloride > 1 ppm benzene > 1 ppm 1,1-DCE	Consult manual for concentration/toxicity/detection data. Upgrade to Level C and evacuate. Upgrade to Level B if concentrations of compounds exceed thresholds shown at left.
GC	Organic Vapors	3 ppm > background or lowest OSHA permissible exposure limit, whichever is lower	On site monitoring or tedlar bag sample collection for laboratory analysis

Notes:

1. MONITOR BREATHING ZONE
2. CAN ALSO BE USED TO MONITOR SOME INORGANIC SPECIES.
3. POSITIVE PRESSURE DEMAND SELF CONTAINED BREATHING APPARATUS
4. LOWER EXPLOSIVE LIMIT (LEL) SCALE IS 0-100%. LEL FOR MOST GASSES IS 15%.
5. NORMAL ATMOSPHERIC OXYGEN CONCENTRATION AT SEA LEVEL IS ~ 20%.
6. BACKGROUND GAMMA RADIATION IS ~ 0.01 - 0.02 MILLIREMS/HOUR.
7. CONTACT H&A HEALTH AND SAFETY STAFF IMMEDIATELY.

2.2.4 DECONTAMINATION EQUIPMENT AND PROCEDURES

DECONTAMINATION EQUIPMENT:

- x TAP WATER
- ___ DISTILLED WATER
- ___ HEXANE
- ___ METHANOL
- ___ ACETONE
- x ALCONOX
- x BRUSHES
- x PLASTIC SHEETING
- ___ DISPOSAL BAGS
- x WASH TUBS (2)
- ___ PAPER TOWELING
- x STEAM CLEANER

SITE CONTROL/DECONTAMINATION PROCEDURES:

DISTINGUISHING FEATURES WHICH DELINEATE ZONES AND APPROXIMATE DIMENSIONS IN FEET:

EXCLUSION ZONE - **courtyard area, approx. 40 ft. x 40 ft.**

CONTAMINATION REDUCTION ZONE - **20 ft. wide buffer on the open east and south sides of courtyard**

SUPPORT ZONE - **outside contam. reduction zone.**

DECONTAMINATION PROCEDURES WHICH ARE TO OCCUR IN:

EXCLUSION ZONE -

CONTAMINATION REDUCTION ZONE - **Steam Cleaning, washing of PPE, containerizing Decon fluid, containerizing used PPE**

SUPPORT ZONE - **none**

2.2.5 EMERGENCY RESPONSE

SEE EMERGENCY CONTACTS LISTED IMMEDIATELY FOLLOWING THE TABLE OF CONTENTS.

III. GENERAL HEALTH & SAFETY PROCEDURES

3.1 ADMINISTRATIVE CONTROLS

3.1.1 Initial Health and Safety Training

Personnel will not be permitted to participate in or supervise field activities until they have been trained to a level required by their job function and responsibility. Enarc-O employees, contractors, subcontractors, and consultants who have the potential to be exposed to contaminated materials or physical hazards must complete the training described in the following sections.

3.1.2 40-Hour Health and Safety Training

This basic course provides instruction on the nature of hazardous waste work, protective measures, proper use of personal protective equipment, recognition of signs and symptoms which might indicate exposure to hazardous substances, and decontamination procedures. It is required for all personnel working on-site, such as equipment operators, general laborers, electricians, plumbers, supervisors, management, etc. who may be potentially exposed to hazardous substances, health hazards, or safety hazards consistent with 29 CFR 1910.120. The course must be conducted by a qualified instructor in accordance with 29 CFR 1910.120.

3.1.3 8-hour Annual Refresher Training

Personnel with 40-hour health and safety training are required to attend an annual 8-hour refresher course to remain current in their training. This course must also be conducted by a qualified instructor in accordance with 29 CFR 1910.120.

3.1.4 8-Hour Supervisor Training

On-site management and supervisors directly responsible for or who supervise employees engaged in hazardous waste operations must have eight additional hours of Supervisor training in accordance with 29 CFR 1910.120. This course includes, but is not limited to, elements appropriate to supervising hazardous waste related projects (e.g., accident reporting/investigation, regulatory compliance, work practice observations, auditing, emergency response procedures, etc.).

3.1.5 Additional Training for Specific Projects

Contractors will ensure their personnel have received additional training on specific instrumentation, equipment, confined space entry, construction hazards, etc., as necessary to perform their duties. This specialized training will be provided to personnel before engaging in the specific work activities.

3.1.6 Documentation of Training

The Contractor/Consultant Project Manager will be responsible for maintaining and providing to Kaddis documentation of its employees' compliance with required training. Kaddis will only allow properly trained and qualified personnel to perform work at the site.

3.2 MEDICAL SURVEILLANCE PROGRAM

3.2.1 Purpose

The Medical Surveillance Program is conducted to provide an initial baseline of the worker's health. Subsequent medical exams are used to monitor the worker's continued well being. The implementation of a medical surveillance program is the responsibility of the contractor/subcontractor employer.

3.2.2 Requirements

Medical surveillance is required by the Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120 (f): Hazardous Waste Site Operations and Emergency Response. The Contractor/Consultant's medical surveillance program must meet or exceed these regulatory requirements.

These regulatory requirements include the determination by a physician that the individual being examined is physically able to use respiratory protection and is able to perform the work defined within the specific job description. The capability of an individual to perform the specified work will be determined from examinations that may include:

- Medical and occupational history, and past gastrointestinal, hematologic, renal, cardiovascular, reproductive, immunological, and neurological problems as well as a history of respiratory disease and personal smoking habits;
- Physical examination, including blood pressure measurements;
- Pulmonary function test (FVC and FEV1);
- Chest x-ray;
- ECG (Electrocardiogram);
- Eye examination and visual acuity;
- Audiometry;
- Urinalysis; and
- Blood chemistry: Hematology, serum analyses, heavy metals toxicology.

3.2.3 Periodic Monitoring

All personnel are required to have a physical examination within the 12 months prior to the beginning of their work on-site. This period may be shortened if the Contractor/Consultant Medical Consultant deems this appropriate. The physician performing the physical will insure the requirements of 29 CFR 1910.120(f) are fulfilled. Documentation attesting to current medical monitoring compliance must be maintained on-site by the Contractor/Consultant Safety Officer.

3.3 SITE CONTROLS

3.3.1 Work Site Access Control

Access to client property is dependent upon site-specific conditions under owner permission and will be controlled by the Enarc-O Project Manager. It will be the Contractor/Consultant Project Manager's responsibility to control access to a site by means of temporary barriers such as flagging tape or fencing. The barrier will be inspected daily for integrity and adequacy by the Contractor/Consultant Site Coordinator.

For sites requiring Level C to Level B PPE (personal protective equipment) the area of field operations will be subdivided into three distinct areas. The extent of these areas is task and location specific. Access to each zone will be controlled with fencing and/or plastic flagging tape. The three areas are defined as:

- Exclusion Zone

  The exclusion zone is the area where the highest potential for exposure by dermal or inhalation routes exists. Personal protective equipment is required and a daily log will be kept of all personnel entering this zone. The exclusion zone will be marked off with barricades or barrier tape which will be placed a minimum of 50 feet from the active work area. This 50 foot minimum may be altered in the Task-Specific Health & Safety Requirements (Section II) depending upon actual site layout. During field operations this boundary may be expanded by the Contractor/Consultant Site Coordinator based upon observations and/or monitoring measurements. Whenever possible, all field work should be performed upwind from potential contaminant sources.

- Contamination Reduction Zone

  The contamination reduction zone is the area immediately adjacent to the exclusion zone. The probability of dermal and inhalation exposure is lower than in the exclusion zone. Typically, contamination reduction zones include facilities for personnel or equipment decontamination. Personal protective equipment worn in the exclusion zone may not be worn outside the contamination reduction zone except during emergencies.

- Support Zone

  Support zones cover all areas outside the contamination reduction zone. Typically, the support area includes facilities for a lunch area, office spaces, and clean equipment and material storage. Protective clothing worn in the exclusion zone may not be worn in a support zone except in emergencies. Emergency contacts are listed immediately following the Table of Contents.

3.3.2 Visitors:

- Visitors and subcontractors entering the site are subject to the same requirements as contractor and consultant personnel and will only be permitted in the immediate area of active operations (i.e., exclusion zone) after receiving written approval from the Contractor/Consultant Project Manager, and supplying a written agreement to comply with this HSP.

- A visitors log will be kept by the Contractor/Consultant Site Coordinator or other designated person.

- Visitor vehicles are restricted to support zones.

3.3.3 Unauthorized Personnel

All established procedures and actions are designed to prohibit unauthorized entry to the work sites. However, if security is violated, the following actions will be taken:

- Unauthorized personnel found within any active site will be reported to the Contractor/Consultant Project Manager, Safety Officer, and Site Coordinator, and Kaddis Project Manager.

- Unauthorized personnel found in the exclusion zone will be escorted through the contamination reduction zone and will be subject to all decontamination procedures established in the project-specific HSP.

- Any unauthorized personnel entering an active site will be escorted from the facility. No re-entry will be permitted.

3.4 ENGINEERING CONTROLS

Engineering controls will be the method of preference to control health and safety hazards. Examples of engineering controls are:

- The use of excavation equipment to take samples from trenches;

- The use of cover material (soil) to suppress vapor emissions;

- The use of air conditioning in heavy equipment cabs to mitigate operator heat stress; and

o The use of ventilation equipment to eliminate hazardous atmospheres from confined spaces.

Administrative controls and personal protective equipment will be used where engineering controls are not feasible or are inadequate. Administrative controls include the exclusion of unnecessary personnel from hazardous areas. It should be noted that scheduled job rotation is not an acceptable administrative control to reduce employee exposure to airborne chemicals.

The hazard control methods to be employed must be described in the task-specific health & safety requirements where they deviate from those described here. As a project progresses, changes to these methods may be necessary. All such changes will be documented as addenda to the task-specific health & safety procedures.

3.4.1 Standard Safe Work Practices

Standard safe work practices applicable to most site activities are listed below. Additional safe work practices unique to specific site tasks must be included in the task-specific health & safety requirements

1. All field personnel must inform the Contractor/Consultant Site Coordinator or designated representative before entering work areas so that their presence can be recorded.

2. Workers must utilize the "buddy system": at least two members of the field crew (including subcontractor personnel) must be in visual contact with each other on-site whenever work is to be performed. If this is not possible, two-way radios will be used.

3. Eating, drinking, chewing gum or tobacco, smoking, or any other activity that increases the probability of hand-to-mouth transfer of contaminated material will not be permitted at the work site.

4. All personal safety equipment and protective clothing will be worn in conformance with Section 3.7 of this HSP.

5. Disposable outer coveralls, boots and gloves will be secured at the wrists and legs, and there will be closure of the suit around the neck.

6. Individuals getting wet to the skin with chemically contaminated liquids must remove clothing and wash the affected area immediately at a location to be identified in the task-specific health & safety requirements. Clothes wet with such liquids, must be changed. Any skin contact with such liquids, whether considered safe or not, will be dealt with immediately and as completely as possible. Medical attention should be sought as necessary.

7. Hands must be washed before eating, drinking, smoking and before using toilets at the facilities provided.

8. Avoid contact with surfaces either suspected or known to be contaminated, such as puddles, mud, or other discolored surfaces. Store equipment on elevated or protected surfaces to reduce the potential of incidental contamination.

9. Only remove personal protective equipment in the contamination reduction zone per Section 3.3.1.

10. Place all disposable coveralls, gloves, and cartridges in appropriate receptacles at the end of every shift or sooner, as directed by the Contractor/Consultant Site Coordinator.

11. Inspect all non-disposable clothing (i.e. hard hat liner, work gloves, cotton overalls) for contamination in the contamination reduction zone. Any clothing found to be contaminated will be decontaminated or disposed of in a manner approved by the Contractor/Consultant Site Coordinator.

12. Report all injuries to the Contractor/Consultant Site Coordinator, Kaddis Project Manager. An accident report, or equivalent must be completed by the Contractor/Consultant Site Coordinator and submitted to the Kaddis Operations Safety Representative or Project Manager for appropriate follow-up.

13. The presence or consumption of alcoholic beverages or illicit drugs on Enarc-O property or during the work day is strictly forbidden.

14. Spillage or splashing of contaminated materials must be prevented. Spills must be contained and follow up calls made as appropriate for the release.

15. Be alert to unsafe conditions or acts and notify the Contractor/Consultant Site Coordinator.

16. Workers need to be familiar with the work area and surroundings, including:

    - o Wind direction in relation to the work area;
    - o Accessibility of associates, equipment, vehicles;
    - o Available communications;
    - o Hot zone (areas of known or suspected contamination);
    - o Site access;
    - o Nearest water sources.

17. The number of personnel and equipment in the exclusion zone must be kept to a minimum.

18. Wastes generated during work activities must be disposed of in accordance with state, federal, and local, regulations.

3.4.2 Safe Work Permits/Hot Work Permits

Safe Work Permits are to be obtained from the Enarc-O Operations Safety Representative before any work is done that involves:

- o Entering vessels, tanks, pits, trenches, manholes, or other confined spaces.
- o Exposure to toxic or infectious material or to abnormal temperatures or pressures when such exposures are outside the employee's daily routine.
- o Using explosives for blasting or demolition.
- o Using flammable or combustible coatings inside buildings. Application of combustible paints by brush or roller is excluded.
- o Excavating and trenching.
- o Working in elevated areas such as roofs.
- o Using temporary heating devices.
- o Working in designated safe work permit areas.

Hot Work Permits are to be obtained from Enarc-O before any work is done that involves:

- o Operating gasoline powered vehicles or equipment inside buildings.
- o Cutting, welding, lead burning, tar kettles, or similar work involving open flames or very high temperatures. In explosion prone areas, this includes any potential source of ignition, such as electric hand tools.

3.4.3 Working in Confined Spaces

A confined space, as defined by OSHA, is any space having a limited means of egress which is subject to the accumulation of toxic or flammable contaminants or has an oxygen deficient atmosphere.

Confined spaces are also areas where occupants are rendered isolated from help in case of need. Confined spaces include, but are not limited to: Ovens, tanks, vessels, bins, boilers, ducts, sewers, pipe chases, manholes, underground utility vaults, tunnels, pipelines, excavations, and trenches.

If waste activities require entrance into a confined space, strict Health and Safety protocol must be followed. Prior to any confined space work activities, written authorization must be obtained (see Section 3.4.3.1).

3.4.3.1 Confined Space Entry

- o A Safe Work Permit will be issued by Kaddis prior to entry into the confined space. This permit must be completed including the signatures of the Contractor/Consultant Safety Officer and Enarc-O Operations Safety Representative.
- o Only authorized, trained personnel may enter a confined space.
- o Open flame devices will not be used to open frozen or otherwise shut manhole covers, hatches or doors. Hot water or steam will be used to remove ice and snow holding such openings closed.

3.4.3.2 Confined Space Ventilation

The confined space will be ventilated to prevent the accumulation of:

- o Flammable vapors above 10% of the Lower Explosive Limit.
- o Concentrations of combustible dust.
- o Toxic and other contaminants in the atmosphere above one half of the TLV.

3.4.3.3 Safety Concerns

A standby employee will be stationed outside the entrance to the confined space to observe or communicate with the employee at all times. Communications (visual, voice, or signal line) will be maintained between all individuals present. The standby employee will be trained and equipped to initiate rescue operation.

3.4.4 Utility Clearance

Utility clearance will be obtained by the Contractor/Consultant Project Manager from Kaddis Facilities personnel and local utilities before the start of any drilling or excavation conducted at the site.

- o Other local utility clearance can be obtained by calling the Underground Facilitites Protection Organization (UFPO) at 1-800-962-7962.
- o All utilities in the work area should be staked at least two weeks prior to the start of work.
- o All activities must be explained in detail to the respective utility by the Contractor/Consultant Site Coordinator. For some activities, such as blasting, the utility may request to have a representative at the site to expedite emergency response.

3.5 DRILLING SAFETY

Drilling and sampling activities present several potential hazards. Minimizing these hazards requires strict adherence to safe operating procedures.

3.5.1 Drill Crews

Drillers will be responsible for the safe operation of the drill rig as well as their crew's adherence to the requirements of the project-specific HSP. The driller must ensure that all safety equipment is in proper condition and is properly used. The members of the drill crew will follow all instructions of the driller, wear all appropriate personal protective equipment, and be aware of the hazards and applicable control procedures.

3.5.2 Rig Inspection

Each day, prior to the start of work, the drill rig and associated equipment will be inspected by the driller. The following checks will be made:

- Vehicle condition: Check proper operation of brakes, lights, steering mechanism, and horn.
- Equipment storage: All equipment such as auger flights, split spoon samplers, hammers, hand tools, etc. will be properly stored in an appropriate location and will be secured before moving the rig.
- Wire rope, Cat Line: All wire rope, cable and Cat Line will be inspected for signs of wear such as broken wires, a reduction in rope diameter, abrasion, or signs of rust. Worn, frayed, or otherwise damaged wire, rope or cable will be replaced.
- Safety equipment: Each rig will have at least one fire extinguisher (Type B/C) and one First Aid Kit.

3.5.3 Rig Set-Up

Each drill rig will be properly blocked and levelled prior to raising the derrick. The rig will be moved only after the derrick has been lowered. The leveling jacks will not be raised until the derrick has been lowered.

Blocking provides a more stable drilling structure by evenly distributing the weight of the rig. Proper blocking ensures that a differential settling of the rig does not occur. Wooden blocks, at least 12 by 12 inches and four to eight inches thick, are recommended and should be placed between the jack swivels and the ground. The emergency brake will be engaged and the wheels that are on the ground chocked.

Site drilling will comply with the following rules:

- Before drilling, the Contractor/Consultant Site Coordinator will ensure an adequate safety zone around the drill rig and associated operations.

- Before drilling, the existence of underground utilities in the work area will be determined and conspicuously marked (See Section 3.4.4).

- If drilling is conducted in the vicinity of overhead power lines, proper distance will be maintained between the drill rig and the lines as per OSHA 29 CFR 1926, Subpart N. The proper distance or shielding technique will be stated in the project-specific HSP.

3.5.4 General Operating Procedures

The operator of the drill rig will only operate from the position of the controls. If the operator must leave this position, the transmission must be in neutral.

When working on the derrick platform, the drill crew should not guide drill rods or pipe into racks by taking hold of a moving line. Materials should not be stored or transported within the derrick. Pipe, drill rods, auger flights, hammers, and other drilling tools should be stored in racks and chained in place. During drilling, penetration hammers will be placed at a safe location on the ground.

3.5.5 Emergency Procedure for Electrical Contact

If a drill rig contacts an electrical line, it may or may not be insulated from the ground by its tires. Death or serious injury will result if a person touches the rig and the ground simultaneously.

- Under most circumstances, the operator and other personnel on the seat of the vehicle should remain seated and not leave the vehicle. Do not move or touch any part, particularly a metallic part, of the vehicle or drill rig.

- If it is determined that the rig should be vacated, all personnel should jump clear and as far as possible from the rig. Do not step off -- jump off, and do not hang on the vehicle or any part of the rig when jumping clear.

- If you are on the ground, stay away from rig and do not let others get near the vehicle. Seek assistance immediately by calling the local emergency services contact. Emergency phone numbers are listed on page iii of this HSP.

3.6 EXCAVATION AND TRENCHING SAFETY

3.6.1 General Excavation and Trenching Safety

The following is a list of minimum requirements for trenching and excavating. Each excavation/trench/shoring project is different, therefore the Contractor/Consultant Project

Manager is responsible for evaluating site specific conditions and making appropriate provisions in the task-specific health and safety requirements (Section II) in conformance with 29 CFR 1926 Subpart P - Excavations.

- o Contact the proper utilities to obtain clearance. Prior to work, review the utilities in the area and be sure they have been staked properly (See Section 3.4.4). Before work begins, a Safe Work Permit must be obtained from Enarc-O Operations Safety Representative as per Section 3.4.2.

- o Be aware that trenches and excavations deeper than four feet are considered confined spaces and require additional safety precautions, such as shoring. If an excavation exceeds four feet in depth, contact the Enarc-O Operations Safety Representative to review the original Safe Work Permit and ensure that it is adequate.

- o The walls and faces of all excavations and trenches more than four feet deep, in which an employee is exposed to danger from moving ground, will be guarded by a shoring system, sloping of the ground, or some other equivalent means. The design of shoring systems must be done by a registered Professional Engineer as per 29 CFR 1926 Subpart P.

- o For excavations or trenches in which an employee may be required to enter, excavated or other material will be effectively stored and retained at least two feet or more from the edge of the excavation or trench.

- o Daily inspections of excavations will be made by the Contractor/Consultant Site Coordinator. If evidence of possible cave-ins or slides is apparent, all work in the excavation will cease until the necessary precautions have been taken to safeguard employees.

- o Trenches more than four feet deep will have ladders or steps located so as to require no more than 25 feet of lateral travel.

- o Hard hats and other personal protective equipment will be worn at all times during any type of excavating or trenching operation.

- o Determine soil composition (e.g., through soil sampling, soil maps, etc.) and other relevant site conditions, with special emphasis on conditions conducive to cave-ins.

- o Monitor the atmosphere in and around trenches on a regular basis to check for explosive, toxic or otherwise dangerous gases and vapors.

- o The Contractor/Consultant Project Manager will insure that all employees involved in the excavation activity have appropriate training in safe trenching practices, with emphasis on factors such as:

    - utility line identification
    - cave-in prevention measures

- recognition of conditions which may cause cave-ins
- means of egress from trench

o Water will not be allowed to accumulate in any excavation. Utilize ditches, dikes, pumps, or other means to keep surface water out of trenches.

o All open excavations must be well marked and barricaded.

3.6.2 Cave-In Hazards

The following conditions increase the likelihood of cave-in:

o Soil materials composed of unconsolidated, uncompacted, and/or rounded particles (See 29 CFR 1926 Subpart P - Excavation Standard). Special care must be used when trenching in areas which have previously been excavated and backfilled.

o Soils which have a high water content, or have been subjected to freeze-thaw or frost-heaving.

o Loading of trench walls by adjacent equipment, supplies, structures, "back-dirt" piles, etc.

o Vibration due to equipment operating near excavations.

o Trench walls that are steeper than the angle of repose of the material composing the walls.

o Deep trenches (i.e., high trench walls).

The following precautions should be used to prevent cave-ins in all trenches in excess of 4 ft. deep. These precautions should also be used in trenches less than 4 ft. deep whenever those site conditions just listed indicate the likelihood of a cave-in:

o Sloping: Trench walls should be sloped to the correct angle of repose.

o Shoring: Vertical trench walls (unless composed of solid rock) must be shored and braced, or restrained with movable trench boxes, to prevent cave-in. Shoring systems must be designed by a registered professional engineer and meet accepted engineering requirements.

3.7 PERSONAL PROTECTIVE EQUIPMENT

Protective clothing and respiratory protection help protect workers from chemical hazards. Although personal protective equipment is the least preferred method, it may be necessary if engineering controls and work practices are inadequate in preventing workers from coming in contact with potential hazards. Personal protective equipment (PPE) will be selected for the potential hazards anticipated and detailed in the task-specific health & safety requirements.

Personnel at the work site will have their own appropriate and properly fitted safety equipment and protective clothing. Safety equipment and protective clothing will be used as directed by the Contractor/Consultant Safety Officer. All such non-disposable equipment and clothing will be kept clean and maintained in proper condition. PPE will be supplied by the contractors and their subcontractors. Kaddis will only provide PPE to Enarc-O/Kaddis employees. Personnel will be trained in the use of the required protective equipment and equipment will be properly fitted.

The levels of protection to be used on-site will be based on applicable OSHA and Environmental Protection Agency (EPA) regulations, Kaddis/Enarc-O requirements, environmental sampling data, site conditions, and other factors. It will be the responsibility of the Contractor/Consultant Safety Officer to select the most effective PPE based on the anticipated hazards of the task.

3.7.1 Levels of Protection

The following is a description of the specific requirements of various levels of PPE in conformance with EPA nomenclature.

3.7.1.1 Level A Protection

Level A provides the highest level of respiratory and skin protection. Based on site contaminants, historical sampling, and operational data, utilization of this level of protection is not anticipated. This level of protection is anticipated only in extreme situations beyond the scope of this document, (i.e., HazMat Response).

3.7.1.2 Level B Protection

Level B should be worn when the highest level of respiratory protection, but a lesser level of skin protection is required. It is the minimum level of protection required to conduct any initial field work. Once sampling data (soil, water, or air) has been collected and analyzed, the necessity of this level of protection may be re-evaluated.

Level B Personal Protective Equipment (not limited to the following):

- Supplied-air respirator (MSHA/NIOSH approved):

A) Pressure-demand, self-contained breathing apparatus

or

B) Pressure-demand, airline respirator with escape bottle.

- Chemical protective clothing: Chemically resistant to anticipated contaminants, (e.g. Saranex or polyethylene coated Tyvek, Chemrel, or Chem-Tuff).
- Gloves (outer): Chemically resistant to anticipated contaminants.
- Gloves (inner)

- o Boots (outer): Chemically resistant to anticipated contaminants.
- o Hard hat*
- o 2-Way radio communications* (intrinsically safe).
- o Joints between gloves, boots, and suit must be taped to ensure an adequate seal.

* The need for these items is dependent upon the work to be performed and will be chosen by the Contractor/Consultant Safety Officer.

3.7.1.3 Level C Protection

Level C protection with an air-purifying respirator should be worn routinely in an atmosphere only after the air contaminant(s) is (are) identified, concentrations measured and the criteria for wearing air-purifying respirator met. Generally, Level C provides the same level of skin protection as Level B, but a lesser degree of respiratory protection.

Level C Personal Protective Equipment:

- o Air-purifying respirators, full-face, (half-face with appropriate safety glasses or goggles when potential for liquid splashes is low), canister or cartridge equipped (MSHA/NIOSH approved).
- o Chemical protective clothing: Chemically resistant to anticipated contaminants, e.g. Saranex or polyethylene coated Tyvek, Chemrel, or Chem-Tuff.
- o Gloves (outer): Chemically resistant to anticipated contaminants.
- o Gloves (inner).
- o Boots (outer): Chemically resistant to anticipated contaminants.
- o Hard hat*
- o 2-Way radio communications* (intrinsically safe).
- o Joints between gloves, boots, and suit must be taped to ensure an adequate seal.

* The need for these items is dependent upon the work to be performed and will be chosen by the Contractor/Consultant Safety Officer.

Criteria for Selection of Level C:

Meeting all of the following criteria permits use of Level C protection:

- o Oxygen concentrations not less than 19.5% or no greater than 22% by volume.
- o Personnel inhalation exposure will be reduced by the respirator below the substance's Threshold Limit Value (TLV)/Permissible Exposure Limit (PEL) or XEL, whichever is lowest and the concentration is within the service limit of the canister/cartridge.
- o Atmospheric contaminant concentrations do not exceed IDLH levels, (See Table 1).
- o Atmospheric contaminants, splashes, or other direct contact will not adversely affect any body area left unprotected by chemically resistant clothing.
- o Job functions do not require self-contained breathing apparatus.
- o Atmospheric contaminant concentrations are not in excess of Level C action criteria, (See Table 2).

3.7.1.4 Level D Protection

Level D is the minimum level of protection to be used during any site activities and does not provide respiratory or skin protection.

Level D Personnel Protective Equipment:

- o Coveralls or work uniform.
- o Gloves*
- o Substantial leather chemical-resistant boots or shoes (steel toe and shank is highly recommended).
- o ANSI Z87 safety glasses.

Chemical splash goggles*.

- o Hard hat*.
- o Disposable/reusable footwear covers*

* The need for these items is dependent upon the work to be performed and will be chosen by the Contractor/Consultant Safety Officer.

Criteria For Selection of Level D:

Meeting any of these criteria allows use of Level D protection:

- o No contaminants are present.
- o Work functions preclude splashes, immersion, or potential for unexpected inhalation of any hazardous chemicals.

Level D protection is a minimum work uniform. It can be worn only in areas where the possibility of contact with contamination is minimal.

3.7.2 Personal Protective Equipment (PPE) Selection

PPE selection will be based on the task and the nature of hazards (type of contaminants, duration of exposure), engineering controls, and the work practices that are anticipated. The selected equipment will provide protection from the chemicals suspected to be present and which demonstrate the potential for skin exposure. The PPE chosen for each task will be specified in the task-specific health & safety requirements.

3.7.3 Changes in PPE

The Contractor/Consultant Safety Officer will make the decision to upgrade or downgrade the levels of protection. The decision will be primarily based on the results of the air monitoring performed during site activity.

3.8 AIR MONITORING

3.8.1 Air Monitoring Scope

The Contractor/Consultant Site Coordinator will conduct air monitoring during site operations. Should any monitoring indicate concentrations in excess of established action levels, the Contractor/Consultant Site Coordinator will notify Contractor/Consultant Safety Officer and will implement appropriate action to protect project personnel, Kaddis/Enarc-O employees, and the nearby community.

Continuous air monitoring, in worker's breathing zones, for volatile compounds will be performed during the activities for which inhalation has been identified as a potential exposure route. These activities include, but are not limited to:

- o Drilling and soil sampling.
- o Excavation of contaminated soil for remediation.
- o Construction activities involving excavation in areas of known or potential soil or groundwater contamination.

- Pump tests where organic vapors were detected during well installation or water samples.

- Well sampling and hand bailing.

The Contractor/Consultant Site Coordinator should make use of both real time direct reading instruments and laboratory analysis of samples obtained by either grab, filter, sorbent, or wet contaminant collection techniques to measure chemical concentrations. Specific equipment is described in Section 3.8.4 of these Requirements.

3.8.2 Sample Locations

3.8.2.1 Personal Monitoring

Personal monitoring will take place at times proposed by the Contractor/Consultant Safety Officer or Site Coordinator and specified in the task-specific health & safety requirements. In scheduling personal monitoring, consideration will be given to collecting samples at times of maximum potential exposure. Samples will be collected in the employees' breathing zone (9 inch radius hemisphere centered at the nose and forward of the shoulders) utilizing direct reading instruments, flow controlled personal sampling pump, or diffusion type dosimeters.

Scheduled personal samples utilizing sampling pump/sorbent tubes or diffusion type dosimeters should be used to collect full-shift exposure data. If the active operations do not require a full shift work schedule, the sample should be collected for the duration of the active operations. Emphasis should be placed on sampling employees in the exclusion zone, however, employees involved in decontamination procedures will be sampled as well. Additional requirements for personal sampling will be specified in the task-specific health and safety requirements.

Non-scheduled personal samples will be collected as directed by the Contractor/Consultant Safety Officer.

3.8.2.2 Perimeter Monitoring

Real-time air monitoring for volatile organic compounds will also be conducted on a regular basis (e.g., hourly) at the downwind site perimeter (exclusion zone as described in Section 3.3.1). If total organic vapor concentrations attributable to excavation, drilling or other activities conducted at the site, exceed 5 ppm above background, work activity must be halted and monitoring continued. At that point, the Community Air Monitoring Plan must be implemented, as described below.

3.8.2.3 Community Air Monitoring Plan

In the event that total organic vapor levels in the breathing zone of filed personnel exceeds 5 parts per million (ppm) above background, real-time air monitoring for volatile compounds at the perimeter of the Site will be required. The community air

monitoring plan includes the following criteria:

- If total organic vapor levels exceed 5 ppm above background at the perimeter of the Site, work activities must be halted and monitoring continued under the provisions of a Minor or Major Vapor Emission Response Plan, as detailed herein. All readings will be recorded and be available for NYSDEC and NYSDOH personnel to review.

Minor Vapor Emissions Response Plan

If the ambient air concentration of organic vapors attributable to exploration activities exceeds 5 ppm above background at the perimeter of the Site, activities will be halted and monitoring continued. If the vapor levels decrease below 5 ppm above background, work activities can resume. If the organic vapor levels are greater than 5 ppm but less than 25 ppm over background at the site perimeter, activities can resume provided:

1) the organic vapor level 200 feet downwind of the Site or one-half the distance to the nearest downwind residential or commercial structure, whichever is less, is below 5 ppm over background; AND

2) the vinyl chloride level (as measured with a drager tube) at the perimeter of the Site is less than 0.5 ppm; AND

3) more frequent intervals of monitoring, as directed by the project safety officer, are conducted.

If the total organic vapor level is above 25 ppm, or the vinyl chloride level is over 0.5 ppm at the perimeter of the Site, activities must be stopped. Downwind monitoring will be continued to minimize the potential impact to the nearest downwind residential or commercial structure at the levels specified in the Major Vapor Emissions Response Plan described below.

Major Vapor Emissions Response Plan

If the total organic vapor levels measured 200 feet downwind of the site, or one-half the distance to the nearest downwind residential or commercial structure (whichever is less) is more than 5 ppm over background, air monitoring must be performed within 20 ft. of these structures ("20 ft. Zone").

All active exploration or sampling operations at the Site shall cease and remain down if any of the following vapor levels are observed within the 20 ft. Zone:

1) Total organic vapors at 5 pm or greater over background; OR

2) vinyl chloride levels greater than 0.5 ppm.

If, following cessation of work activities on the Site, efforts to abate the emission source are unsuccessful, and any of the above levels persist for more than 30 minutes in the 20 ft. zone, the Major Vapor Emissions Response Plan (MVERP) shall be placed into effect. In addition, any of the following conditions *in the 20 ft. Zone* will necessitate activation of the MVERP:

- sustained organic vapor levels greater than 10 ppm over background; or
- vinyl chloride levels over 1 ppm.

Major Vapor Emissions Response Plan Activation

Upon *MVERP* activation, the following activities will be undertaken:

1. The Safety Officer will be notified; all Emergency Response Contacts listed in the Health and Safety Plan will be contacted, including the local police authorities; AND

2. Air monitoring will be conducted at 30-minute intervals within the 20-ft. Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Safety Officer.

All project employees will be briefed with regard to the details of the Minor and Major Vapor Emission Response Plans, including anticipated hazards, safety practices, emergency procedures, and communication pathways, prior to initiating Site activities.

3.8.3 Sample Methods

3.8.3.1 Integrated Sampling

The Contractor/Consultant Safety Officer will determine if there is a project specific need for integrated sampling and include a detailed sampling plan in the task-specific health & safety requirements.

3.8.3.2 Real Time Sampling

Real time monitoring will be conducted with a photoionization detector equipped with an 10.6 eV lamp or a flame ionization detector as specified in the task-specific Health & Safety section (see Section 2.2.3). These instruments are capable of detecting the volatile organic chemical compounds identified in Table 1 to an approximate lower detection limit of 1 ppm. The OSHA TLV's for the compounds listed in Table 1 are at or above the detection limit of the proposed equipment. The rapid response of these instruments allows for quick determination of airborne concentrations and therefore, subsequent changes in the safety procedures can be implemented if needed (See Section 3.8.4). Refer to Section 2.2.3 for frequency of environmental monitoring.

3.8.4 Air Monitoring Equipment

3.8.4.1 Direct Reading Instruments

The instruments used for air monitoring activities may include, but are not limited to, those listed below. The Contractor/Consultant Safety Officer will make the decision as to which instruments must be on a project-specific basis.

- o A flame ionization detector (FID) equal or superior to Foxboro organic vapor analyzer (OVA) Model 128.

- o A photoionization detector (PID) equal or superior to Photovac Microtip. Due to the general contaminant mix at the site the 10.6 eV probe will be utilized during site investigations.

- o A combustible gas indicator/oxygen meter equal or superior to MSA Model 260 or 360.

  Note: During environmental activities, the potential for creating a flammable atmosphere will be monitored, (e.g., prior to confined space entry, initial operations with atmospheres having the potential to exceed IDLH.) Please refer to Table 2 of this HSP for Action Levels.

Each instrument must be intrinsically safe where warranted. Each will be calibrated and maintained in accordance with the manufacturer's recommendations. Calibration records will be maintained in a daily field logbook.

3.8.4.2 Integrated Sampling Equipment/Techniques

Variable flow, belt mounted personal sampling pumps may be used in conjunction with the appropriate sample media to provide exposure estimates where real time analysis is inadequate. The following equipment/techniques may be used:

- o Diffusion or Permeation Type Dosimeters

- o Analysis of Sorbents

3.8.4.3 Specialized Monitoring Equipment and Analyses

Specialized sampling instruments and analyses (e.g.,H_2S monitors, solid sorbents, sampling bags) will be used on project sites on an "as needed" basis as determined by the site conditions, sampling history at the site, and the type of work to be performed. The Contractor/Consultant Safety Officer will determine the need for specialized equipment or analyses on a project specific basis and include thorough descriptions of sampling plans/procedures and equipment operation and maintenance in the task-specific health & safety requirements.

3.8.4.4 Spare Monitoring Equipment

Appropriate spare monitoring equipment will be made available either on the Project Site or at a location in the project area, as determined by the Contractor/Consultant Safety Officer. The location of spare equipment will be included in the task-specific health & safety requirements. Field activities will be suspended if the properly calibrated field monitoring instrumentation is not available.

3.8.5 Record Keeping

A Field Logbook will be maintained by the Contractor/Consultant Site Coordinator. It will be updated daily. The entries will include:

- o Task description and date
- o Location of work site
- o Personnel involved:
  - Name
  - Function
  - Level of personal protection (any change in level of protection will be recorded at the time of implementation)
- o Health and Safety instrumentation calibration:
  - Instrument name (OVA, LEL, etc.)
  - Serial number
  - Calibration information (i.e. calibration gas)
  - Instrument setting (OVA span set)
  - Time of calibration
- o Meteorological information
  - Type of day (sunny, cloudy, rain, etc.)
  - Wind speed and direction (estimate)
  - Temperature
- o Events of the day in chronological order.
- o Health and safety instrumentation readings
  - Breathing zone concentrations
  - Time
  - Sample concentration with corresponding identification number

- Any unusual occurrences, problems or observations

- Signature of writer

Field Logbook Health and Safety entries, data sheets, etc. will be reviewed by the Contractor/Consultant Safety Officer on a regular basis. Upon review, each log book will be signed to demonstrate that the data has been reviewed and approved.

3.8.6 Summary of Action Levels

Project action levels will be determined by the Contractor/Consultant Safety Officer based upon site conditions and information and will be presented in the task-specific health & safety requirements. The levels defined in Tables 1 and 2 of this HSP will serve as guidelines for project action levels.

3.9 HEAT AND COLD STRESS

3.9.1 Heat Stress

Heat stress occurs in several forms. By order of increasing severity, they are:

1. Heat Rash
2. Heat Cramps
3. Heat Exhaustion
4. Heat Stroke

The potential for a worker to develop heat stress is related to the ambient temperature, relative humidity, and the nature of the work being performed. The Contractor/Consultant Safety Officer must include project specific information on heat stress identification, care and prevention procedures in the task-specific health & safety requirements (Section II).

3.9.2 Cold Stress

Cold stress, as well as heat stress, occurs in different forms. By order of increasing severity, they are:

1. Trench Foot
2. Frostbite
3. Hypothermia

The potential for a worker to develop cold stress is related to the ambient temperature, wind chill, protective clothing, and the nature of the work being performed. The Contractor/Consultant Safety Officer must include project specific information on cold stress identification, care and prevention procedures in the task-specific health & safety requirements (Section II).

3.10 DECONTAMINATION

Personnel and equipment are subject to decontamination procedures when exiting the exclusion zone. No contaminated material will be removed from the exclusion zone without undergoing proper decontamination procedures.

3.10.1 Personnel Decontamination

No personal protective equipment will be removed from the exclusion zone without proper decontamination or placement in a disposal receptacle.

Specific personal decontamination procedures must be detailed in the task-specific health & safety requirements (Section II). The following are guidelines for developing personnel decontamination procedures contained in the task-specific health & safety requirements (Section II):

A. Tools, etc. will be dropped off onto a plastic sheet in the exclusion zone for subsequent re-use or decontamination.

B. The boot wash station will consist of two plastic or metal tubs, two garden sprayers, and a boot brush. One sprayer will contain a detergent water mixture, the other will contain clean water.

C. The outer layer of disposable protective clothing will be removed by removing outer boots, outer gloves, hood, tape, etc., and placed in a receptacle for disposal. Clothing will be removed by "peeling" off while turning it inside-out. This will minimize contact with possible contamination on the outer surface.

D. Respirators will be removed and cartridges placed in a receptacle for disposal.

E. Inner gloves will be removed by rolling off the hand while turning them inside-out and placed in a receptacle for disposal.

F. If highly toxic, skin-corrosive or skin-absorbable materials are known or suspected to be present, personnel must shower before exiting the site.

NOTE: The Contractor/Consultant Site Coordinator will ensure established personnel decontamination procedures are properly implemented and enforced.

3.10.2 Equipment Decontamination

Equipment, including drill rigs, will arrive at the site free of debris and contamination. Equipment will be cleaned and decontaminated before departure from the site. Decontamination chemically contaminated equipment will be performed at a minimum of Level C protection for steam cleaning and hydro-washing.

Specific equipment decontamination procedures will be based upon the type of work being

performed and anticipated levels of contamination. The following items are guidelines for the establishment of equipment decontamination procedures to be included in the task-specific health & safety requirements:

A. All equipment that has been in the exclusion zone or the contamination reduction zone will be visually inspected and/or wipe sampled to assess the extent of contamination.

B. Sensitive instrumentation should be handled in a manner which will minimize the potential of exposure to hazardous soils and liquids. This care in handling will greatly reduce the amount of decontamination required. Should the conditions in the exclusion zone present an extreme potential for contamination, instrumentation may be wrapped in plastic.

C. All hand tools, safety equipment, and heavy equipment will be decontaminated before leaving the site. (e.g. high pressure, low volume hot water washed, steam cleaned, brushed with low phosphate detergent, and water rinsed.)

D. Heavy equipment must have visible residues removed in the exclusion zone. Wheels, wheel wells and cabs of vehicles must be cleaned before equipment is removed from the exclusion zone. The equipment may then be moved to a more centrally located decontamination pad for more extensive decontamination. This move must be accomplished in a manner that will prevent the spread of contamination along the travel path. A detailed plan for necessary equipment relocation must be included in the task-specific health & safety requirements (Section II).

E. If warranted and required by the Project Work Plan, samples such as equipment blanks will be taken and submitted for project related analysis to confirm the decontamination procedures.

3.10.3 Location of Decontamination Areas

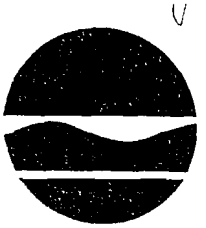
Decontamination areas for project equipment and personnel will be designated by the Kaddis/Enarc-O Project Manager by the following guidelines:

- Each decontamination area will be sited to have access to water and electrical (GFCI protected) supplies as necessary for the decontamination process.
- Access to the decontamination area(s) will be limited and controlled.
- The specific decontamination area(s) for each project will be clearly defined in the task-specific health & safety requirements.

APPENDIX B

Correspondence Regarding Approval for Soil Disposal

New York State Department of Environmental Conservation
Division of Solid & Hazardous Materials
Bureau of Hazardous Waste Facilities
50 Wolf Road, Albany, New York 12233-7252
(518) 457-9255 Fax (518) 457-9240



John Cahill
Acting Commissioner

January 6, 1997

Mr. Ronald Iannucci, Sr., President
Kaddis Manufacturing Corp.
P.O. Box 92985
Rochester, NY 14992-9085

Dear Mr. Iannucci:

Re: Enarc-O Machine Products, Inc.
Lima, New York

Department staff have reviewed the soil and TCLP leachate data for the four samples collected on October 31, 1996 at the Enarc-O Machine Products site in Lima, New York.

The data quality of the soil samples appears to be fine and this data does demonstrate that the amount of contamination in the soil samples is well below, by a factor of about 50 times, the soil sediment action levels in TAGM 3028.

The TCLP leachate values for these same locations result in three samples being non-detected, and one location reporting values of 84 ppb for tetrachloroethylene and 77 ppb for trichloroethylene. These leachate values appear to have a high bias since they are grater than the theoretical amount that could be leached based on the soil sample results.

These TCLP leachate values are well below the values that would classify this material as a characteristic waste. Because of this the Department sees no reason why this material cannot be disposed of in a permitted solid waste landfill. We believe this choice will be protective of the environment and cost-effective for your company.

If you need and further assistance, please contact Mr. John Petiet regarding this issue at (518) 457-9255.

Sincerely,

Steve Kaminski

Steve Kaminski P.E.
Supervisor
Eastern Engineering Section
Bureau of Hazardous waste Facilities
Division of Soil & Hazardous Materials

cc: D. Rollins, Reg. 8
Mike Ryan
R. Mahoney, H&A

APPENDIX C

Quality Assurance Project Plan

APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

1.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

A quality assurance/quality control program is designed to produce data of the quality necessary to achieve project objectives and meet or exceed the minimum standard requirements for field and analytical methods. The QA/QC program will include:

- A mechanism for ongoing control and evaluation of data quality.
- A measure of data quality in terms of precision, accuracy, representativeness, completeness, and comparability.

The following is a general discussion of the criteria used to measure the quality at both field and laboratory analytical data. Field data collection and quality assurance will be the responsibility of Haley & Aldrich and its subcontractors retained for field explorations (drillers, etc.). Laboratory data quality assurance as described herein will be the responsibility of the contract analytical laboratory retained for this project.

1.0.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions or is a quantitative measure of the variability of a group of measurements compared to their average value.

Precision is usually stated in terms of standard deviation but other estimates such as the relative percent difference (RPD) expressed as a percentage of the mean, range (maximum value minus minimum value), and a relative range are common.

The overall precision of measurement data is a mixture of sampling and analytical factors. Analytical precision is much easier to control and quantify than sampling precision. There are more historical data related to individual method performance and the "universe" is limited to the samples received within a laboratory. In contrast, sampling precision is unique to each site.

Sampling precision for this project will be determined by collecting and analyzing collocated (split) or field replicate samples and by creating and analyzing laboratory replicates from one or more of the field samples. The analytical results from the collocated or field replicate samples will provide data on sampling precision. Laboratory replicate analysis will provide data on laboratory precision. For the Remedial Program collocated or replicate samples will be collected at a rate of 10% of the total number of samples obtained in a particular sampling effort.

1.0.2 Accuracy

Accuracy relates to the bias in a measurement system. Bias is the difference between the average value of observed measurements and the "true" value. Sources of error are the sampling process, field contamination, preservation, handling, sample matrix, sample preparation and analytical techniques. For the Remedial Program sampling accuracy will be assessed by evaluating the results of field/trip blanks. Field and trip blanks will be collected as appropriate for each sampling effort. Analytical accuracy will be assessed through the use of known QC samples and matrix spikes.

1.0.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of a population, a parameter variation at a sampling point, or an environmental condition. Representativeness is a qualitative parameter which is most concerned with the proper design of the sampling program. The representativeness criterion is best satisfied by making certain that sampling locations are selected properly and a sufficient number of samples are collected.

Representativeness will be addressed by describing sampling techniques and the rationale used to select sampling locations. Sampling locations may be biased (based on existing data, instrument surveys, observations, etc.) or unbiased (completely random or stratified-random approaches) depending on the situation. The rationale used to determine sampling locations will be explicitly explained.

For the former Remedial Program nearly all sampling will be biased; that is, water samples and monitoring well placement will be dictated by apparent presence or absence of site specific target compounds. Specific sample technique descriptions, which allow consistency, repetitiveness and thus representativeness in sampling, are included in this work plan as described by the specific Work Tasks in this plan.

Representativeness may also be assessed by the use of collocated samples. By definition, collocated samples are collected so that they are equally representative of a given point in space and time. In this way, they provide both precision and representativeness information. As stated previously collocated samples will be collected at a rate of 10% of all samples collected.

1.0.4 Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is essentially the same for all data uses: that a sufficient amount of valid data be generated.

1.0.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Sample data should be comparable with other measurement data for similar samples and sample conditions. This goal is achieved through using standard operating procedures to collect and analyze representative samples and the reporting of analytical results. The standard operating procedures for the various activities to be conducted during this Remedial Program are contained within the attached appendices.

1.1 DOCUMENTATION AND CHAIN-OF-CUSTODY

1.1.1 Field Procedures

The quality of data can be greatly effected by sample collection activities. If the integrity of collected samples is for some reason in question, the data, regardless of its analytical quality will also be in question. Field sampling standard operating procedures will provide for the collection of samples representative of the matrix being investigated.

The following procedures will be used to maintain the integrity of the samples:

- Upon collection, samples will be placed in the proper containers. In general, samples collected for organic analysis will be placed in pre-cleaned glass containers and water samples collected for inorganic and field parameters analysis which will be placed in precleaned plastic (polyethylene) bottles.

- Each sample will be assigned a unique sample I.D. number which will be placed on a sample label securely affixed to the containers. Other information to be placed on the sample label will include: the sample type, the sampler's name, date collected and preservation method. Information on the labels will be completed with a ballpoint or felt-tip waterproof pen.

- Samples will be properly and appropriately preserved by field personnel in order to minimize loss of the constituent(s) of interest due to physical, chemical or biological mechanisms.

- The appropriate sample volumes to be collected will be confirmed prior to initiation of the field program to ensure that method-or contract-required detection limits (or quantification limits) can be successfully obtained and that the required level of quality control relative to both precision and accuracy can be performed.

- A chain-of-custody form will be completed as each sample is collected. The completed forms will accompany the samples to the laboratory. The field personnel collecting the samples will be responsible for the custody of the samples until the samples are relinquished to the laboratory. Sample transfer will require the individuals relinquishing and receiving the samples to sign, date and note the time on the chain-of-custody form.

  On-site headspace analysis of water, soil and soil vapor, if collected and required during the various field operations, will not require chain-of-custody records. However, information

from these analyses will be recorded on one of H&A's standard field forms, and will include information identifying each headspace sample with the correlated laboratory sample split, if one is taken.

- Samples will be shipped or delivered in a timely fashion to the contract laboratory so that holding-times and/or analysis times as prescribed by the chosen methodology can be met. Samples will also be transported in containers (coolers) which will maintain the appropriate temperature for those analytical parameters for which such refrigeration is required in the defined preservation protocols.

Field personnel will be required to keep written records of field activities on applicable preprinted field forms or in a bound field notebook. These records will be written legibly in ink and will contain pertinent field data and observations. Entry errors or changes will be crossed out with a single line, dated and initialed by the person making the correction. Field forms and notebooks will be reviewed by the Quality Assurance Officer.

1.1.2 Laboratory Procedures

The contract laboratory chain-of-custody procedures will be based upon the National Enforcement Investigation Center (NEIC) policies and procedures (EPA-330/9-78-001-R). A full-time sample custodian will be assigned the responsibility of sample control. It will be the responsibility of the sample custodian to receive all incoming samples. Once received, the custodian will: 1) document that each sample is received in good condition (i.e., unbroken, cooled, etc.), and that the associated paperwork, such as chain-of-custody forms have been completed; and 2) will sign the chain-of-custody forms. In special cases, the custodian will document from appropriate subsamples that chain-of-custody with proper preservation has been accomplished. The custodian will also document that sufficient sample volume has been received to complete the analytical program.

The sample custodian will then place the samples into secure limited access storage (refrigerated storage if required).

Consistent with the analyses requested on the chain-of-custody form, analyses by the contract laboratory's analysts will begin in accordance with the appropriate methodologies. Samples will be removed from secure storage only after internal chain-of-custody sign-out procedures have been followed.

Empty sample bottles, when the available volume has been consumed by the analysis, will be returned to secure and limited access storage. Upon completion of the entire analytical work effort, samples will be disposed of by the sample custodian. The length of time that samples are held will be at least thirty (30) days after reports have been submitted.

Disposal of remaining samples will be completed in compliance with RCRA and 6 NYCRR Part 373 regulations.

Empty sample bottles will be disposed of as non-hazardous solid waste consistent with sample exclusion and empty container provisions of RCRA. All liquid and solid samples for disposal will be reviewed by the contract laboratory's management prior to authorization for disposal. If the samples are hazardous by characteristic (reactive, corrosive, ignitable or toxic) or are a TSCA/PCB waste, appropriate controlled disposal will be performed. The contract laboratory will be a permitted generator of hazardous wastes and will have disposal contracts with all necessary types of subtitle-C TSDF facilities. Full documentation of each step of the disposal process, consistent with the requirements of RCRA will be monitored by the contract laboratory's Environmental Health and Safety Officer.

For other non-characteristically hazardous or non-TSCA materials, the contract laboratory will review the available analytical results for the samples in question and dependent on the presence of and/or concentration of hazardous constituents will either dispose of materials as hazardous wastes or exercise its options to dispose of the materials as non-hazardous waste based upon the laboratory samples exclusion provisions of RCRA.

1.2 FIELD INSTRUMENT CALIBRATION PROCEDURES

Several field instruments will be used for both on-site screening of samples and for health and safety air monitoring. On-site screening and off-site air monitoring for health and safety purposes will be accomplished using several different organic vapor detection devices (Foxboro OVA, Draeger tubes).

1.2.1 Organic Vapor Detection Instruments

Instruments including the Foxboro Organic Vapor Analyzer, HNu PI-101 photoionization organic vapor detector, (11.7 eV lamp) Photovac Microtip, and Draeger tubes may be used to monitor air quality during drilling and sampling procedures. General calibration procedures common to each instrument manufacturer's specifications will be followed (except for the Draeger tubes which do not require calibration).

1.2.2 Draeger Multi-Gas Detector System

The Draeger Multi-Gas detector system consists of two primary components, the gas detector pump and the Draeger indicator tubes. Each Draeger indicator tube kit contains specific operating procedures provided by the manufacturer. Operation of the Draeger Multi-Gas detector system will be performed with strict adherence to the manufacturer's gas indicator tube kit specifications.

Prior to each operation of the system, the gas detector pump will be inspected for:

- Leaks within the folds of the bellows
- Proper seating of the indicator tube within the pump head stopper.
- Expiration date of indicator tube to be used.

Satisfactory completion of the pre-operation inspection will be noted on the Field Sampling Record, along with the results of each field measurement.

1.2.3 pH/Conductivity/Temperature Measurements

A field monitoring instrument will be utilized to determine pH, specific electrical conductance and temperature measurements in conjunction with water quality sample collection. The probes will be calibrated immediately prior to each day's operation using NIST traceable reference materials. Calibration data including reference materials and dates of reference material preparation and expiration, and the percent of true value observed will be recorded on the Field Sampling Record.

If calibration verification standard recovery is determined to be outside acceptance criteria of $\pm$ 20% of the standard true value, the specific probe will be reconditioned and recalibrated or replaced.

1.3 Laboratory Analytical Procedures

Analytical procedures to be utilized for laboratory analysis of environmental samples as part of the Remediation program will be from the following document:

- "Test Methods for Evaluating Solid Waste" SW-846, USEPA Office of Soils Waste and Emergency Response 3rd Edition, Update December 1987.

The laboratory analyses will be performed by a laboratory that is NYSDOH ELAP-Certified for CLP analysis.

1.4 Internal Quality Control Checks

1.4.1 Laboratory Procedures

Procedures which contribute to maintenance of overall laboratory quality assurance and control include proper sampling techniques, appropriately cleaned sample bottles (either by the contract laboratory or purchased as "certified clean"), proper sample identification and logging, applicable sample preservation, storage and analysis within holding times, and use of controlled materials.

The quality control program utilized by the contract laboratory will be based upon recommendations contained in the EPA Handbook for Analytical Quality Control in Water and Waste water Laboratories (March 1979), 600/4-/79-019.

Precision and accuracy charts will be maintained for specific parameters as described in the EPA handbook.

Consistent with general guidance from the EPA Handbook, control charts for internal standards and method surrogates will be maintained for each method to be performed as part of the analysis of each project sample.

Duplicate Samples

A duplicate analysis will be performed for every analytical batch or at a minimum of 10 percent of all project samples analyzed by the contract laboratory. The precision or reproducibility of the data generated will be monitored using a precision quality control chart.

The precision chart used to monitor laboratory precision will be based upon information presented in Section 6 of the EPA Handbook of Analytical Quality Control in Water and Waste water Laboratories (March 1979), 600 5-79-019.

The Upper Control Limit (UCL) will be calculated as follows:

$$UCL = D_{4R}$$
$$= 3.27\ (0.006)$$
$$= 0.0196$$

Where:

D_4 = Shewart factor for ranges based upon duplicate analyses.
R = The mean range of multiple replicate determinations.

The critical R value (R_c) is the upper control limit rounded off to an operationally feasible number; i.e., the $R_C = 0.020$. This R_C or critical R value is the maximum allowable difference between replicate determinations on a single sample. The R value will be plotted every day analyses are performed and the points will be reviewed for trends. If an R value exceeds the R_C value, the data will be considered invalid and the cause for such performance will be investigated and corrected before analyses are resumed.

Matrix Spike Samples

A minimum of 10 percent of all project samples to be analyzed by the contract laboratory will be spiked with known amounts of the target compounds being analyzed. The amount of the compound recovered from the sample compared to the amount added will be expressed as a percent recovery. The percent recovery of an analyte is an indication of the accuracy of an analysis and will be expressed on an accuracy chart.

Percent recovery will be calculated for matrix spike and matrix spike duplicate analyses (MS/MSD).

$$\%\ Recovery = \frac{Spiked\ Sample - Background}{Known\ Value\ of\ Spike} \times 100$$

The standard deviation of the MS/MSD recoveries will be calculated. The upper and lower warning limits will be set at plus and minus 2 standard deviation units. The upper and lower control limits will be set at plus and minus 3 standard deviations.

The acceptance criteria based upon this chart will be defined as follows:

The quality control value indicates acceptable analysis values when it falls between the lower warning limit (LWL) and the upper warning limit (UWL).

If the quality control value falls between the control limit and warning limit (UCL and UWL or LCL and LWL), the analysis should be scrutinized as possibly out-of-control. The sample results will still be acceptable at this point.

If the quality control value falls outside the control limits (UCL or LCL), this indicates an out-of-control situation. The analysis must be stopped until the reason for the problem has been identified and resolved. After it has been corrected, the problem will be documented in the procedure book, with the solution noted.

The contract laboratory will also include the analysis of Standard Reference Materials (SRM's) whenever possible. Standard reference materials will be supplied from independent manufacturer's and traceable to NIST materials with known concentrations of selected parameters. In cases where an independently supplied SRM is not available, one may be prepared by the contract laboratory.

1.4.2 Field Procedures

Field Blanks

Internal quality control checks include analysis of equipment blanks used to validate successful equipment cleaning activities.

Whenever possible, dedicated equipment will be employed to reduce the possibility of cross-contamination of samples.

Equipment used for organic sample collection will be cleaned prior to each usage of the equipment, according to the following procedure:

- Potable Water Rinse
- Alconox detergent (or equivalent) wash
- Potable water rinse
- Deionized water rinse

1.5 CALIBRATION PROCEDURES

The use of materials of known purity and/or quality will be utilized for the analysis of environmental samples as part of the Remedial Program. Field personnel and the contract laboratory will carefully monitor the use of all laboratory materials including solutions, standards and reagents through well-documented procedures.

All solid chemicals and acids/bases used by field personnel and the contract laboratory will be reagent grade or better. All gases will be High Purity or better. All standards or standard solutions will be

obtained from the U.S. Environmental Protection Agency or from reliable Cooperative Research and Development Agreement (CRADA) certified commercial sources.

All Standard Reference Materials or Performance Evaluation Materials will be obtained from the National Institute of Standards and Technology (formerly National Bureau of Standards) or reliable CRADA certified commercial sources.

All materials including standards or standard solutions will be dated upon receipt, and will be identified by material name, lot number, purity or concentration, supplier, receipt/preparation date, recipient/preparer's name, expiration date and all other pertinent information.

Standards or standard solution concentrations will be validated prior to use. This validation may be re-standardization for acids or bases, response factor comparison, standard curve response, comparison to other standards made at a different time and/or by a different analyst. All standards and standard materials will be checked for signs of deterioration including unusual volume changes (solvent loss), discoloration, formation of precipitates or changes in analyte response. All standards and standard solutions will be properly stored and handled and will be labeled with all appropriate information including compound/solution name, concentration, solvent, expiration date, preparation date and initials of the preparer.

All solvent materials or materials used as a part of a given procedure will also be checked. Each new lot of solvent will be analyzed to insure the absence of interfering constituents.

Instruments will be calibrated in order to assure that method required criteria including sensitivity and detection limits can be met. Each instrument will be calibrated with standard solutions appropriate to the type of instrument and method being performed.

1.5.1 Gas Chromatograph/Mass Spectrometer/Data System

The mass spectrometer (MS) will be tuned prior to each analytical event and verified after twelve hours of continuous operation, using decafluorotriphenylphosphine (DFTPP) or bromofluorobenzene (BFB)(as appropriate) according to EPA procedures. The tuning results will be maintained on file.

Standard curves will be prepared based on the analysis of pure chemicals at known concentrations. At least three levels will be analyzed within the dynamic range of the analytical system.

For volatile organics, surrogates will be used to establish purge and trap efficiency. Quantitation will be accomplished via internal standardization techniques.

For semi-volatile organics, surrogates will be added to the raw sample to assess preparatory recoveries; internal standards will be added to all extracts and calibration solutions immediately before analysis for quantitation.

Surrogates and internal standards added to all samples and standards will be monitored daily.

1.5.2 Gas Chromatographs

To verify detector sensitivity and chromatographic performance, calibration curves will be generated from the analysis of pure compounds at known concentrations covering the dynamic range within each analytical batch.

Detector response will be compared to a historical file for each compound or class of compounds to validate acceptable performance. If acceptable standard curves are not generated, corrective measures such as replacing glass injector linings, changing septa, changing columns, and "baking" columns and/or detectors will be employed until proper performance has been established.

1.6 TECHNICAL SYSTEM AUDITS

1.6.1 Field Procedures

Technical Systems audits for field sampling and analysis procedures will be conducted by a qualified Haley & Aldrich staff person who is familiar with the procedures being reviewed, but is not directly involved in the Remedial Program. Systems audits will be conducted for groundwater and soil sampling and will occur at the beginning of each sampling task. An audit checklist will be prepared and used for each audit. It contains the items that pertain to the procedure under review such as well purging during the water quality sampling procedures. The checklists along with the auditor's observations and recommendations will be submitted to the QAO.

The following items will comprise the systems audit and will appear on the checklist:

- Field instrument calibration and appropriate documentation.
- Documentation of field log books and sampling data sheets.
- Potential contamination source minimization.
- Proper sample collection, storage, handling and transportation procedures.
- Compliance with chain-of-custody procedures.

1.6.2 Laboratory Procedures

Generally, for any and all measurement systems, the following chronological steps will be performed at one or more levels of the data generation process:

- sample receipt;
- sample logging, inventory, chain-of-custody;
- sample splitting and preservation (if required);

- sample storage;
- sample preparation (extraction and/or digestion);
- sample analysis (standard, QC and samples);
- data calculation;
- data reporting (internal);
- data review/QC logging;
- re-analysis (if and when required) and assessment;
- report preparation;
- report issuance/central file maintenance;
- data storage on magnetic tape
- sample archival and/or disposal.

Two specific analytical groups will be involved in the analytical protocols for this project. These groups will be GC and GC/MS. The specific means by which each group processes the data will be in general agreement with the steps listed above.

Linearity of the standard curve will be verified through regression analysis and final sample concentrations will be entered in a metals data logbook once quality control information, including the results of the SRM's, is deemed acceptable. These results will be transcribed into a final report form for final data/QC review and subsequent issuance.

Gas Chromatography (including separations laboratory)

The sample processing begins in the separations laboratory where a bound notebook will be maintained for the purpose of recording all pertinent information regarding the extraction and clean-up (if required) for the samples. This logbook will contain the following data:

- analyst
- extraction date
- job number
- sample I.D.
- extracted volume or weight of sample
- final concentration volume

- vial number (for extracts produced)
- analysis type (Base/Neutral, Acid Phase, Pesticide)
- glassware set

The above information will be required for either GC or GC/MS analyses. After samples have been prepared for analysis, the GC department will utilize a series of logs, reporting forms and computers to maintain the necessary data. The first will be a bound injection log which contains the following:

- analyst
- injection date
- job number
- sample I.D. vial number
- instrument run number
- method number (specific column and instrument conditions for the particular analyses)
- detector used

On the day that specific analyses will be performed, a minimum of three (3) point, standard curve will be generated via both computer assisted raw data plotting and regression analyses, using the areas as integrated by the gas chromatograph. The integrations and the standard curves will be reviewed by the analyst for consistency and accuracy, and if found acceptable, the sample concentrations will be calculated using standardized internal report forms. These forms will also contain information relative to field blanks, method blanks and solvent blanks associated with the analysis. Information data required for these calculations will be acquired from both the separations and the injection logbooks.

All chromatographs, standards information, QA/QC results, copies of separations and injection logbook pages and other project specific information will be maintained in separate files and used for data calculation and final report preparation.

Gas Chromatography/Mass Spectrometry (GC/MS)

A bound injection log will be maintained for each GC/MS unit and contains the following information:

- analysis date/time
- analyst
- computer file number

- sample I.D. and extract vial number
- job number
- injected volume
- extracted volume
- final volume and dilution
- column number
- injection port temperature
- GC temperature program
- run time
- column pressure
- multiplier setting
- internal standard retention time and % recovery
- surrogate retention time and % recovery

On each day of analysis, a standard curve will be generated to determine calibration factors. Samples will be searched for the characteristic ions of each compound of interest (as listed in the method) and if the ion's retention time and ratio meet the established criteria, the compound will be qualitatively identified. The analyte concentration will be calculated from the primary ion area. The same type of procedure will be used for the evaluation of field blanks, method blanks and solvent blanks.

The data will be reviewed relative to the appropriate quality control results for that analytical batch. Internal reporting forms will be used for precision and accuracy data from the GC/MS analysis of volatiles and/or base neutral, acid phenolic or pesticide/PCB determinations. Upon approval by the GC/MS group supervisor, the project sample analytical data will be transferred to the report preparation group for final review and report issuance.

1.7 PERFORMANCE AND SYSTEM AUDITS

By NEIC definition, an audit is a systematic check to determine the quality of operation of some function or activity. Audits are further defined as being of two basic types; performance and system audits.

A performance audit is one in which quantitative or qualitative data are independently obtained for comparison with routinely obtained data from a measurement system. Performance audits to be completed by the contract laboratory will incorporate a number of mechanisms including the analyses of performance evaluation samples, U.S. Environmental Protection Agency, NYSDOH, as well as the analysis of commercially available check samples and/or the EPA's quality assurance check sample program. Additionally, the contract laboratory QA Officer will submit blind performance evaluation samples to the laboratory on a semi-annual basis. The routine use of available and applicable SRM's also provides for a continuous performance audit.

System audits, as opposed to performance audits, are strictly qualitative and consist of an on-site review of a laboratory's quality assurance system and physical facilities for calibration and measurement. System audits are routinely performed by NYSDEC Bureau of Technical Services (BTS) personnel as an element of certification programs. Additionally, detailed internal audits will also be performed on a semi-annual basis by the contract laboratory Quality Assurance Officer.

At the conclusion of internal or external system audits, reports will be provided to the contract laboratory's operating divisions for appropriate comment and remedial/corrective action where necessary. Written response to internal as well as external audits will be required. Records of audits and corrective actions will be maintained by the Contract Laboratory QA Officer.

1.8 PREVENTATIVE MAINTENANCE

1.8.1 Field Procedures

The field equipment preventive maintenance program helps to ensure the effective completion of the sampling effort and is designed to minimize equipment down time. Program implementation is concentrated in three areas:

- Maintenance responsibilities.
- Maintenance schedules.
- Inventory of critical spare parts and equipment.

The maintenance responsibilities for field equipment will be assigned to the task leaders in charge of specific field operations. Field personnel will be responsible for daily field checks and calibrations and for reporting any problems with the equipment. The maintenance schedule will follow the manufacturer's recommendations. In addition, the field personnel will be responsible for determining that critical spare parts are included with the field equipment. An adequate inventory of spare parts will be maintained to minimize down time. The inventory will primarily contain parts that are subject to frequent failure, have limited useful lifetimes and/or can't be obtained in a timely manner.

1.8.2 Laboratory Procedures

All analytical equipment at the contract laboratory will be covered by some type of maintenance contract. The degree and extent of outside (contracted) routine and/or preventative maintenance assistance will be a function of the complexity of the equipment, and the contract laboratory expertise relative to repair and/or maintenance of the instrumentation.

Annual preventative maintenance service visits will involve cleaning, adjusting, inspecting and testing procedures designed to deduce product failure and/or extend useful product life. Between visits, routine operator maintenance and cleaning will be performed according to manufacturer's specifications.

1.9 DATA ASSESSMENT PROCEDURES

1.9.2 Field Procedures

Field-generated information such as field logs and forms will be reviewed for validity. The reviewing will include field logbooks/forms, data entry and calculation checks.

1.9.2 Laboratory Procedures

Quality Assurance (QA) procedures are based on the specific methodology utilized for sample analysis. Each analytical procedure includes determination/maintenance of standard response and linearity, instrument tuning, internal standard responses, surrogate recoveries in blanks and samples, spike recoveries and replicate precision. Many of the QA criteria are method based and decisions as to corrective action in the form of re-analysis will be determined by the analyst. Surrogate, internal standard and spike recoveries will be plotted on control charts so that trends in data quality can also be monitored so that appropriate and timely corrective action can be taken.

The contract laboratory's quality assurance/quality control program will include the following:

- Precision, in terms of replicate percent difference (RPD), will be determined by replicate sample analysis at a frequency of one per sample set or one sample in ten (10%) whichever is greater or at the appropriate frequency as defined by the method. RPD is defined as the absolute difference of replicate measurements divided by the mean of these analyses normalized to percentage.

- Accuracy, in terms of percent recovery (recovery of known constituent additions or surrogate recoveries), will be determined by the analysis of spiked and unspiked samples. The objective is to spike with such a quantity as to raise the sample concentration to 75% of the working analytical range. For large on-going projects, it will often times be most advantageous to perform the spiking of a random sample after the initial analysis has been completed. Alternatively and specific to certain methods, matrix spike and matrix spike duplicates are used for expression of accuracy. Recovery data can be gathered in two (2) forms; relative recovery and absolute recovery. Relative recovery is based on a spike being added to project samples while absolute recovery is based upon the SRM's or spiking of laboratory water (matrix spike blank). The frequency of spiking for both absolute and/or

relative recoveries will be one per sample set or one sample in ten (10%) whichever is greater. The selection of relative recovery or absolute recovery will be determined by the volume of sample available for analysis. Generally, if greater than ten samples have been received, a relative and an absolute recovery will be measured.

- With each set of project samples a method blank will be prepared and analyzed. If field blanks are received, this blank will be processed and reported as a project sample. Trip blanks, if received will also be analyzed, processed and reported as a project sample. Trip blanks will be prepared and analyzed with all sample collections for volatile organic analysis. Additionally, holding blanks for volatile analysis and solvent blanks will be prepared as required. Solvent blanks are analyzed based upon method blank results and/or changes in solvent suppliers/lots. Unprocessed solvent blanks will be continually analyzed on the GC and or GC/MS as a routine control measure for these instruments.

- Standard Reference Materials (SRM's) will be used for each analysis. Sources of SRM's include the U.S. Environmental Protection Agency, commercially available material from CRADA certified vendors and/or laboratory produced solutions. SRM's, when available and appropriate, will be processed and analyzed on a frequency of one per set of samples.

- Stock and working standard solutions and separate spiking solutions will be prepared from materials supplied by the U.S. Environmental Protection Agency or purchased from commercially available sources. Standard curves will be generated consistent will methodology. Standard curves will be produced once per day and/or verified by re-analysis of mid-range standards at least every tenth sample. Standard curves for conventional parameters (i.e. cyanide) will not be generated daily but will be verified on a daily basis. Standard curves will also be reviewed for consistency to help identify problems that could be associated with the applicable instruments and/or the standard solutions.

1.10 INVESTIGATIVE CORRECTIVE ACTION

1.10.1 Field Procedures

Corrective action is intended to correct problems that arise when sampling or measurement procedures and environmental data do not meet accepted performance criteria. The Quality Assurance Officer will be responsible for ensuring the quality of the sampling procedures and environmental data and initiating corrective action when appropriate.

The corrective action procedures will be as follows:

- Identify/define the problem.

- Assign responsibility for investigating the problem.

- Investigate/determine the cause of the problem.

- Determine an appropriate corrective action to eliminate the problem.

- Implement the corrective action.

- Evaluate the effectiveness of the corrective action.

- Verify that the corrective action has eliminated the problem.

The above procedures will be implemented through the use of the Systems Audit as described previously or upon any team member becoming aware of the potential need for corrective action. Any member of the project may initiate corrective action procedures by reporting the nature of the suspected problem to the Project Manager or QAO. The Project Manager will begin corrective action by relating the problem to appropriate personnel. A corrective action alternative will be selected, implemented and verified through the use of technical audits.

1.10.2 Laboratory Procedures

Within a laboratory QA/QC program, a percentage of data will not meet all of the established criteria. The following paragraphs defines the corrective action decision process relative to possible non-compliant events within the contract laboratory QA/QC program.

a) If precision, accuracy and SRM (if available) data are all within the established warning limits; proceed with final issuance of data report including all QA/QC results.

b) If precision, accuracy and SRM (if available) are within control limits but one or all of these parameters exceed the warning limits, the source(s) of bias/error needs to be evaluated, but proceed with final issuance of data report including all QA/QC results.

Source of error/bias may be found in the following:

- calculation errors
- transcription errors
- sample matrix (i.e., high suspended solids in water sample, oily sediment, etc.
- sample homogeneity
- level of contaminant measured (validity of the precision measurement is a factor of concentration)
- analyst error (warning control limits exceeded for one analyst more frequently than others)
- appropriateness of method(s) based upon sample type (wastewater as opposed to drinking water)

c) If precision, accuracy and/or SRM (if available) are out of control, one of the following approaches to the problem can be used:

- SRM out-of-control whether or not precision or accuracy are in control;

method based errors are suggested and all data is suspect. If SRM is verified as out-of-control (i.e., standards are checked, etc.) all samples will be re-analyzed or data reported as out-of-control, if no additional sample available.

- SRM (if available) is in control but absolute recovery is out of control; method based error is suspected. If standards and spiking solutions are verified to be accurate as independent solutions, all data is suspect unless reprocessing and re-analysis of absolute recovery sample can be completed to prove only random error. If systematic error (constant out-of-control absolute recovery) is found, all samples will be re-analyzed after corrective action has been taken.

- SRM (if available), absolute recovery and precision are in control but relative recovery is out of control; matrix problems are likely. Proceed to issue data report with appropriate qualifications as to possible matrix effects.

- SRM (if available), absolute recovery and relative recovery are in control but precision is out-of-control; matrix problem likely in the form of sample heterogeneity. If sample appears homogeneous, the sample will be re-analyzed; if data is still out-of-control, data report will be issued with qualifications. If, on the other hand, data is in control, analyst error will be suspected. Each data point from the original sample set will be appropriately qualified.

- SRM and absolute recovery are under control but both relative recovery and precision are out-of-control; matrix effects, sample homogeneity problems and/or analyst error will be suspected. If re-analysis of a well-mixed homogeneous sample by different analyst(s) is still out-of-control, the data will be with a qualifier relative to matrix effects. If upon re-analysis relative recovery is within control limits but precision is still uncontrolled, the data report will be issued with advise of potential errors relative to heterogeneity of sample. If, in the last possible case, re-analysis indicates adequate precision but uncontrolled relative recovery, the final data report will be issued with advise of possible sample matrix effects on this data.

d) Precision limits will be defined by a relative percent difference which, when exceeded, indicates unacceptable analytical performance. Accuracy limits will be expressed in percent recovery of spiked material. A recovery below or above the set criteria will indicate a need for corrective action.

If any analysis has been deemed "out-of-control" corrective action will be taken to insure continued data quality.

The following presents a number of corrective actions which may be employed, depending upon the particular situations.

- Calculations will be rechecked.

- Sampling handling, i.e., digestion, concentration and or extraction logs will be checked for discrepancies in sample handling.

- The target analyte concentration will be reviewed to determine if it has severely influenced the reliability of the precision or recovery calculations.

- The instrument and method performance will be verified by inspecting data on standard reference materials (SRMs) processed in the same data set.

- Quality control data on the other samples in the data set, including surrogate recovery, internal standards, etc., will be reviewed to determine if the problem was method related or sample related.

- If original sample is available, the sample will be assessed for homogeneity.

- If sample is unavailable and no explanation for poor quality control results can be determined, the Project Quality Assurance Officer will be notified and additional sample may be obtained. If additional sample is unavailable, the results will be issued with a qualification as to their accuracy.

1.11 QUALITY ASSURANCE (QA) REPORTS TO MANAGEMENT

Critically important to the successful implementation of the QA Plan is the reporting system which provides the means by which the program can be reviewed, problems identified and programmatic changes made to remediate or improve the plan.

Quality Assurance reports to management take a number of forms as follows:

- Audit reports, internal and external audits with responses

- Performance evaluation sample results; internal and external sources

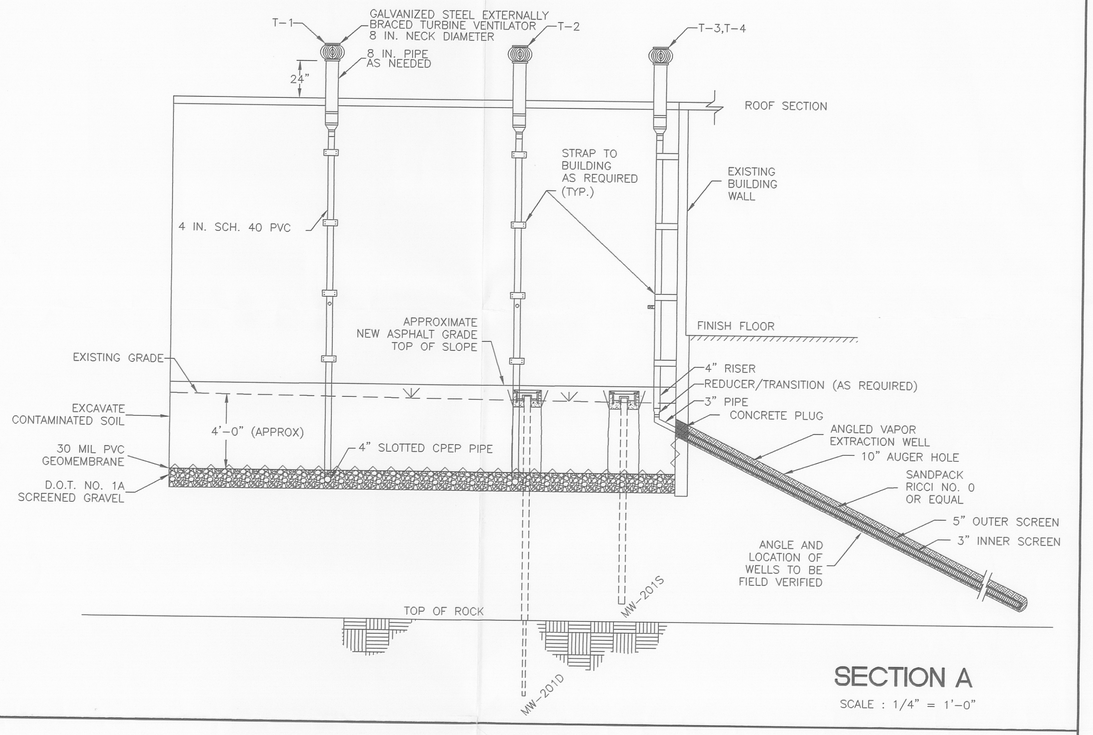
- Daily QA/QC exception reports corrective actions

- QA charts

QA/QC corrective action reports will be prepared by the Contract laboratory QAO and presented to the contract laboratory management personnel so that performance criteria can be monitored for all analyses from each analytical department. The updated trend/QA charts prepared by the contract laboratory QA/QC personnel will also be distributed at least monthly and reviewed by various levels of the contract laboratory management as well as the Contract laboratory Officer.

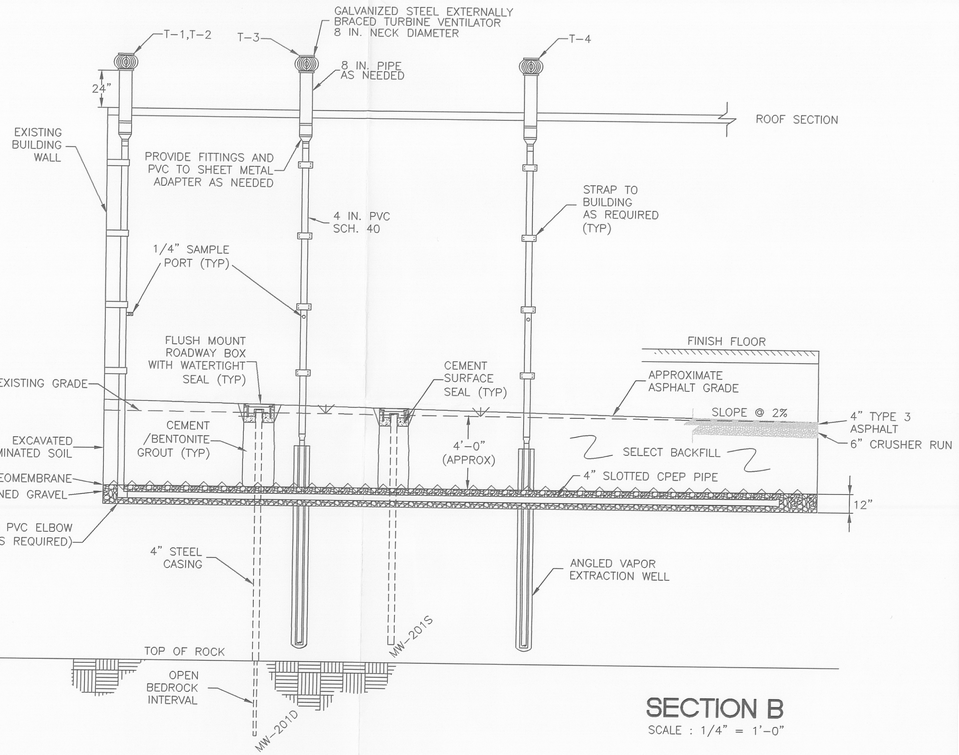
APPENDIX D

Drawing P-1



SECTION A

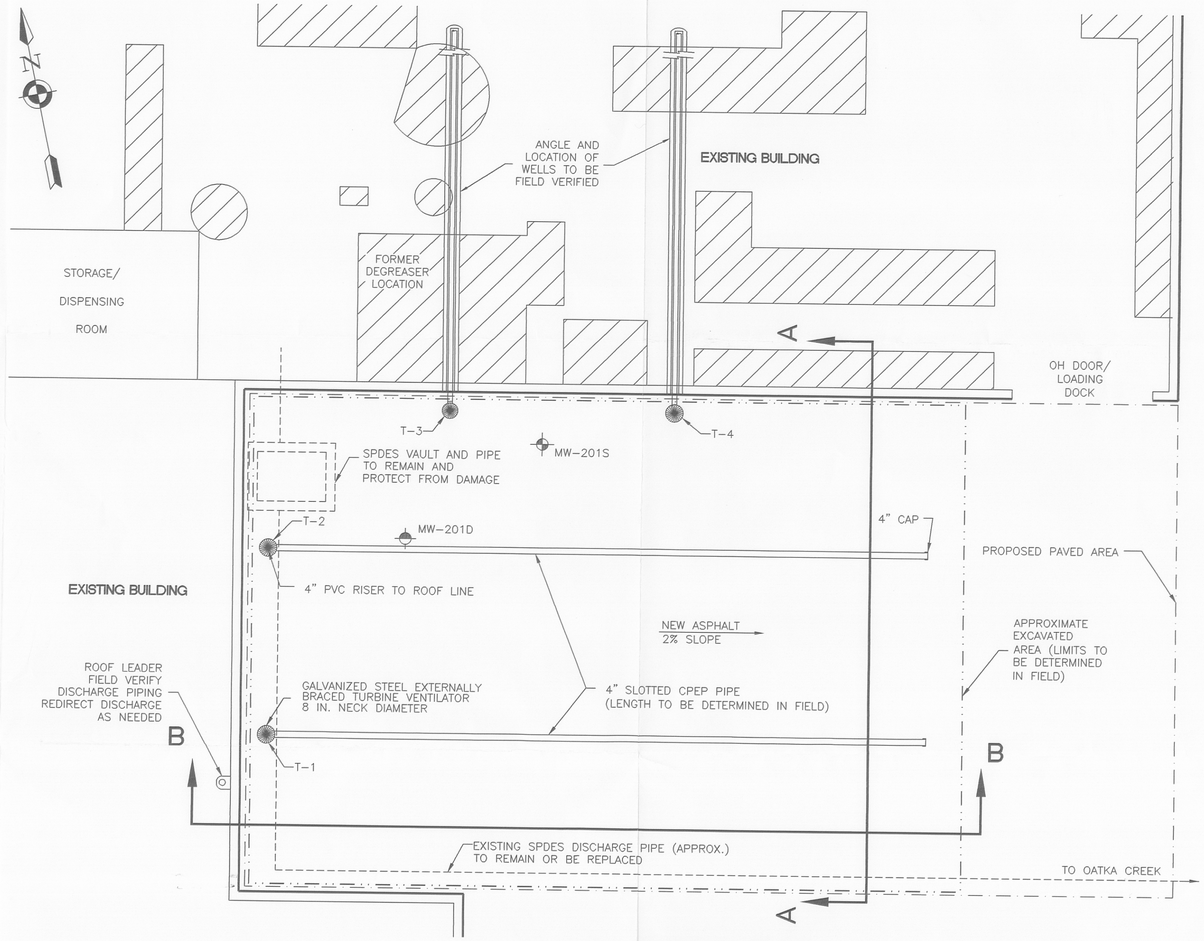
SCALE : 1/4" = 1'-0"



SECTION B

SCALE : 1/4" = 1'-0"

70372-050



PARTIAL PLAN

NOTES:

1. ALL LOCATIONS AND DIMENSIONS APPROXIMATE TO BE FIELD VERIFIED.
2. 30 MIL PVC GEOMEMBRANE SHOULD COVER ENTIRE EXCAVATED AREA AND SHOULD BE ONE CONTINUOUS PIECE. (GREAT LAKES CONTAINMENT INC. 1-800-455-7800)
3. TOP OF STONE LAYER SHALL BE PREPARED PRIOR TO PLACEMENT OF PVC GEOMEMBRANE. PREPARATION SHALL INCLUDE GRADING AND REMOVAL OF MATERIALS THAT COULD PUNCTURE THE PVC GEOMEMBRANE.
4. CARE SHALL BE TAKEN NOT TO PUNCTURE THE PVC GEOMEMBRANE. HEAVY EQUIPMENT (INCLUDING TRUCKS) SHALL NOT BE DRIVEN OVER THE PLACED SHEETING.
5. SEAL ANY PENETRATIONS OF THE BARRIER MATERIAL FOR PIPING, ETC.
6. ANGLED WELLS BY OTHERS, EXACT LOCATIONS TO BE DETERMINED.
7. 4" SLOTTED CORRUGATED POLYETHYLENE PIPE (CPEP) AS SUPPLIED FROM ADS OR APPROVED EQUAL.
8. EXTERNALLY BRACED TURBINE VENTILATOR AS SUPPLIED FROM GRAINGER NO. 2C529 OR APPROVED EQUAL.
9. PROPERLY SUPPORT ALL PIPING TO BUILDING.
10. PROTECT EXISTING WELLS TO NEW PAVED GRADE AND PROVIDE ROADWAY BOX FOR EACH.
11. PAVEMENT TO BE 4" TYPE 3 NYSDOT ASPHALT OVER 6" CRUSHER RUN. SLOPE ASPHALT AT 2% AWAY FROM BLDG TO MATCH EXISTING GRADE.
12. ALL EXISTING UTILITIES WILL BE PROTECTED DURING CONSTRUCTION AND ROOF LEADER TO BE REDIRECTED IF REQUIRED.
13. SELECT BACKFILL TO BE COMPACTED IN 12 INCH LIFTS.
14. JOINT BETWEEN THE ASPHALT AND EXISTING BLDG WALLS SHALL BE SEALED.

LEGEND:

- FLOOR AREA OBSTRUCTED BY EQUIPMENT, STORAGE OR OTHER, (DIMENSIONS APPROXIMATE).
- APPROX. EXCAVATION LIMITS
- ASPHALT PAVING LIMITS
- MW-201S — OVERBURDEN MONITORING WELL
- MW-201D — BEDROCK MONITORING WELL

1/4" = 1'-0"
0 4'-0" 8'-0"
SCALE (IN FEET)

STATE OF NEW YORK · WAYNE CHARLES HARVEY · 067080 · LICENSED PROFESSIONAL ENGINEER

ISSUE	DATE	REVISIONS	BY
D	01/12/99	REVISED FINAL	H&A
C	10/13/98	FINAL	H&A
B	9/25/98	FINAL DRAFT	H&A
A	08/15/98	ISSUE FOR REVIEW	H&A

HALEY & ALDRICH
UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS
Haley & Aldrich, Inc.
189 North Water Street
Rochester, New York 14604-1151
Tel: 716.232.7386
Fax: 716.232.6768

ENARC-O MACHINE PRODUCTS, INC.
REMEDIATION CONSTRUCTION
LIMA, NEW YORK

LOW-VACUUM VAPOR EXTRACTION SYSTEM

0 1/2 1
THIS BAR MEASURES 1" AT TRUE SCALE

Project Engineer:	MNR
Designed By:	RJM/VBD
Drawn By:	RJS
Checked By:	WCH
Sheet No.:	1 of 1
Date:	SEPT 1998
File No.	70372-050
Scale:	1/4" = 1'
Filename:	PLANRB
Drawing No.	P-1
Issue	D

APPENDIX E

Example System Operations Log Sheet

ENARC-O MACHINE PRODUCTS
LOW VACUUM SOIL VAPOR EXTRACTION SYSTEM
OPERATIONS LOG SHEET

	DATE:									
START TIME:_____	TIME:									
START DATE:_____	BY:									
DESCRIPTION	**UNITS**	**DATA**	**DATA**	**DATA**	**DATA**	**DATA**	**DATA**	**DATA**	**DATA**	**DATA**
[MINIMUM MONTHLY CHECKS]										
T-1 VAPOR FLOW	SCFM									
T-1 PID READING	PPM									
T-2 VAPOR FLOW	SCFM									
T-2 PID READING	PPM									
T-3 VAPOR FLOW	SCFM									
T-3 PID READING	PPM									
T-4 VAPOR FLOW	SCFM									
T-4 PID READING	PPM									

NOTES: