USEPA BROWNFIELDS ASSESSMENT DEMONSTRATION PILOT PROJECT

Work Plan
Quality Assurance Project Plan
Health and Safety Plan
Community Involvement Plan

Former Karg Brothers Tannery
Johnstown, New York

CITY OF JOHNSTOWN, NEW YORK

Prepared by:

Malcolm Pirnie, Inc.
15 Cornell Road
Latham, New York 12110

March 2000
2384010

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Region 5
Warrensburg Spill Response

MALCOLM PIRNIE

WORK PLAN

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1.0 INTRODUCTION

The City of Johnstown, New York (City) has been selected to receive a grant under the United State Environmental Protection Agency's (USEPA) Brownfields Assessment Demonstration Pilot Program for a Site Investigation and Remedial Alternatives Evaluation at the former Karg Brothers Tannery in Johnstown, New York (Project). The objectives of the Project include:

- Use of a community-focused approach to conduct the Pilot;
- Assess environmental conditions at the site;
- Evaluation of remedial options, which are protective of human health and the environment, based on community needs and end-use planning for the property;
- Enhancement of the Cayadutta Creek watershed through pollution prevention measures and possible integration with the adjacent Schriver Pond Linear Park; and
- Planning to support revitalization of the property.

This site-specific Work Plan summarizes the scope of work for the Project. This Work Plan and the associated Quality Assurance Project Plan (QAPP), Community Involvement Plan (CIP), and Health and Safety Plan (HASP) will be submitted to the USEPA and the New York State Department of Environmental Conservation (NYSDEC) for regulatory review.

2.0 SITE DESCRIPTION AND BACKGROUND

2.1 SITE LOCATION AND DESCRIPTION

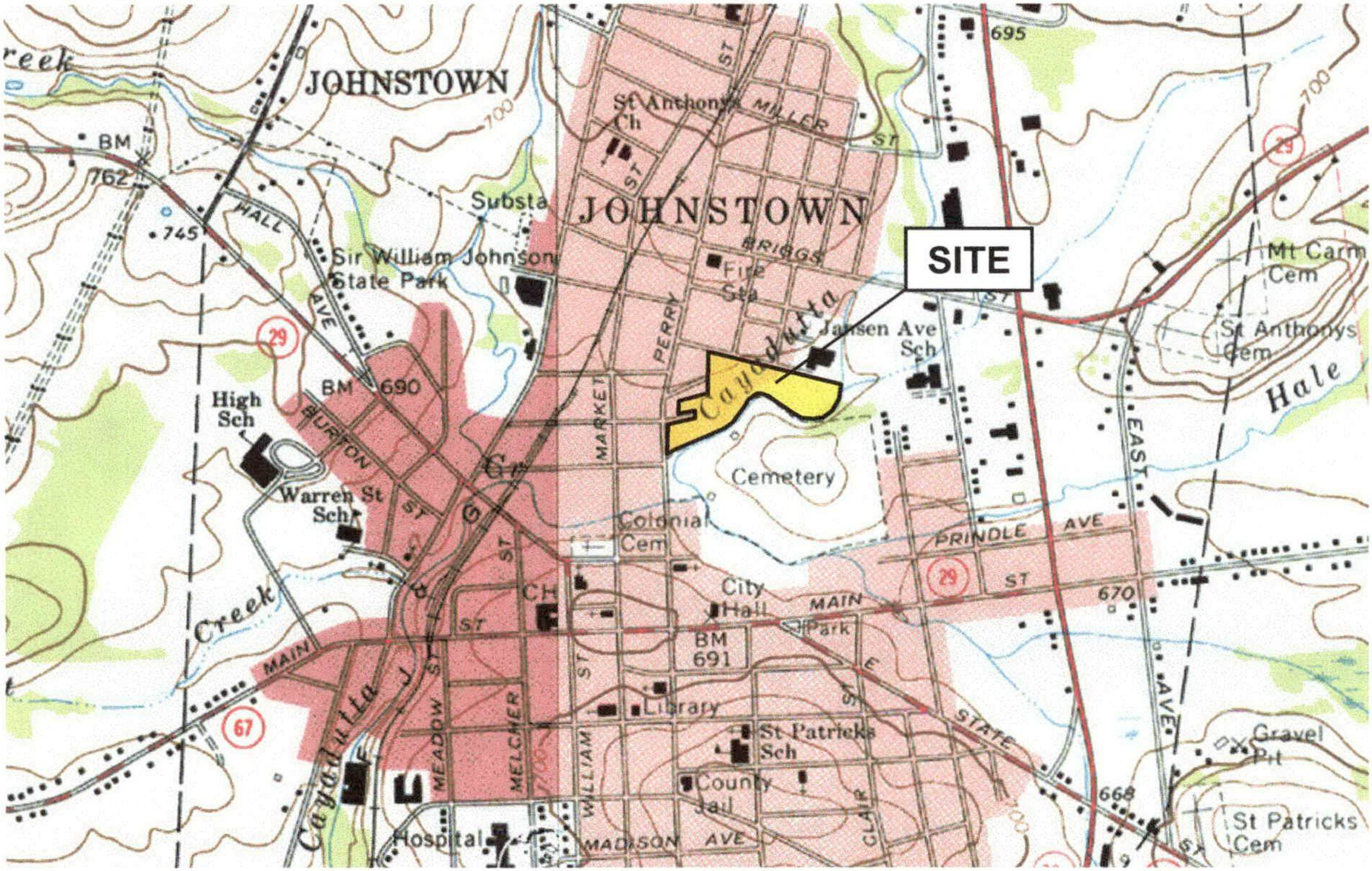
The site is located at the intersection of North Perry Street and Crescendoe Road in the City of Johnstown, Fulton County, New York (Figure 2-1). The Cayadutta Creek borders the site to the east and south. The site is approximately 10 acres. As shown on Figure 2-2, the site consists of four separate structures. The structure on the eastern portion of the site (former Warehouse) is currently being redeveloped and is occupied by the City of Johnstown Department of Public Works and a private textile company. The remaining structures are unoccupied.

As shown in Figure 2-2, several above ground storage tanks (ASTs) remain at the site. These ASTs include:

- 20,000-gallon No. 6 fuel oil AST;
- 10,000-gallon Stoddard solvent AST;
- Two 2,000-gallon sulfuric acid ASTs;
- 10,000-gallon chrome tanning solution AST;
- 1,000-gallon Leukanol D-48 AST;
- A salt brine AST; and
- Several ASTs used for process-water storage.

In addition, numerous large wooden drums used in the tanning process are present in the Cow Beaming and Tanning Building, the Beam Shop, the Pickling Room, and the Tanning and Coloring Building. Several 55-gallon drums containing unknown liquid and/or solid contents are also present in the production buildings.

Two concrete wastewater settling basins and a series of sludge tanks associated with the former on-site wastewater treatment system also remain on-site. As shown in Figure 2-2, these tanks are located adjacent to the Cow Beaming and Tanning Building and the tannery office, respectively.



SOURCE: U.S.G.S 7.5 MIN. PECK LAKE AND GLOVERSVILLE QUADS

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FORMER KARG BROTHERS TANNERY
JOHNSTOWN, NEW YORK

LOCATION MAP

FIGURE 2-1

Source: "Former Karg Brothers Tannery, Brownfields Redevelopment"
City of Johnstown, Office of the Engineer, 1998

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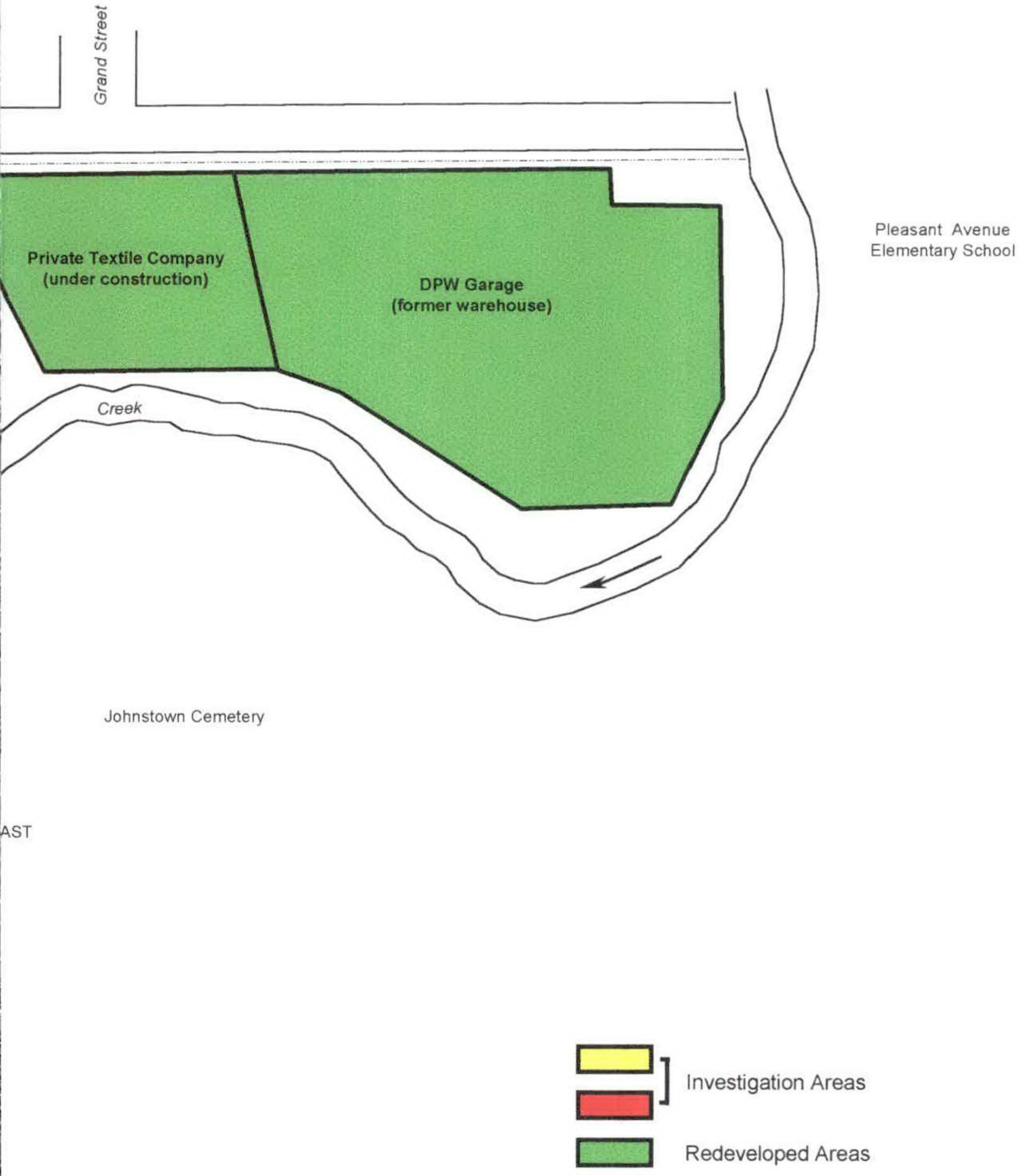

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FIGURE 2-2

2.2 GEOLOGY/HYDROGEOLOGY

The surficial geology of the site is characterized as lacustrine sands deposited during the last glacial retreat (Caldwell, 1987). These sands are typically well-sorted, stratified, quartz sand with a thickness ranging from six to 60 feet. Surficial geology at the site is also likely characterized by bank deposits (sand, silt, and gravel) associated with Cayadutta Creek and fill materials associated with the construction of the tannery. Bedrock in the vicinity of the site is mapped as the Middle Ordovician Canajoharie Shale of the Lorraine, Trenton, and Black River Groups (Fisher, et al., 1970). The Canajoharie Shale is characterized as a dark gray to black finely bedded shale with occasional coarser grained fine sand sequences. The depth to bedrock in the vicinity of the site is unknown, but is likely 20 to 40 feet below ground surface (bgs).

The site is at an elevation of approximately 680 feet above mean sea level (amsl). Based on local topography, the local groundwater flow direction is expected to be to the south and east, towards the Cayadutta Creek. The depth to the groundwater table beneath the site is unknown, however, based on the site's proximity to the Creek, it is expected that the water table is no more than 10 feet bgs.

2.3 SITE HISTORY

The former Karg Brothers Tannery was established in the early 1900s. From the 1900s to the early 1980s, the tannery underwent a series of expansions. The most recent expansion included the construction of a 93,000 square foot warehouse on the eastern portion of the property. The tannery operated continuously at this location until 1993, when the facility was shut-down and abandoned. Operations performed at the facility included degreasing, pickling, beaming (hair removal), tanning, and finishing of animal hides. These operations required the use of Stoddard solvent, acids, lime, chromium compounds, dyes, and pigments.

3.0 SITE INVESTIGATION

The focus of this work is to collect sufficient information to characterize the nature and extent of contamination in the on-site structures (i.e., waste materials), in the groundwater and subsurface soils, and in the surface water and sediment of the Cayadutta Creek. This information will be utilized in the Site Investigation and Remedial Alternatives Evaluation report (SI/RAE) to evaluate remedial alternatives and to assess the need for removal actions at the site. The base scope of work, includes: site survey, sampling of waste and building materials, soil borings, groundwater monitoring well installation, soil and groundwater sampling and analysis, and surface water and sediment sampling and analysis.

All samples collected during the SI/RAE will be analyzed by a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) and Analytical Services Protocol (ASP)-approved analytical laboratory. ASP Category B data packages will be produced for each sample. A Data Usability Summary Report (DUSR) will be prepared upon the receipt of all analytical data to ensure that the quality of the data is sufficient to evaluate remedial alternatives.

3.1 SITE SURVEY

Malcolm Pirnie will survey the site to create a base map and to generate an inventory of waste materials, tanks, and other materials of environmental concern at the site. The base map and inventory will be used to assess potential environmental impacts to groundwater, surface water, and soil, and to group waste materials based on type, location, process, and content. The survey will include:

- Relevant physical features of the site (i.e., buildings, streets, Cayadutta Creek);
- Locations of wooden drums, ASTs, tanks, 55-gallon drums, trenches, and waste end-products (i.e., hides, if present);

- Location of sewer system connections (i.e., manholes, floor drains, and catch-basins) and invert elevations of sewer system piping, where possible;
- Location of utilities (i.e., transformers, utility poles, water supplies, etc.); and
- Location and dimension of wastewater-treatment areas (i.e., settling basins and sludge tanks).

The survey will provide sufficient detail to prepare plans and specifications for removal and/or remedial measures required during and/or after the investigation. In addition, the locations of monitoring wells (vertical elevations and horizontal coordinates), soil borings, waste material sampling points, and surface water/sediment sampling locations will be surveyed and plotted on the base map as these tasks are completed. The survey will report Northing and Easting coordinates to the nearest 1.0 foot in reference to a relative coordinate system. Elevations to the nearest 0.01 foot shall be provided for the survey marker and top of the casing at each monitoring well.

3.2 EVALUATION OF WASTE MATERIALS

The first phase of the project will focus on the various building and waste materials at the site that may present a hazard to human health and/or the environment. Waste materials will be inventoried and evaluated to assess removal and/or remedial options available to the City through the various grant programs and USEPA departments. In addition, waste materials present at the site, whether hazardous or non-hazardous, must be characterized prior to demolition or removal activities so as to support appropriate classification of materials in accordance with federal and state regulations.

3.2.1 Wooden Drums

Wooden drums used in the tanning process are present in the Cow Beaming and Tanning Building, the Beam Shop, the Pickling Room, and the Tanning and Coloring Building (Figure 2-2). Several drums are also present outside of the buildings. Malcolm Pirnie will inventory, map, and "group" all wooden vats located in the production buildings based on type, location, tanning process, and contents, if any. Wood core samples will be collected from representative vats in each group. Each core sample will be analyzed for leachable volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), toxic metals, reactivity, and corrosivity by the Toxicity Characteristic Leaching Procedure (TCLP) to evaluate whether or not the vats are considered characteristically hazardous under the Resource Conservation and Recovery Act (RCRA). Sludges or waste materials found in the vats will also be evaluated through TCLP testing. The procedures for waste material evaluation are provided in the QAPP.

3.2.2 55-Gallon Drums

Several 55-gallon drums with unknown liquid and/or solid contents are present in the production buildings. Malcolm Pirnie will inventory, map, and sample the contents of each drum to evaluate potential removal/disposal options. Liquid samples will be analyzed for Target Compound List (TCL) VOCs by Method 8260B, SVOCs by USEPA Method 8270C, Pesticides/PCBs by USEPA Methods 8081A and 8082, Target Analyte List (TAL) Metals (including cyanide and hexavalent chromium), reactivity, corrosivity, and ignitability. Solid samples will be analyzed through TCLP testing. The procedures for drum sampling are provided in the QAPP.

3.2.3 Wastewater Settling Basins

As shown in Figure 2-2, two concrete settling basins associated with the on-site wastewater treatment system are adjacent to the Cow Beaming and Tanning Building and the tannery office, respectively. A series of sludge storage tanks are also located adjacent to the office building. The dimensions of the basins\tanks and their contents will be measured to determine their volume as well as the volume of sludge and water in each. The thickness of sludge will be determined by probing with a metal rod on a grid pattern in the basin. One water sample and two sludge samples will be collected from each basin/tank. The water samples will be analyzed for TCL/TAL parameters and hexavalent chromium. The sludge samples will be analyzed through TCLP testing and analysis of TCL/TAL parameters (including hexavalent chromium). Specific procedures for evaluation and sampling of the settling basins are provided in the QAPP.

3.2.4 Aboveground Storage Tanks

As discussed in Section 2, at least seven ASTs are present at the site. The ASTs range from 1,000 to 20,000 gallons in capacity and were used to store a variety of liquids, including No. 6 fuel oil, Stoddard solvent, sulfuric acid, and chrome tanning solutions. Malcolm Pirnie will inventory and map all ASTs present at the site. During the inventory, each tank will be inspected to assess the volume and nature (i.e., liquid or solid) of the contents, if any. Observations of tank construction, approximate age, and condition will also be made. Piping and valves associated with each tank will be documented as part of this inventory.

Upon completion of the inventory, the contents of each tank will be sampled. Liquid samples will be analyzed for TCL VOCs, SVOCs, Pesticides/PCBs, TAL Metals (including cyanide and hexavalent chromium), reactivity, corrosivity, and ignitability. Solid samples will be analyzed through TCLP testing. The procedures for AST sampling are discussed in the QAPP.

3.3 CONTAMINATION PATHWAYS INVESTIGATION

Several potential pathways exist by which contamination from the site could be released to the environment. These pathways include:

- Release of contaminants to the plant/City sewer system through floor drains, manholes, and catch basins;
- Release of contaminants to soil and groundwater from past operations, accidental spills, and improper storage of tanning materials; and
- Release of contaminants to surface water and sediment of the Cayadutta Creek.

Since these potential pathways are associated with the site as a whole (i.e., not individual processes limited to specific buildings), Malcolm Pirnie will conduct the pathways investigation on a site-wide basis.

3.3.1 Sewer System Assessment

Malcolm Pirnie will locate, inspect, and map the location of manholes, floor drains, and catch basins associated with the on-site sewer system. During the inspection, an assessment will be made as to whether or not there is still flow in the sewer. This assessment will aid in the preparation of plans for the eventual abandonment of the sewer system. Since future use of the sewer is not expected, the collection of water, sediment, and/or sludge samples from the sewer will not be conducted.

3.3.2 Soil Borings

A total of seven shallow soil borings will be completed at the site using a Geoprobe® direct-push drill rig to evaluate any contamination associated with the former site operations. The locations of the proposed soil borings locations are shown on Figure 3-1. Each soil boring will be completed to the top of the water table (approximately 10 to 15 feet bgs). Soil samples will be collected from grade to the bottom of each boring using two-inch MacroCore sampling tubes. Subsurface soils from each boring will be screened for the presence of VOCs using a photoionization detector (PID) and visually examined for evidence of contamination. Based on the results of the field screening, a minimum of one soil sample from each boring will be selected for analysis of TCL VOCs, SVOCs, Pesticides/PCBs, TAL Metals, and hexavalent chromium. Selected samples will also be analyzed for total organic carbon (TOC) for use in the remedial alternatives analysis. Additional soil samples may be collected based on field screening and observations by Malcolm Pirnie's on-site geologist. Required QA/QC samples, including field duplicates, equipment blanks, and matrix spike samples will also be collected. The procedures for subsurface soil sample collection, soil characterization, and screening are provided in the QAPP.

Source: "Former Karg Brothers Tannery, Brownfields Redevelopment"
City of Johnstown, Office of the Engineer, 1998

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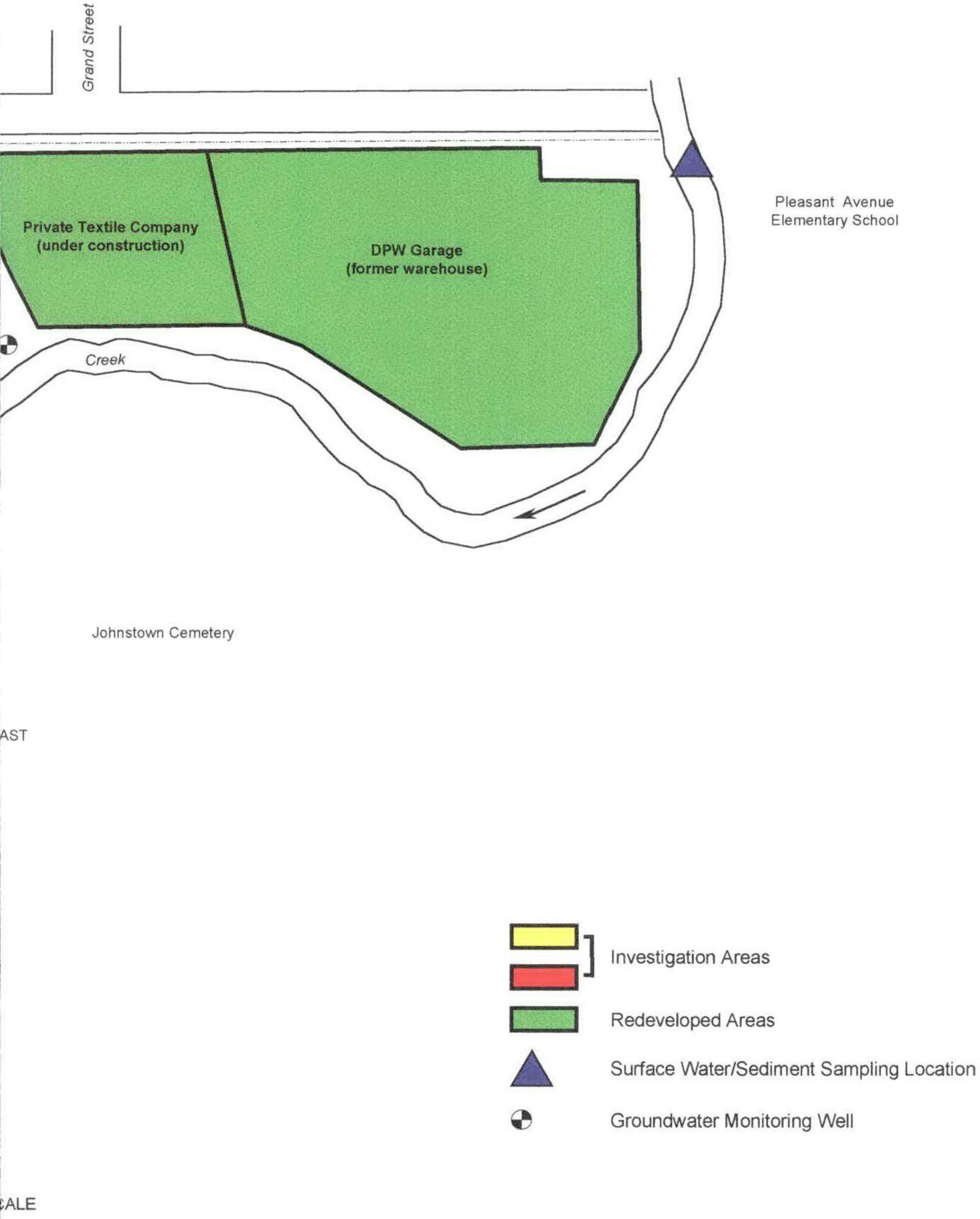

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FIGURE 3-1

3.3.3 Groundwater Monitoring Well Installation

Each of the soil borings will be converted to a groundwater monitoring well to provide information on the hydrogeology and groundwater quality of the site. The monitoring wells will be installed in the Geoprobe boreholes with the well screen intercepting the water table. Each monitoring well will be installed as follows. A 2.0-inch O.D. diameter, threaded, steel rod drive casing will be attached to an expendable drive point and advanced through the borehole left by the Macro Core soil sampling. The drive casing will be advanced to the bottom of the borehole with a hydraulic ram. Once the drive casing is in place, 1.0-inch diameter PVC riser will attached to a PVC well screen and lowered into the drive casing to three to four feet below the water table. The annular space between the drive casing and the PVC screen will be filled with clean silica filter pack sand. The drive casing will then be removed to expose the PVC screen and riser pipe. Clean silica filter pack will continue to be added as the drive casing is recovered. The filter pack material will extend to one to two feet above the PVC screen. The remainder of the borehole will be filled with a bentonite/water mixture. Each monitoring well will be constructed of 1.0-inch I.D. Schedule 40 PVC screen, 10 feet in length with screen openings of 0.010 inches, and 1.0-inch I.D. Schedule 40 PVC flush-threaded riser. The riser will be sealed at the ground surface with bentonite. A flush mount protective casing will be set around each monitoring well, the top of which will be fitted with a locking cap. All monitoring wells will be developed upon completion. Detailed procedures for monitoring well installation are presented in the QAPP.

3.3.4 Groundwater Sampling

Following the installation of the monitoring wells, groundwater from all monitoring wells will be sampled in accordance with the procedures provided in the QAPP. Groundwater samples will be analyzed for TCL VOCs, SVOCs, Pesticides/PCBs, and TAL Metals (including hexavalent chromium). Required QA/QC samples, including field duplicates, equipment blanks, and matrix spike samples will also be collected.

3.3.5 Hydraulic Conductivity Testing

Hydraulic conductivity tests will be performed at all monitoring wells after groundwater sampling has been completed. Water level measurements will be conducted prior to testing to insure that the wells have fully recovered. All equipment introduced into the well will be decontaminated prior to testing.

Rising head tests will be performed in the monitoring wells according to the method of Bouwer and Rice (1976) and Bouwer (1989). This method involves instantaneously decreasing the water level in the well by removing a "slug" of known volume from the well, and measuring the corresponding rate of rise of the water level. The change in water level with time will be monitored and recorded manually or by a pressure transducer linked to a data logger. A detailed description of the procedure to be followed when conducting the tests is included in the QAPP.

3.3.6 Surface Water and Sediment Sampling

Surface water and sediment samples will be collected from the Cayadutta Creek at two locations, located at the upstream and downstream property boundaries, respectively, to evaluate water and sediment quality in the vicinity of the site. The sampling locations are shown in Figure 3-1. Surface water samples will be collected in accordance with the procedures outlined in the QAPP.

Staff gauges will be placed in the Creek at the upstream and downstream sampling locations to the measure surface water elevation. Surface water elevations will be compared to groundwater elevations to evaluate groundwater discharge to the Creek.

4.0 SITE INVESTIGATION/REMEDIAL ALTERNATIVES EVALUATION REPORT

A Site Investigation/Remedial Alternatives Evaluation Report (SI/RAE) will be prepared and submitted to the NYSDEC and USEPA for review and comment. The report will include the following:

- Discussion of field investigation activities.
- Presentation of analytical results for all media sampled.
- Quality assurance/quality control evaluation of the analytical data including the results of the data validation.
- Discussion of the nature and extent of contaminants.
- Comparison of analytical results to background concentrations.
- Conclusions and recommendations drawn from the interpretation of the data.
- Supporting data, including analytical data packages, field log forms, and monitoring well construction diagrams.

The RAE portion of the report will evaluate the applicable remedial alternatives for the media of concern identified during the site investigation. Each of the alternatives will be evaluated for technical applicability and cost effectiveness. The RAE will also include potential re-use alternative for the site so that an appropriate re-use, which is protective of human health and the environment, can be selected. Cleanup objectives for the site will be developed in accordance with the applicable local, State, and Federal regulations, including the NYSDEC Voluntary Cleanup Program.

5.0 REMEDIAL ALTERNATIVES EVALUATION

Following completion of the Site Investigation, alternatives for remediation of the site will be evaluated. The alternatives will be designed to attain the remedial objectives, which are to be established during the SI to address identified risks to human health and the environment based on the potential end-use scenarios for the site.

The tasks to be conducted during the screening process will include the following:

- Identification of potential end-use scenarios and associated risk-based objectives;
- Identification of applicable remedial technologies and process options; and
- Development and evaluation of remedial alternatives.

5.1 END-USE PLANNING

Potential end-use scenarios will be identified so that an appropriate re-use, which is protective of human health and the environment, can be selected. Risk-based remedial action goals will be developed based on the potential end-use scenarios. It is anticipated that the final end-use for the site will be commercial/light-industrial.

5.2 TECHNOLOGY SCREENING

Based on the remedial action objectives and each identified general response action, potential treatment technologies and their associated containment or treatment and disposal requirements will be identified. A prescreening of these potential treatment technologies for suitability as part of a remedial alternative will be conducted.

Technologies which could prove extremely difficult to implement, which might not achieve the remedial objective in a reasonable time, or which might not be applicable or feasible based on the site-specific conditions will be eliminated from further consideration. The remaining technologies will be combined into remedial alternatives that meet the response objectives.

5.3 PRELIMINARY SCREENING OF REMEDIAL ALTERNATIVES

Potential remedial alternatives will be screened on the basis of effectiveness, implementability, and cost. These screening criteria are briefly described below:

- **Effectiveness** - The effectiveness evaluation will consider the capability of each remedial alternative to protect human health and the environment. Each alternative will be evaluated as to the protection it would provide and the reductions in toxicity, mobility, or volume of contaminants it would achieve.

- **Implementability** - The implementability evaluation will be used to measure both the technical and administrative feasibility of constructing, operating and maintaining a remedial action alternative. In addition, the availability of the technologies involved in a remedial alternative will be considered.

- **Cost** – The cost evaluation will include estimates of capital costs, annual operation and maintenance (O&M) cost, and present worth analysis. These conceptual cost estimates will be order-of-magnitude estimates.

5.4 ANALYSIS OF ALTERNATIVES

The remedial alternatives that pass the preliminary screening will be further evaluated. Alternatives with extremely low cost/benefit values will be deleted from further consideration. Alternatives that provide similar levels of protection, yet which have significantly different cost will be compared. The least costly of these will be selected for further study. An alternative will be recommended which is protective of public health and the environment and is cost-effective.

6.0 UTILIZATION PLAN

6.1 MINORITY/WOMEN-OWNED BUSINESS ENTERPRISE (MBE/WBE)

This MBE/WBE Plan documents the good faith efforts to be undertaken to comply with the requirements of USEPA to subcontract with minority- and women-owned business enterprises and to employ minorities and women. The purpose of the MBE/WBE Plan is to demonstrate and document Malcolm Pirnie's intention to make a good faith effort to meet the goals of the USEPA. This goal is as follows:

- The Contractor agrees to make good faith efforts to subcontract percentages of the total contract value to New York State certified MBE and WBE firms.

6.1.1 Malcolm Pirnie Corporate Affirmative Action Statement

Malcolm Pirnie supports the USEPAs commitment to minority- and women-owned business enterprises. The firm will make good faith efforts to meet or exceed the goals for this contract. Malcolm Pirnie is in compliance with Title VII of the Civil Rights Acts of 1964, as amended by the Equal Employment Opportunity Act of 1972.

6.1.2 Good Faith Efforts Undertaken To Ensure MBE/WBE Participation

6.1.2.1 General

As part of the USEPA Brownfields Pilot Demonstration Project at the former Karg Brothers Tannery, the City of Johnstown has retained Malcolm Pirnie to perform the following Tasks:

- Perform a Site Investigation (SI).
- Prepare an SI Report.
- Prepare a Remedial Alternatives Evaluation (RAE) Report.

Subcontractors will be needed to assist or provide services listed below. Subcontractors will be selected in accordance with USEPA procurement guidelines.

- Geoprobe Soil Borings and Monitoring Well Installation;
- Laboratory Analytical Services; and
- Data Usability Summary Report (DUSR)

6.1.2.2 MBE/WBE Work Assignment Participation

In accordance with the Assistance Agreement between the USEPA and the City, the MBE/WBE participation goals for this project are:

- MBE: 8.8%
- WBE: 8.8%

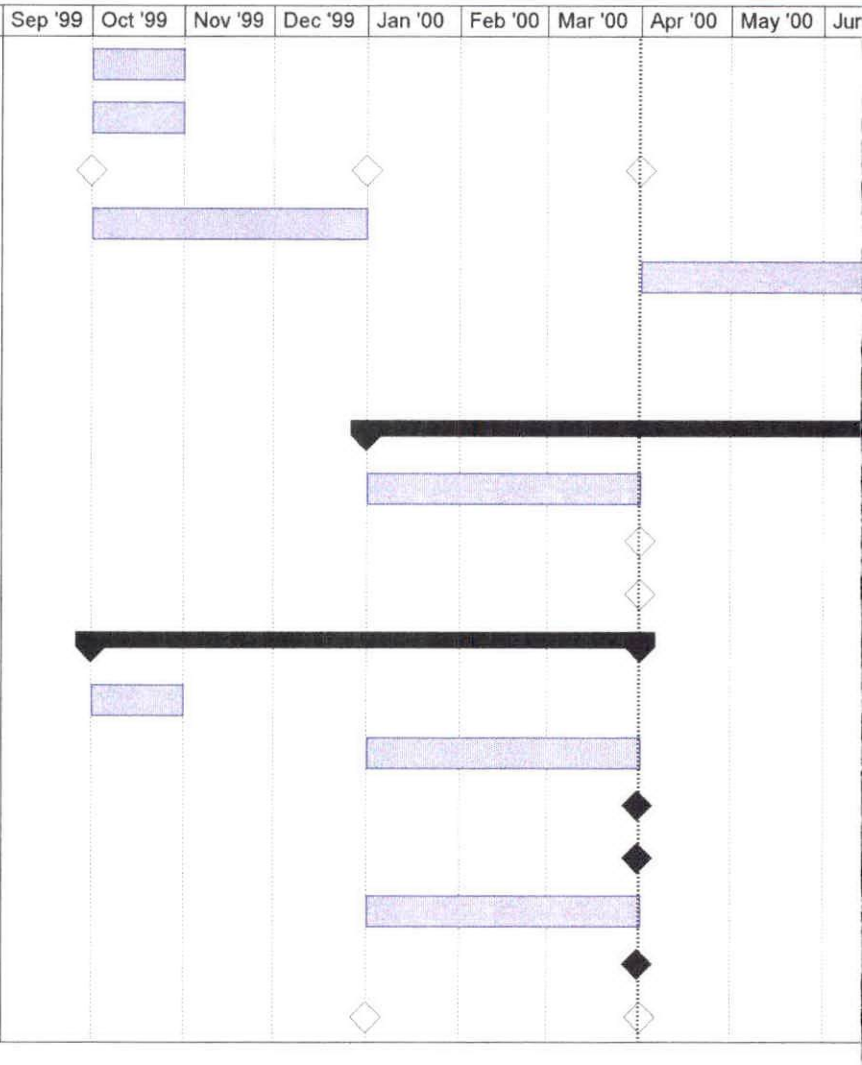
It is expected that MBE/WBE subcontractors will be utilized for laboratory analytical services and in the preparation of the DUSR.

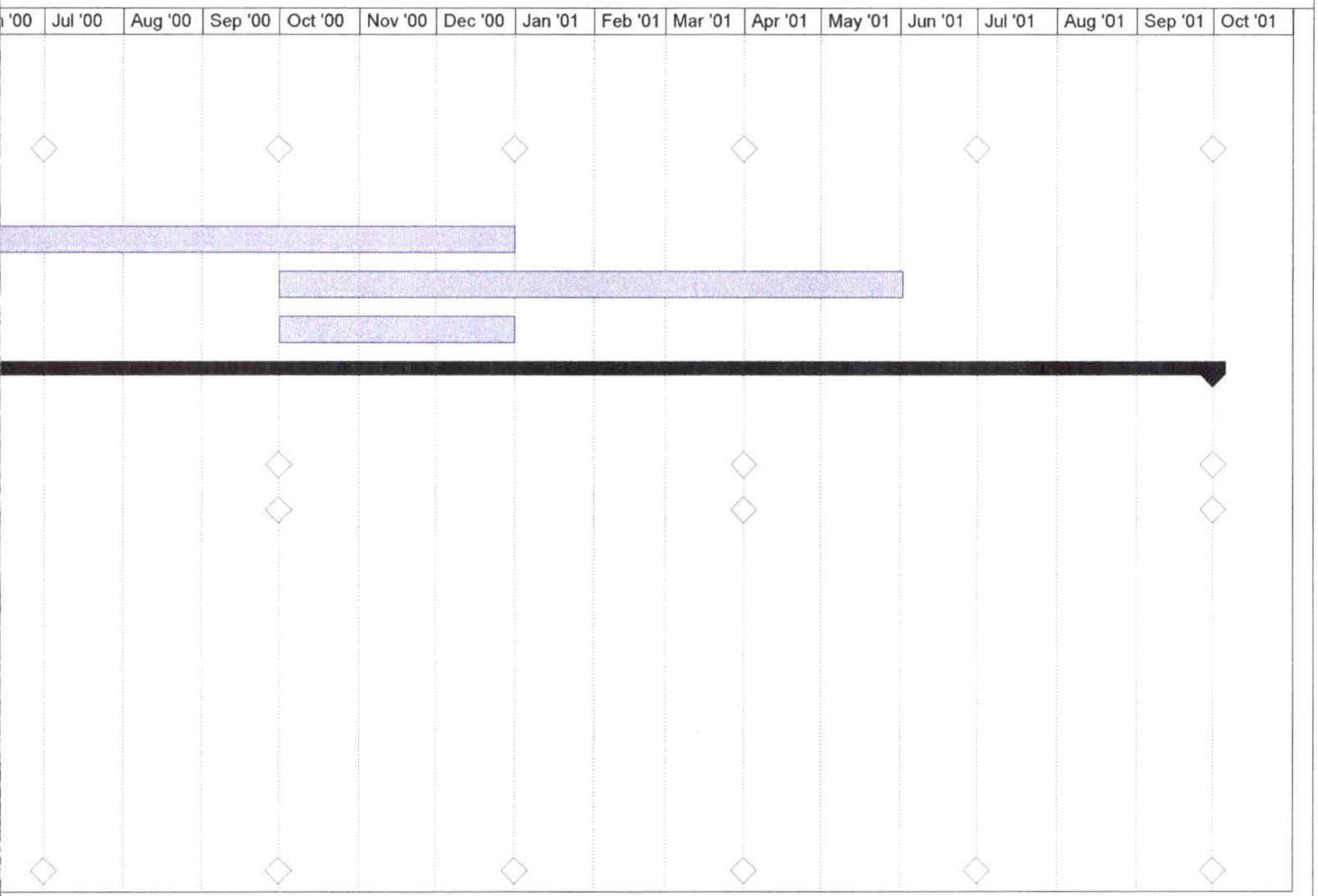
7.0 SCHEDULE

Figure 7-1 presents the schedule for the Project. As shown in Figure 7-1, Malcolm Pirnie will begin field activities by April 2000. Based on the scope of work described in this Work Plan, it is expected that the final SI/RAE report can be submitted to the USEPA and NYSDEC no later than June 2001.

City of Johnstown, New York
U.S. EPA Brownfields Assessment Demonstration Pilot
Former Karg Brothers Tannery
Project Schedule

ID	Task Name
1	**USEPA Site Approval**
2	**Core Task-Force Formed**
3	**Meetings**
13	**Site Inventory/Site Identification**
14	**Site Investigation**
15	**Feasibility Study**
16	**End Use Plans**
17	**Community Involvement**
18	**Community Involvement Plan**
19	**Meetings**
24	**Outreach Activities**
29	**QA/QC**
30	**Generic QA/QC Plan**
31	**Site-Specific Plan**
32	**NYSDEC Submittal**
33	**USEPA Submittal**
34	**Site Sampling Plan (Work Plan)**
35	**NYSDEC Work Plan Submittal**
36	**Quarterly Reports**

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Oct '01

8.0 REFERENCES

Caldwell, D.H. and R.J. Dineen, 1987, Surficial Geological Map of New York, Hudson-Mohawk Sheet, New York State Museum-Geological Survey, Map and Chart Series No. 40, Scale 1:250,000.

Fisher, D.W., Isachsen, Y. W., Rickard, L.V., 1970, Geologic Map of New York- Hudson-Mohawk Sheet, The University of New York, The State Education Department.

QUALITY ASSURANCE PROJECT PLAN

USEPA BROWNFIELDS ASSESSMENT DEMONSTRATION PILOT PROJECT

Former Karg Brothers Tannery
Johnstown, New York

CITY OF JOHNSTOWN, NEW YORK

Prepared by:

Malcolm Pirnie, Inc.
15 Cornell Road
Latham, New York 12110

March 2000
2384010

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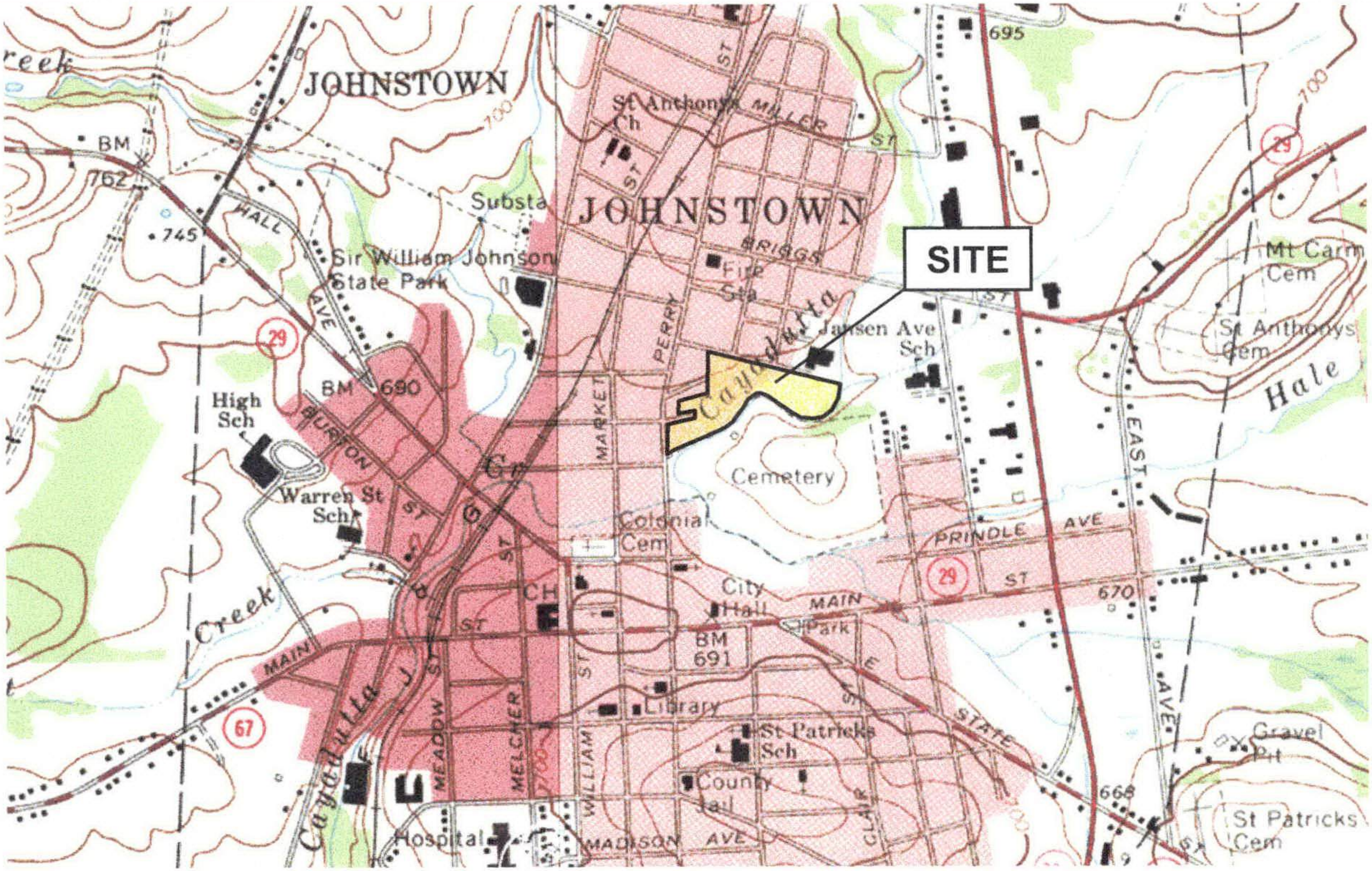
1.0 INTRODUCTION AND PROJECT ORGANIZATION

1.1 BACKGROUND/OBJECTIVES

The City of Johnstown (City), New York has been selected to receive a grant under the United States Environmental Protection Agency's (USEPA) Brownfields Assessment Demonstration Pilot Program for a Site Investigation and Remedial Alternatives Evaluation (Project) at the former Karg Brothers Tannery in Johnstown, New York (site). The location of the site is shown in Figure 1-1. This Quality Assurance Project Plan (QAPP) presents, in specific terms, the policies, organizations, objectives, functional activities, and quality assurance (QA) and quality control (QC) activities designed to achieve the data quality goals of the Project at the former Karg Brothers site.

The QA addressed herein is applicable to both the field sampling activities and the laboratory analyses of field samples. Laboratory analyses and QC procedures will be in accordance with the 1989 New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol/Contract Laboratory Protocol (ASP) and USEPA Contract Laboratory Program (CLP) procedures. The analytical laboratory that will be employed to analyze the field samples collected during the Site Investigation (SI) will be certified by the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) for NYSDEC ASP/CLP analyses.

The methods and procedures presented in this site-specific QAPP are in accordance with those contained in the USEPA Region 2 Generic Brownfields QAPP for Brownfields Assessment Demonstration Pilot Projects (Generic QAPP). A copy of the signed *Title and Approval Page* for the Generic QAPP is presented in Attachment 1.



SOURCE: U.S.G.S 7.5 MIN. PECK LAKE AND GLOVERSVILLE QUADS

MALCOLM PIRNIE

FORMER KARG BROTHERS TANNERY
JOHNSTOWN, NEW YORK

LOCATION MAP

FIGURE 1-1

1.2 PROJECT ORGANIZATION AND RESPONSIBILITY

The City has entered into an Assistance Agreement with the USEPA for the execution of the Project. As such, the City will have the overall responsibility of assuring that the Project is conducted in accordance with the guidelines set forth in the Assistance Agreement. The City has retained Malcolm Pirnie, Inc. (Malcolm Pirnie) to implement the Project on their behalf.

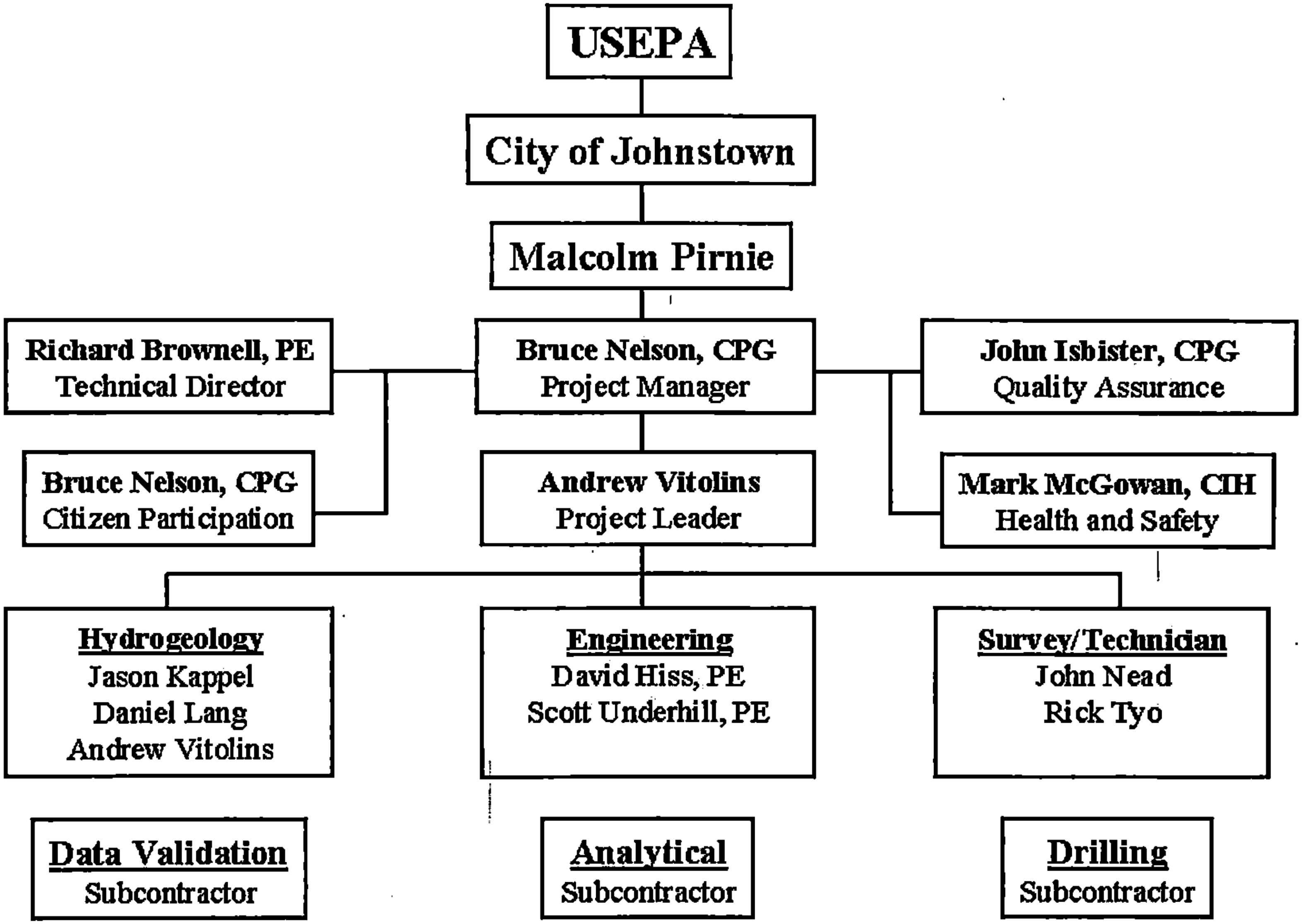
1.2.1 Project Organization

The Project organization is presented on Figure 1-2. The responsibilities for key Malcolm Pirnie staff positions are summarized below:

- ***Bruce Nelson – Project Manager:*** Responsible for planning and implementation of the SI/RAE on behalf of the City.
- ***Andrew Vitolins – Project Leader:*** Directs all field activities. Assists Project Manager with implementation of SI/RAE activities. Ensures that Health and Safety procedures are observed in the field.
- ***Richard Brownell (Technical Director) / John Isbister (Quality Assurance)*:** Responsible for independent technical review of project scope, objectives, quality, and reports.
- ***Bruce Nelson – Citizen Participation Coordinator*:** Responsible for coordinating community involvement in the Demonstration Pilot process.
- ***Mark McGowan – Health and Safety*:** Responsible for identifying and prescribing appropriate protective measures for field investigations.

1.2.2 Subcontractors

Subcontractors will be required for data validation, laboratory analytical services, and drilling. Specific contractors will be selected for these tasks upon approval of the Work Plan documents by the regulatory agencies. Subcontractor selection will be conducted in accordance with the Assistance Agreement.



MALCOLM PIRNIE

USEPA BROWNFIELDS DEMONSTRATION PILOT
FORMER KARG BROTHERS TANNERY
JOHNSTOWN, NEW YORK

PROJECT ORGANIZATION

FIGURE 1-2

2.0 QUALITY ASSURANCE OBJECTIVES

2.1 PURPOSE

The purpose of this QAPP is to ensure that data collected as part of the SI at the former Karg Brothers Tannery site are of sufficient quality to make sound project decisions. In this section, the specific quality assurance objectives are identified and developed by establishing Data Quality Objectives (DQOs). The intended use of the data, the procedures available for laboratory and field analyses, and the available resources are used to establish DQOs . The end result of this process is the development of specific quality requirements for each data collection activity. Once the DQOs have been established, the analytical methods which are capable of supporting the DQOs are selected. Specific quality assurance objectives for the analytical methods are then determined.

This process is presented more completely and specifically in the following sections.

2.2 DATA REQUIREMENTS/LEVELS OF CONCERN

The purpose of the SI is to characterize the nature and extent of contaminants at the site in accordance with the SI Work Plan. SI analytical sampling results will be used to determine if contaminant concentrations in ground water exceed State Standards Criteria and Guidance Values (SCGs). Analytical results for soil samples will be compared to state guidance values presented in TAGM HWR-94-4046. Data gathered during the SI will be used to identify cost-effective, environmentally sound, long-term measures for remediation of the site, if required.

2.3 DATA QUALITY OBJECTIVES AND QUALITY ASSURANCE OBJECTIVES

The DQOs are specific, predetermined goals for data quality that must be achieved for this data to be useful in supporting project decisions. The DQOs have been developed to ensure that the various investigation activities and analyses produce data that is valid and useful for this project. The DQOs need to be supported by a certain level of data quality which varies based on the intended use of the data. The USEPA has defined certain analytical levels and associated confidence levels, which are used as a guide to support the DQOs. The analytical levels required for specific data uses and the types of analyses needed to achieve a particular analytical level are defined as follows:

1. ***Level I*** - Field screening or analysis using portable instruments. Results are often not compound specific and not quantitative but results are available in real-time.

2. ***Level II*** - Field analyses using more sophisticated portable analytical instruments; in some cases the instruments may be set up in a mobile laboratory on-site. There is a wide range in the quality of data that can be generated. It depends on the use of suitable calibration standards, reference materials, and sample preparation equipment; and the training of the operator. Results are available in real-time or within several hours.

3. ***Level III*** - Analyses performed in a mobile or an off-site analytical laboratory. Level III analyses may or may not use CLP procedures, but do not usually utilize the validation or documentation procedures required of CLP Level IV analysis. The off-site laboratory may or may not be a CLP laboratory.

4. ***Level IV*** - CLP routine analytical services. Level IV is characterized by rigorous QA/QC protocols and documentation.

5. ***Level V*** - Non-standard methods. Analyses may require method modification and/or development. Method development or method modification may be required for specific constituents or detection limits.

To measure and control the quality of analysis and to ensure that the DQOs are met, certain QA parameters are defined and utilized in data analysis activities in this project. They are defined as follows:

- ***Precision*** - is a measure of mutual agreement among individuals of the same property, usually under prescribed similar conditions. Precision is expressed in terms of standard deviation and is evaluated based on the calculated relative percent difference (RPD) of standard matrix spikes, sample matrix spikes, and sample duplicates (field duplicates and laboratory duplicates). The evaluation of precision for this project will be based on the RPD between duplicate standard matrix spikes, duplicate sample matrix spikes, and sample duplicates.

- ***Accuracy*** - is the degree of difference between measured or calculated values and true values. The difference is expected to be within the precision interval for the measurement to be deemed accurate. For this project, accuracy will be measured based on the average percent recovery of standard matrix control spikes.

- ***Representativeness*** - expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. To assure that the samples delivered to the laboratory for analysis are representative of the site conditions, quality assurance procedures for sample collection and handling (discussed below) will be followed whenever samples are collected.

- ***Completeness*** - is a measure of the amount of the data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions. The goal and objective is 100 percent completeness. However, due to unforeseen field conditions, laboratory conditions and analytical limitations (such as matrix interference or required dilution) which could result in data qualification, it may not be possible to achieve 100 percent completeness. The minimum level of laboratory completeness is expected to be 95 percent for each analytical parameter. The minimum level of project completeness will be 90 percent. This is expected to be achieved by ensuring proper sample packaging and extraction procedures. The project manager has the responsibility of deciding whether re-sampling and reanalysis are required to meet the data quality objectives. The project manager will then inform the laboratory coordinator and the QA supervisor of the decision.

- ***Comparability*** - is the confidence with which one data set can be compared with another. All data will be calculated and reported in units consistent with standard procedures so that the results of the analyses can be compared with those of other laboratories. The objectives of the analytical laboratory for comparability are to:

  1. Demonstrate traceability of standards to NIST or EPA sources,

  2. Use standard methodology,

3. Report results from similar matrices in standard units,

4. Apply appropriate levels of quality control within the context of the laboratory QA program, (Level III, EPA Data Objectives for Remedial Response Activities, 1987), and

5. Participate in inter-laboratory studies to document laboratory performance.

- *Sensitivity* - The data generated during the SI will be sensitive enough to meet SCG criteria. Table 1 provides the analytical detection limits for the project analytes.

2.4 DATA QUALITY OBJECTIVES DEVELOPMENT

In this section the DQOs for each data collection activity are described along with the necessary QA/QC requirements. Anticipated QA/QC samples for these data collection activities are presented in Tables 2 through 4.

Air

Air monitoring will be performed SI activities to provide information concerning the health and safety of the workers at the site and for the population in nearby residences and businesses. The air monitoring results will be used to select appropriate personal protective equipment and to stop work in the event that perimeter levels exceed those indicated in the Health and Safety Plan. The air monitoring will be conducted using portable field instrumentation to screen the site. To meet the DQOs of screening the site for particulates, Level I analytical support will be required. In Level I analysis, results are available in real-time and the instruments used are sensitive enough to screen for contaminant levels that threaten health and safety.

Waste Materials

Waste materials will be sampled and analyzed to evaluate whether or not these materials are characteristically hazards under regulations set forth in the Resource

TABLE 1

SAMPLE ANALYSES
FORMER KARG BROTHERS TANNERY
CITY OF JOHNSTOWN, NEW YORK

	CRQLs	
Analyte	**Water (µg/l)**	**Soil (µg/kg)**
TAL Metals		
Aluminum	9.1	1820
Antimony	6.4	1300
Arsenic	4.3	900
Barium	0.5	100
Beryllium	0.5	100
Cadmium	1.3	300
Calcium	31.2	6240
Chromium	1.6	320
Cobalt	6.5	1300
Copper	3	600
Iron	14	2800
Lead	2.4	500
Magnesium	46.7	9340
Manganese	0.5	100
Mercury	0.20	100
Nickel	5.8	1200
Potassium	119	23800
Selenium	2.9	600
Silver	1.7	340
Sodium	113	22600
Thallium	5.8	1200
Vanadium	2.5	500
Zinc	3.8	800
Cyanide	10	500
Pesticides and PCBs (8081A/8082)		
Alpha-BHC	0.05	1.7
Beta-BHC	0.05	1.7
Delta-BHC	0.05	1.7
Gamma-BHC (Lindane)	0.05	1.7
Heptachlor	0.05	1.7
Aldrin	0.05	1.7
Heptachlor epoxide	0.05	1.7
Endosulfan I	0.05	1.7

TABLE 1

SAMPLE ANALYSES
FORMER KARG BROTHERS TANNERY
CITY OF JOHNSTOWN, NEW YORK

Analyte	CRQLs Water (µg/l)	CRQLs Soil (µg/kg)
Dieldrin	0.10	3.3
4,4-DDE	0.10	3.3
Endrin	0.10	3.3
Endosulfan II	0.10	3.3
4,4-DDD	0.10	3.3
Endrin Aldehyde	0.10	3.3
Endosulfan sulfate	0.10	3.3
4,4-DDT	0.10	3.3
Methoxychlor	0.50	17
alpha-Chlordane	0.05	1.7
gamma-Chlordane	0.05	1.7
Toxaphene	5	170
AROCLOR-1016	0.1	33
AROCLOR-1221	0.2	67
AROCLOR-1232	0.1	33
AROCLOR-1242	0.1	33
AROCLOR-1248	0.1	33
AROCLOR-1254	0.1	33
AROCLOR-1260	0.1	33
<u>Volatile Organics (8260B)</u>		
Acetone	10	10
Benzene	0.7	5
Bromodichloromethane	5	5
Bromoform	5	5
Bromomethane	5	5
2-Butanone	10	10
Carbon disulfide	5	5
Carbon tetrachloride	5	5
Chlorobenzene	5	5
Chloroethane	5	5
Chloroform	5	5
Chloromethane	10	10
Dibromochloromethane	5	5
1,1-Dichloroethane	5	5
1,2-Dichloroethane	5	5
1,1-Dichloroethene	5	5
1,2-Dichloroethene	5	5

TABLE 1

SAMPLE ANALYSES
FORMER KARG BROTHERS TANNERY
CITY OF JOHNSTOWN, NEW YORK

	CRQLs	
Analyte	**Water (µg/l)**	**Soil (µg/kg)**
1,2-Dichloropropane	5	5
cis-1,3-Dichloropropene	5	5
trans-1,3-Dichloropropene	5	5
Ethylbenzene	5	5
2-Hexanone	10	10
Methylene chloride	5	5
4-Methyl-2-pentanone	10	10
Styrene	10	10
1,1,2,2-Tetrachloroethane	5	5
Tetrachloroethene	5	5
Toluene	5	5
1,1,1-Trichloroethane	5	5
1,1,2-Trichloroethane	5	5
Trichloroethene	5	5
Vinyl acetate	10	10
Vinyl chloride	2	5
Xylene, total	5	5

TABLE 1

SAMPLE ANALYSIS METHODS
FORMER ASHLAND CHEMICAL COMPANY
CITY OF JOHNSTOWN, NEW YORK

Analyte	CRQLs	
	Water (µg/l)	Soil (µg/kg)
Semi-Volatile (8270C)		
Acenaphthene	10	330
Acenaphylene	10	330
Anthracene	10	330
Benzo(a)anthracene	2	100
Benzo(b)fluoranthene	2	330
Benzo(k)fluoranthene	2	330
Benzo(a)pyrene	2	330
Benzo(ghi)perylene	10	330
Butylbenzylphthalate	10	330
bis(2-Chloroethyl)ether	5	330
bis(2-Chloroethoxy)methane	5	330
bis(2-Ethylhexyl)phthalate	10	330
4-Bromophenylphenylether	10	330
2-Chloronapthalene	5	330
4-Chlorophenylphenylether	2	330
Chrysene	2	330
Dibenzo(a,h)anthracene	10	330
di-n-Butylphthalate	10	330
1,3-Dichlorobenzene	5	330
1,2-Dichlorobenzene	5	330
1,4-Dichlorobenzene	5	330
Diethylphthalate	10	330
Dimethylphthalate	10	330
2,4-Dinitrotoluene	5	330
2,6-Dinitrotoluene	5	140
di-n-Octylphthalate	10	330
Semi-Volatiles (8270) (Cont'd)		
Fluoranthene	10	330
Fluorene	10	330
Hexachlorobenzene	2	330
Hexachlorobutadiene	5	330
Hexachlorocyclopentadiene	5	1000

TABLE 1

SAMPLE ANALYSIS METHODS
FORMER ASHLAND CHEMICAL COMPANY
CITY OF JOHNSTOWN, NEW YORK

Analyte	CRQLs Water (µg/l)	CRQLs Soil (µg/kg)
Hexachloroethane	10	330
Indeno(1,2,3-cd)pyrene	2	330
Isophorone	10	330
Naphthalene	10	330
Nitrobenzene	5	330
4-Nitrophenol	10	800
n-Nitrosodi-n-propylamine	5	330
n-Nitrosodiphenylamine	10	330
Pentachlorophenol	20	800
Phenanthrene	10	330
Phenol	2	100
Pyrene	10	330
1,2,4-Trichlorobenzene	5	330
2-Methylnapthalene	10	330
2,4,5-Trichlorophenol	10	1600
2-Nitroaniline	25	800
3-Nitroaniline	25	800
Dibenzofuran	10	330
4-Nitroaniline	25	800

<u>TCLP Metals</u>

- Arsenic
- Barium
- Cadmium
- Chromium
- Lead
- Mercury
- Selenium
- Silver

<u>TCLP Volatiles</u>

- Benzene
- 2-Butanone
- Carbon tetrachloride

TABLE 1

SAMPLE ANALYSIS METHODS
FORMER ASHLAND CHEMICAL COMPANY
CITY OF JOHNSTOWN, NEW YORK

- Chlorobenzene
- Chloroform
- 1,2-Dichloroethane
- 1,1-Dichloroethene
- Tetrachloroethene
- Trichloroethene
- Vinyl chloride

TCLP Semi-Volatiles

- 2-Methylphenol
- 3-Methylphenol
- 4-Methylphenol
- 1,4-Dichlorobenzene
- 2,4-Dinitrotoluene
- Hexachlorobenzene
- Hexachlorobutadiene
- Hexachloroethane
- Nitrobenzene
- Pentachlorophenol
- Pyridine
- 2,4,5-Trichlorophenol
- 2,4,6-Trichlorophenol

TCLP Pesticides

- Chlordane
- Endrin
- Heptachlor
- Lindane
- Methoxychlor
- Toxaphene

Other

- Hexavalent Chromium
- Total Organic Carbon

TABLE 2

WASTE MATERIAL SAMPLES
FORMER KARG BROTHERS TANNERY
CITY OF JOHNSTOWN, NEW YORK

LOCATION	ESTIMATED NUMBER OF SAMPLING LOCATIONS	TCLP Metals	Full TCLP	TCL/ TAL	RCRA Char.
INVESTIGATIVE SAMPLES					
Wooden Drums (wood)	25	25	5		
Wooden Drums (contents, solid)	5	5		1	5
55-gallon drums (contents, liquid)	10			10	10
55-gallon drums (contents, solid)	5		5		5
ASTs (contents, liquid)	10			10	10
ASTs (contents, solid))	10		10		10
Settling Basins (contents, liquid)	2			2	
Settling Basins (contents, solid)	5		5		
QA/QC SAMPLES					
Field Duplicates				2	
Matrix Duplicates				2	
Matrix Spike Duplicates				2	
Field Blanks				4	
TOTALS	72	30	25	33	40

TABLE 3

SOIL AND SEDIMENT SAMPLES
FORMER KARG BROTHERS TANNERY
CITY OF JOHNSTOWN, NEW YORK

LOCATION	TOTAL NUMBER OF SAMPLING LOCATIONS	TCL	TAL	TOC
INVESTIGATIVE SAMPLES				
Soil Borings	7	7	7	3
Sediment	2	2	2	1
QA/QC SAMPLES				
Field Duplicates		1	1	--
Matrix Duplicates		1	1	--
Matrix Spike Duplicates		1	1	--
Field Blanks		2	2	--
TOTALS	9	14	14	4

TABLE 4

GROUNDWATER AND SURFACE WATER SAMPLES
FORMER KARG BROTHERS TANNERY
CITY OF JOHNSTOWN, NEW YORK

LOCATION	TOTAL NUMBER OF SAMPLING LOCATIONS	TCL	TAL
INVESTIGATIVE SAMPLES			
Groundwater	7	7	7
Surface Water	2	2	2
QA/QC SAMPLES			
Field Duplicates		1	1
Matrix Duplicates		1	1
Matrix Spike Duplicates		1	1
Field Blanks		1	1
Trip Blanks		1*	0
TOTALS	9	12*	11

* Trip blanks analyzed for TCL volatile organics only

Conservation and Recovery Act (RCRA). Waste material sample analyses are summarized in Table 2.

Groundwater

Groundwater will be sampled and analyzed to characterize the nature and extent of groundwater contamination at the site. The data will be used to identify the location of any groundwater contamination, to aid in determining contaminant source locations and to determine if any SDGs have been exceeded. In order to meet these objectives, the data from the groundwater samples must be of known quality. Therefore data quality objective Level IV has been chosen. This level is characterized by rigorous QA/QC protocols and documentation, which historically have provided high quality data able to meet the DQOs for this data. Samples from the upgradient monitoring wells, and the wells at the downgradient property boundary will be critical samples. Groundwater sample analyses are summarized in Table 3.

Soil

The objective of the soil sampling program is to define the nature and extent of contamination in soils. To be useful in meeting these objectives, the data from the soil samples must be of known quality. To support the DQOs, analytical Level IV will be used. This level is capable of producing high quality data characterized by rigorous QA/QC protocols and documentation. Soil sample analyses are summarized in Table 4.

There are no known critical samples currently identified.

Surface Water and Sediment

Surface water and sediment samples will be collected and analyzed to characterize the nature and extent of surface water and sediment contamination at the site. The nature and extent of surface water and sediment contamination will be determined by comparing upstream and downstream analytical results. Surface water sample analyses are summarized in Table 3. Sediment sample analyses are summarized in Table 4.

3.0 FIELD INVESTIGATION PROCEDURES

3.1 SAMPLING PROCEDURES AND EQUIPMENT

The field investigation procedures that will be followed during this SI are summarized below.

3.1.1 Decontamination of Sampling Equipment

Cross contamination of samples from any source is to be avoided. All sampling equipment must be clean and free from the residue of any previous samples. All non-dedicated sampling equipment must be cleaned initially and prior to being reused. The following is the procedure for decontamination and does not apply to heavy equipment or drilling equipment, with the exception of split-spoon samplers. All heavy equipment and drilling equipment will be steam cleaned in a predesignated location prior to use and between locations. Well point casings and screens will also be steam cleaned.

To accomplish this, the following procedures will be followed:

- Wash and scrub with low phosphate detergent,
- Rinse with tap water,
- Rinse with 10 percent HNO_3, ultra-pure (1 percent HNO_3 for carbon steel)
- Rinse with tap water,
- Rinse with isopropanol (pesticide grade or better),
- Rinse thoroughly with deionized water,
- Air dry, and
- Wrap in aluminum foil for transport.

Well point evacuation tubing and equipment such as submersible pumps, will be decontaminated by thoroughly washing all internal and external surfaces with soapy water and rinsing with deionized water prior to use. All tubing must be dedicated to individual well points, i.e., (tubing cannot be reused).

Field instrumentation should be cleaned per manufacturer's instructions. Probes, such as those used in pH and conductivity meters, and thermometers must be rinsed prior to and after each use with deionized water.

3.1.2 Soil Borings and Subsurface Soil Sampling

3.1.2.1 Soil Sampling Objectives

Subsurface soil samples will be collected to evaluate the vertical and horizontal extent of contamination in the subsurface soils at the site and to document the underlying stratigraphy. Specific sampling objectives are outlined in the Work Plan.

3.1.2.2 Soil Sampling Equipment

The following equipment will be used to collect split-spoon soil samples:

- Photoionization Detector (PID)
- Roll of polyethylene sheeting
- Stainless steel spatula or spoon
- Stainless steel bowl
- Latex gloves (disposable)
- Neoprene gloves
- Certified, precleaned sample containers
- Aluminum foil
- Field logbook and pen
- Decontamination equipment.

3.1.2.3 Soil Sampling Procedures

A concrete coring device or apparatus sufficient to penetrate four to six inches of asphalt or concrete may be required to advance the soil borings in certain areas of the site. Following the opening of the soil boring hole, a Macro-Core soil sampler, blind probe, or similar direct push system will be driven into the subsurface to create a borehole approximately 1-1/2-inch to two inches in diameter. Subsurface soil samples will be removed from the borehole in four-foot intervals in plastic tubes. A qualified inspector will characterize the soil samples and record his/her observations on a field boring log.

After soil characterization and logging, the plastic tube will be cut along its length and the soil core will be screened for volatile organic compounds (VOCs) using a PID. Based on PID readings and field observations, the volume of soil required for VOC analysis will be transferred to the appropriate sample container. After collecting the sample for VOC analysis, the plastic tube will be cut in half and the soil from the separate two-foot plastic tube halves will be emptied into a stainless steel bowl and homogenized for additional analyses.

3.1.3 Well Point Installation

3.1.3.1 Installation Objectives

Well points will be installed at the site to collect groundwater samples for chemical quality analysis. In addition, in-situ hydraulic conductivity tests will be conducted in the well points to characterize aquifer properties. Groundwater elevations will be measured to evaluate the horizontal components of groundwater flow.

3.1.3.2 Installation Equipment

A Geoprobe environmental sampler will be utilized to advance the soil borings and Macro-Core soil sampler equipment. The PVC well point and riser pipe will be advanced through the borehole to the water table by hand and with the use of the geoprobe sampler. Probes and any other large pieces of equipment which come into contact with the soil must be steam cleaned before use and between boreholes. If visibly contaminated with free phase products or any other contaminants, probes and other equipment must be decontaminated by the following procedure:

- Wash and scrub with low-phosphate detergent.
- Tap water rinse.
- Rinse with isopropanol.
- Thoroughly rinse with deionized, demonstrated analyte free water.
- Air dry.

Decontamination solutions shall be provided by the selected subcontractor and will be included in the mobilization/demobilization cost. Decontamination fluids shall be handled in accordance with Section 3.2, Investigation Derived Waste.

3.1.3.3 Well Point Installation Procedures

After completion of soil sampling, and upon reaching the bottom of the soil boring, a two-inch outside diameter (O.D.) temporary casing with an expendable tip will be driven to the base of the borehole with a hydraulic ram. A minimum of two inches of clean filter pack sand will be emplaced into the casing. The well point assembly, consisting of one-inch I.D. PVC casing with five feet of continuous 0.01-inch slot PVC screen, will be inserted through the two-inch PVC. Well point screens will be placed at the intervals as described in the Work Plan.

Clean filter pack sand will then be poured into the annular space between the temporary casing and the well point assembly as the temporary casing is slowly removed. The filter pack sand will extend approximately two feet above the top of the screened interval. A minimum one-foot thick layer of bentonite pellets will be placed above the filter pack by slowly dropping the pellets along the side of the well point casing. If the bentonite pellets are emplaced above the water table, they will be hydrated with potable water. After allowing sufficient time for the bentonite to hydrate, the temporary casing will continue to be removed and the remainder of the annulus will be grouted to the surface with a cement-bentonite grout. The cement-bentonite grout will consist of a mixture of portland cement and water in the proportion of 5 to 6 gallons of water per 94-pound bag of cement, with approximately three to five percent bentonite powder.

The PVC riser will be sealed at the ground surface with bentonite pellets. The riser will extend above ground surface approximately two to three feet and will be capped with a PVC cap.

3.1.4 Water Level Measurements

3.1.4.1 Measurement Objectives

Water levels in well points will be measured and used in conjunction with horizontal and vertical ground survey data to determine horizontal and vertical components of groundwater flow. Water level measurements will also be used to determine the volume of standing water in well points for development and purging activities.

3.1.4.2 Measurement Equipment

The following equipment will be used for the measurement of water levels:

- Electronic water level indicator
- Field logbook and pen
- Photoionization Detector (PID)
- Deionized Water
- Low Phosphate Detergent

3.1.4.3 Measurement Procedure

At each well point, the PVC cap will be removed and the head space and breathing zone's air quality will be monitored with a PID. This step may be omitted in subsequent rounds of water level measurements in those well points which yielded no detectable amounts of vapors or gases from prior sampling rounds.

The battery of the electric water level indicator will be checked by pushing the battery check button, and waiting for the audible signal to sound or the instrument light to come on. The water level indicator will be decontaminated before collecting a measurement in each well point by using an alconox wash and deionized water rinse. The instrument will then be turned on and the probe will be slowly lowered into the well point, until the audible signal is heard or the instrument light goes on, indicating that the sensor in the probe has made contact with the water surface in the well point.

The depth to water will be recorded to the nearest one-hundredth of a foot, from the top of the measuring mark on the well point riser. The date, time, well point number, and depth to water will be recorded in the field book.

3.1.5 Well Point Development

3.1.5.1 Development Objectives

Well points installed at the site will be developed to improve their hydraulic properties by removing sediment from the well point and clearing the well point screen of fine particles.

3.1.5.2 Development Equipment

The following equipment will be needed to develop the well points:

- Electric water level indicator
- Polyethylene or nalgene tubing and foot-valve
- Bottom-filling PVC bailer
- Bailer cord
- Temperature, pH, dissolved oxygen, specific conductivity and turbidity meters
- Photoionization Detector (PID)
- Field logbook and field logs
- Roll of polyethylene sheeting
- Decontamination equipment

3.1.5.3 Development Procedures

Well point development will be conducted using one or more of the following techniques:

- Bailing
- Inertial Pumping
- Surge Block

Well point development will be conducted at least 24 hours after installation. Prior to developing each well point, the initial water level and total depth will be measured. Following well development, the total depth will again be measured to determine the quantity of sediment removed.

All equipment placed into the well point will be either decontaminated prior to its introduction into the well point, in accordance with Section 3.1.1, or it will be dedicated. Well point development will proceed with repeated alternating sequences of surging and removal of water from the well point, until the discharge water is relatively sediment free.

The effectiveness of the development procedure will be monitored after each well volume has been removed by field parameter measurements such as turbidity, pH, temperature, and conductivity measurements. These field measurements and other observations will be recorded on a Well Development/Purging Log, presented in Appendix A.

In general, well point development will be discontinued after a minimum of 10 well volumes have been removed and stabilization of field parameter measurements has occurred, or when the turbidity of the discharge water reaches 50 Nephelometric Turbidity Units (NTUs) or less.

Water generated during the development process will be disposed in accordance with Section 3.5.

3.1.6 Groundwater Sampling

3.1.6.1 Sampling Objectives

Groundwater samples will be collected for chemical quality analysis. Specific sampling objectives are outlined in the Work Plan. Samples will be collected at least 24 hours after the well points have been developed.

3.1.6.2 Sampling Equipment

The following equipment will be needed to collect groundwater samples for analysis:

- Electric water level indicator
- Peristaltic pump
- Polyethylene or nalgene tubing and foot-valve
- Bottom-filling PVC bailer
- Dedicated, disposable bailer cord
- Temperature, pH, dissolved oxygen, specific conductivity and turbidity meters
- Photoionization Detector (PID)
- Field logbook and field logs
- Preservatives
- Laboratory prepared sample containers
- Roll of polyethylene sheeting
- Decontamination equipment

3.1.6.3 Sampling Procedures

Groundwater sampling will be conducted in accordance with the USEPA Low-Flow Sampling Protocol (USEPA 1998). A piece of polyethylene sheeting will be fitted over the monitoring well and laid on the ground. The sampling equipment will be placed on the polyethylene sheeting. The well cap will be removed and the headspace at the top of the monitoring well will be measured with a PID. This step may be omitted in those monitoring wells which have already demonstrated in the previous rounds of water level measurement that they contain no or insignificant amounts of vapors or gases. The PID will be calibrated before the start of each sampling event. The water volume in the monitoring well will be calculated using the following equation:

$$V = 7.48 \pi r^2 h$$

(NOTE: $1 \text{ ft}^3 = 7.48$ gal)

where:

v = volume of water in monitoring well casing (gal.)
h = height of water column (feet)
r = casing internal radius (feet)

Clean, new polyethylene tubing will be attached to the centrifugal or positive placement pump, which will be decontaminated between monitoring well locations, as described in Section 2.1.1. The pump will be lowered into the water column to a maximum depth of two feet above the bottom of the well. A foot-valve will be used in conjunction with the tubing to eliminate back flow from the pump. The well will be purged at a steady rate of 200 to 500 milliliters per minute (ml/min). Measurements of field parameters consisting of pH, specific conductance, temperature, dissolved oxygen, reduction potential, turbidity, and water level will be conducted in each monitoring well prior to, during, and after purging (just before sampling) through the use of a flow-through cell. Both the pH and the specific conductivity meters will be calibrated for water temperature before each sampling event.

The volume of water removed from each monitoring well will be dependent upon the amount of time required for stabilization of the field parameters. In general, the well will be considered stabilized for sample collection when field parameters have stabilized for three consecutive readings as follows:

■ pH:	+/- 0.1 standard units
■ Specific Conductance:	+/- 3%
■ Reduction Potential:	+/- 10 millivolts
■ Dissolved Oxygen	+/- 10%
■ Turbidity	+/- 10%

When the field parameters have stabilized, the volume of water will be recorded, and groundwater in the monitoring well will be sampled through the pump at a flow rate between 100 and 250 ml/min. The purge water will be discharged in accordance with Section 2.5.

The analytical parameters and order of sample collection for groundwater samples will be:

1. In-situ measurements: temperature, pH, specific conductance and dissolved oxygen;

2. Volatile organic compounds (VOCs);

3. Semi-volatile organic compounds (SVOCs);

4. Pesticides/PCBs;

5. Total metals, etc.

The sample bottles will be pre-preserved by the laboratory. The preservation requirements are presented on Table 3. The sample bottles will be immediately placed in a cooler held at 4°C.

Disposable gloves will be worn by the sampling personnel and changed between sampling points.

Data to be recorded in the field logbook will include the information presented in Section 2.4 and purging and sampling methods, depth to water, volume of water removed during purging, pH, temperature and specific conductivity values, and PID readings.

Groundwater samples for metals analysis will be filtered in the field using a borosilicate filter apparatus with 0.45 micron filters if the turbidity at the time of sample collection is greater than 50 NTUs.

3.1.7 Hydraulic Conductivity Testing

3.1.7.1 Testing Objectives

Rising head hydraulic conductivity tests will be conducted in newly installed well points to estimate soil properties for their screened intervals.

3.1.7.2 Testing Equipment

The following equipment will be needed to perform hydraulic conductivity testing:

- Data logger and transducer
- Electronic water level indicator
- Field logbook and pen
- PVC or stainless steel slug

3.1.7.3 Testing Procedures

Equipment being introduced into the well point to conduct hydraulic conductivity tests will be decontaminated using the procedures outlined in the Section 3.1.1. Water level readings will also be taken prior to conducting the test and recorded in the field log book and Water Elevation Field Logs presented in Appendix A.

Hydraulic conductivity testing will only be conducted on well points which have achieved static equilibrium after development or purging.

Water level fluctuations will be monitored using either a water level probe to record the water level change, or a pressure transducer linked to a data logger. The method of measurement is similar for both cases in that they both measure the change in water levels from a static condition after an initial perturbation. The static water level will be taken and recorded on the field log before conducting the test.

When using a data logger and transducer, the transducer will be placed below the static water level before the slug is introduced. The slug will be constructed of stainless steel or PVC and will measure approximately 0.15 feet in diameter and three to five feet in length. The data logger will have the necessary initial input parameter data entered (i.e., well point identification, static water level, etc). As the slug enters the water, the water level will rise. Once the groundwater in the well point has returned to static conditions the slug will be removed from the water, lowering the water level (rising head test). If the data logger is used, the pressure above the transducer will change and the pressure change will be recorded. This change in pressure will be calculated internally to true water levels based on the original static water level entered. If a transducer and data logger are used, the frequency of readings will follow a logarithmic scale as shown below:

ELAPSED TIME	INTERVAL
0-5 seconds	0.5 seconds
5-20 seconds	1.0 seconds
20-120 seconds	5.0 seconds
2-10 minutes	30 seconds
10-100 minutes	2 minutes
100-1,000 minutes	10 minutes

The test will continue until either the water level recovers fully to static conditions, or until approximately 70 percent of the original static level is reached or for a total of two hours, whichever comes first.

If a water level probe is used in place of the pressure transducer and data logger, manual readings of water level change will be recorded. The readings will be collected on a separate logarithmic time scale and recorded on field logs.

The data collected will be reduced and analyzed using analytical methods such as Bouwer and Rice, 1976 and Bouwer, 1989.

3.1.8 Surface Water Sampling

3.1.8.1 Sampling Objectives

Surface water samples will be collected from the Cayadutta creek. Surface water samples will be analyzed for the same analytical parameters as those listed for groundwater samples.

All sampling locations will be marked in the field with a survey stake and labeled with the sample I.D.

3.1.8.2 Sampling Equipment

- pH, temperature, and specific conductivity meters
- Field log book and pen
- Roll of polyethylene sheeting
- Glass beaker
- Stainless steel dipper
- Certified, precleaned sample containers
- Preservatives
- Latex gloves (disposable)
- Neoprene gloves
- Decontamination equipment

3.1.8.3 Sampling Procedures

Surface water samples shall be collected in a downstream-to-upstream order. If the water is sufficiently deep, sample containers shall be submerged with their openings facing upstream, making sure to avoid any floating or submerged debris. Sampling personnel shall be downstream of the sample container. A stainless steel dipper or glass beaker will be used to transfer water to the sample containers.

Collection procedures for surface water samples are:

1. Submerge a precleaned stainless steel dipper or glass beaker with minimal surface disturbance.

2. Allow the device to fill slowly and continuously.

3. Retrieve the dipper/beaker from the surface water with minimal disturbance.

4. Remove the cap from the sample bottle and slightly tilt the mouth of the bottle below the dipper/beaker edge.

5. Empty the dipper/beaker slowly, allowing the sample stream to flow gently down the side of the bottle with minimal entry turbulence.

The flow velocity at each sampling location will be estimated upon the completion of sampling. Samples will be preserved as outlined in Table 5.

The analytical parameters and order of sample collection for surface water samples will be:

1. In-situ measurements: temperature, pH, specific conductance and dissolved oxygen;
2. Volatile organic compounds (VOCs);
3. Semi volatile organic compounds (SVOCs);
4. Total metals,

Samples will be immediately placed in a cooler and held at 4°C.

If the exterior of sample bottles become grossly contaminated during sample collection due to highly turbid surface waters, the exterior of the bottles will be washed with soapy water and rinsed with deionized water after the bottles have been capped and before placing the samples in the cooler for shipment.

Sampling equipment will be decontaminated as discussed in Section 3.1.1. Disposable gloves will be worn by the sampling personnel and changed between sampling points. While performing any equipment decontamination, phthalate-free gloves (nitrite or natural rubber) will be worn in order to prevent phthalate contamination of the sampling equipment by interaction between the gloves and the organic solvent(s).

Data to be recorded in the field log book includes the information presented in Section 3.4, and odor, pH, temperature, specific conductivity, and approximate water depth.

3.1.9 Sediment Sampling Objectives

Sediment samples will be collected from the Cayadutta Creek to assess any potential environmental impacts from the site to the Creek. Specific sampling objectives are outlined in the Work Plan.

TABLE 5
FORMER KARG BROTHERS TANNERY
SAMPLE CONTAINER, PRESERVATION, AND HOLDING TIME REQUIREMENTS

MATRIX	ANALYSIS	CONTAINER	PRESERVATION	HOLDING TIME
Soil	TCL Volatiles	1 - 4 oz. glass	Cool to 4 deg. C	7 days
	TCL Semi-Volatiles TCL Pesticides/PCBs	1 - 8 oz. glass	Cool to 4 deg. C	5 days
	TAL Metals Cyanide	1 - 8 oz. glass	Cool to 4 deg. C	180 days 12 days
	Hexavalent Chromium	500 ml polyethylene	Cool to 4 deg. C	24 hours
Groundwater	TCL Volatiles	2 - 40 ml glass w/ septum	HCl, Cool to 4 deg. C	7 days
	TCL Semi-Volatiles	2 - 2 liter amber glass	Cool to 4 deg. C	7 days
	TCL Pesticides/PCBs	2 - 2 liter amber glass	Cool to 4 deg. C	7 days
	TAL Metals	1 liter polyethylene	HNO_3, Cool to 4 deg. C	180 days
	Cyanide	1 liter polyethylene	NaOH, Cool to 4 deg. C	180 days
	Hexavalent Chromium	500 ml polyethylene	Cool to 4 deg. C	24 hours
Waste Materials (Solid)	TCLP Volatiles	1 - 4 oz. glass w/septum cap	Cool to 4 deg. C	7 days
	TCLP Semi-Volatiles	1 - 8 oz. glass	Cool to 4 deg. C	5 days
	TCLP Pesticides	1 - 8 oz. glass	Cool to 4 deg. C	5 days
	TCLP Metals	1 - 8 oz. glass	Cool to 4 deg. C	180 days
	Reactivity	1 - 8 oz. glass	Cool to 4 deg. C	None documented.
	Corrosivity	1 - 8 oz. glass	Cool to 4 deg. C	24 hours
	Ignitability	1 - 8 oz. glass	Cool to 4 deg. C	None documented.
Waste Materials (Liquid)	Reactivity	500 ml polyethylene	Cool to 4 deg. C	None documented.
	Corrosivity	500 ml polyethylene	Cool to 4 deg. C	24 hours
	Flashpoint	500 ml polyethylene	Cool to 4 deg. C	None documented.

3.1.9.1 Sediment Sampling Equipment

The following equipment will be used to collect sediment samples:

- Stainless steel spatula or spoon
- Stainless steel bowl
- Eckman® or Ponar®dredge
- Latex gloves (disposable)
- Neoprene gloves
- Certified, precleaned sample containers
- Aluminum foil
- Field logbook and pen
- Personal Flotation Device
- Decontamination equipment

3.1.9.2 Sediment Sampling Procedures

Sediment samples will be collected from the Cayadutta Creek. Sediment sampling locations are outlined in the Work Plan. At locations where the stream bed is accessible, sediment samples will be collected using a decontaminated stainless-steel spoon. Upon collection, the grab sample will be homogenized in a stainless steel bowl and classified according to the USCS. Where the stream is not directly accessible (i.e., where the banks are too steep for safe access), a decontaminated Eckman® or Ponar® dredge will be used to collect the sample. Upon collection, the sediment sample will be visually classified according to the USCS and transferred to the appropriate laboratory-supplied bottle.

3.1.10 Wooden Drum Sampling

3.1.10.1 Sampling Objectives

Wooden drums will be sampled to evaluate whether or not these materials are characteristically hazards under the regulations set fourth in the Resource Conservation and Recovery Act (RCRA).

3.1.10.2 Sampling Equipment

The following minimum equipment will be required to conduct porous media sampling:

- Decontaminated steel chisel (rock or wood), as appropriate
- Coring drill
- Hammer or mallet
- Decontaminated stainless steel scoop or spoon
- Polyethylene sheeting
- Personnel Protective Equipment -
  - Face shield or safety glasses
  - Disposable latex gloves
- Certified, precleaned sample containers
- Decontamination equipment
- Camera
- Field logbook, pen and site map

3.1.10.3 Sampling Procedures

Based upon a determined sample location criteria as defined by the Work Plan or at the Field Team Leader's discretion, select and document the location and material to be sampled. A photograph shall be taken as well as measurements from known features. A logbook entry shall be made noting location, a description of the type of media being sampled, means being used to collect samples, data, time and sampling personnel. The rationale for collecting sample shall also be clearly noted.

Once the sampling location has been documented, the following steps shall be performed to collect sample:

1. Sampling personnel shall cut and place new polyethylene sheeting on the ground below the chosen location. Care shall be taken not to step on the plastic or contaminate it with foreign matter.

2. Sampling personnel shall label the sample jar(s) and don a fresh pair of disposable gloves.

3. Wearing eye protection, and using a decontaminated rock or wood chisel, or coring drill as appropriate, the sampler will remove a sufficient volume of material.

4. The collected sample shall be carefully poured or scooped into a precleaned sample jar and the jar appropriately sealed, preserved, documented on a chain of custody form and packed for shipment.

3.1.11 Drum Sampling and Sludge Sampling

3.1.11.1 Sampling Objectives

Analytical samples will be collected from drums, ASTs, and/or basins containing waste material to evaluate whether or not these materials are characteristically hazards under the regulations set fourth in the (RCRA).

3.1.11.2 Sampling Equipment

The following equipment will be needed to collect samples for analyses:

- Photoionization Detector (PID)
- Non-sparking drum opening tools;
- Clear sampling tube, Coliwasa, and/or stratified sample thief;
- pH paper; Eckman® or Ponar® dredge;
- Personnel Protective Equipment -
  - Face shield or safety glasses
  - Disposable latex gloves
- Field logbook and field logs;
- Laboratory prepared sample containers;
- Roll of polyethylene sheeting; and
- Decontamination equipment.

3.1.11.3 Sampling Procedures

When sampling from drums, the drum opening area will be physically separated by a minimum of 25 feet from drum removal and drum staging operations in order to prevent a possible explosive or chemical chain reaction.

When sampling from drums, the drum bung or lid will be opened and removed slowly to allow any built up pressure to be released using non-sparking tools and allow the drum to equilibrate. The headspace measurement within the drum will then be taken using a PID and the results recorded. A clear sampling tube will be inserted into the bottom of the drum or top of a solid layer and the liquid material allowed to reach its natural level. The exposed end of the tube will be capped with a stopper or a gloved finger, and the tube removed. The tube will be inspected for separate phase liquids and a description written into the field book noted. If two or more phases are contained within the drum each phase will be analyzed separately. The uncapped end of the sampling tube will then be placed in the precleaned laboratory sample jars. The capped end will be carefully released and the contents allowed to drain carefully.

Should leakage problems occur with the open tube sampler due to sample viscosity a Coliwasa or stratified sample thief will be used to collect representative samples of stratified liquids.

Solids, when encountered in drums, ASTs, or basins, will be sampled by means of a dedicated tube. The sample will be obtained by coring the tube into the solid. Solids may also be collected using an Eckman® or Ponar® dredge at locations where solid samples can not be sampled by hand or tube (i.e., settling basins). The tube will then be removed from the drum and the sample extruded into the sample jars.

Upon completion of the sampling all sampling equipment and personnel protective equipment will be containerized in a new drum which will be marked accordingly.

The sample bottles will be immediately placed in a cooler held at 4°C. Samples will not be preserved using acids or bases, due to the possibility of reactions.

Disposable gloves will be worn by the sampling personnel and changed between sampling points. While performing any equipment decontamination phthalate-free gloves (neoprene or natural rubber) will be worn in order to prevent phthalate contamination of the sampling equipment by the interaction between the gloves and the organic solvent(s). Data to be recorded in the field logbook will include the information presented in Section 3.4 and a description of the drum contents and quantity, pH paper reading, and PID reading

3.2 FIELD QUALITY CONTROL SAMPLES

Quality control procedures will be employed to check that sampling, transportation and laboratory activities do not bias sample analytical quality. Trip blanks, field blanks, duplicate samples, matrix spike samples and matrix spike duplicates will provide a quantitative basis for validating the analytical data. A summary of the anticipated QA/QC samples for each media is included in Tables 2 through 4.

3.2.1 Trip Blanks

The trip blanks will be prepared by the laboratory by filling 40 ml vials with a Teflon-lined septum with deionized, analyte-free water. The trip blank will accompany the day's sample containers at all times. One trip blank will be returned to the laboratory with each cooler containing aqueous samples for VOC analysis. The trip blank will be analyzed for volatile organic compounds, to detect possible contamination during shipment. Trip blanks will remain in the shipping cooler from the time of packing, in the laboratory, to arrival back at the laboratory

3.2.2 Field Blanks

A field blank consists of an empty set of laboratory-cleaned sample containers. At the field location, deionized, analyte-free water is passed through decontaminated sampling equipment and placed in the empty set of sample containers for analysis of the same parameters as the samples collected with the sampling equipment. One field blank will be collected per every 20 environmental samples, per media.

3.2.3 Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample pairs are analyzed by the laboratory to provide a quantitative measure of the laboratory's precision and accuracy. When performing NYSDEC ASP/CLP volatile organic or organic extractable analysis, the laboratory must be supplied with triple sample volume for each Sample Delivery Group (SDG) in order to perform matrix spike and matrix spike duplicate analyses. This does not include field or trip blanks. Blanks do not require separate matrix spike or duplicate analyses regardless of their matrix.

The limits on an SDG are:

- Each Case for field samples, or
- Each 20 field samples within a Case, or
- Each fourteen calendar day period during which field samples in a Case are received (said period beginning with receipt of the first sample in the SDG), whichever comes first.

Field personnel will specify samples for MS/MSD analysis. Aqueous samples for extractable organics (semi-volatiles and pesticides/PCBs) require that three times the volume of the sample selected for each MS/MSD sample be collected and submitted to the laboratory for analysis. Extra sample volume is not required for volatile organic analysis unless low level detection methods are used. Extra volume is not required for aqueous samples for inorganic analysis. A matrix spike and matrix duplicate can be obtained from standard sample volumes. Non-aqueous samples (soils/sediment) do not require that any extra volume of sample be submitted to the laboratory for MS/MSD samples.

3.2.4 Field Duplicates

For each sample matrix, a field duplicate sample will be collected at a rate of one sample per 20 environmental samples per media. The duplicate sample is collected at the same location as the environmental sample. The field duplicate sample is identified using the sample designation system described in Section 3.3. The identity of the field duplicate is not revealed to the laboratory. The analytical results of the environmental sample will be compared to the field duplicate sample, to evaluate field sampling precision.

3.3 SAMPLE DESIGNATION

A sample numbering system will be used to identify each sample. This system will provide a tracking procedure to allow retrieval of information about a particular sample, and will assure that each sample is uniquely numbered. The sample identification will consist of at least three components as described below. Identification numbers for soil boring samples will also have a fourth component.

- ***Project Identification:*** The first component consists of a two letter designation which identifies the project site. For this project, the two letter designation will be KB for the Karg Brothers.

- ***Sample type:*** The second component, which identifies the sample type, will consist of a two letter code as follows:

  MW - Monitoring well (Groundwater Sample)
  SB - Soil Boring
  WM Waste material

- ***Sample Location:*** The third component identifies the sample location using a two digit number.

- ***Sample Identification:*** The fourth component will only be used for soil boring samples, to indicate the interval from which the sample was collected.

- ***Quality Assurance/Quality Control Samples***: The samples will be labeled with the following suffixes:

  FB - Field Blank
  MS - Matrix Spike
  MSD - Matrix Spike Duplicate
  TB - Trip Blank.

Duplicate samples will be numbered uniquely as if they were samples. A record of identification for duplicate samples will be maintained.

Examples of identification numbers are given below:

KB-SB-02-10:	Soil boring, boring location number 2, 10 feet below ground surface.
KB-MW-3-MSD:	Monitoring well groundwater sample, well point sample location 3, matrix spike duplicate.
KB-MW-TB:	Trip blank for monitoring well groundwater sample.

3.4 FIELD DOCUMENTATION

3.4.1 Introduction

Documentation of an investigative team's field activities often provides the basis for technical site evaluations and other such related written reports. All records and notes generated in the field will be considered controlled evidentiary documents and may be subject to scrutiny in litigation.

Personnel designated as being responsible for documenting field activities must be aware that all notes may provide the basis for preparing responses for legal interrogatories. Field documentation must provide sufficient information and data to enable reconstruction of field activities. Numerically serialized field logbooks provide the basic means for documenting field activities. The following information must be provided on the inside front cover of each field logbook:

- Project Name (Site Name)
- Site Location
- Site Manager
- Date of Issue

Control and maintenance of field logbooks is the responsibility of the Field Team Leader.

3.4.2 Documentation of Field Activities

Field logbook entries must be legibly written and provide an unbiased, concise, detailed picture of all field activities. Use of preformatted data reporting forms must be identifiable and referenced to field notebook entries.

Step-by-step instructions and procedures for documenting field activities are provided below and in following sub-sections. These instructions and procedures are organized as follows:

Instruction and procedures relating to the format and technique in which field logbook entries are made are as follows:

- Leave the first two pages blank. They will provide space for a table of contents to be added when the field logbook is complete.
- The first written page for each day identifies the date, time, site name, location, MPI personnel and their responsibilities, other non-personnel and observed weather conditions. Additionally, during the course of site activities, deviations from the work plan must also be documented.
- All photos taken must be traceable to field logbook entries. It is recommended to reference photo locations on the site sketch or map.
- All entries must be made in ink. Waterproof ink is recommended.
- All entries must be accompanied by the appropriate military time (such as 1530 instead of 3:30).
- Errors must be lined through and initiated. No erroneous notes are to be made illegible.
- The person documenting must sign and date each page as it is completed.
- Isolated logbook entries made by a team member other than the team member designated responsible for field documentation, must be signed and dated by the person making the entry.
- Additions, clarifications, or corrections made after completion of field activities must be dated and signed.

3.4.3 General Site Information

General site characteristics must be recorded. Information may include

- Type of access into facility (locked gates, etc.)
- Anything that is unexpected on site (e.g., appearance of drums that have not been previously recorded)
- Information obtained from interview with access or responsible party personnel (if applicable), or other interested party contact on site.
- Names of any community contacts on site.
- A site map or sketch may be provided. It can be sketched into the logbook or attached to the book.

3.4.4 Sample Activities

A chronological record of each sampling activity must be kept.

- Explanation of sampling at the location identified in the sampling plan (e.g., discolored soil, stressed vegetation).
- Exact sample location, using permanent recognizable landmarks and reproducible measurements.
- Sample matrix
- Sample descriptions, i.e., color, texture, odor (e.g., soil type, murky water) and any other important distinguishing features.
- Decontamination procedures, if used.

As part of chain-of-custody procedures, recorded on-site sampling information must include sample number, date, time, sampling personnel, sample type, designation of sample as a grab or composite, and any preservative used. Sample locations should be referenced by sample number on the site sketch or map. The offer and/or act of providing sample splits to a thirty party (e.g., the responsible party representative; state, county, or municipal, environmental and/or health agency, etc.) must be documented.

3.4.5 Sample Dispatch Information

When sampling is complete, all sample documentation such as chain-of-custody forms shall be copied and copies placed in the project files. A notation of numbers of coolers shipped, carrier and time delivered to pick-up point should be made in a field notebook.

3.5 CONTROL AND DISPOSAL OF INVESTIGATION DERIVED WASTE

Investigation derived wastes will be handled in accordance with the NYSDEC Proposed Decision Technical and Administrative Guidance Memorandum (TAGM). Disposal of contaminated groundwater generated during Site Investigations and the Final TAGM - Disposal of Drill Cuttings. As borings are advanced, spillage and disposal of potentially contaminated soils and water will be minimized through the implementation of the procedures described below.

Drill cuttings and spoils generated at each boring will be placed (shoveled) on polyethylene sheeting. After completing the boring, the cuttings/spoils will be returned to the borehole provided that the borehole will not be used for the installation of a monitoring well, that it did not penetrate an aquitard or aquiclude and that the cuttings/spoils do not contain oily (product) substances. The boring will then be topped off with a cement/bentonite grout cap.

Excess cuttings/spoils which are not returned to the borehole will be spread out and dewatered (dewatering will be allowed to infiltrate the ground) next to the borehole. Groundwater that is purged from monitoring wells or discharged during drilling activities may be disposed of at each site and allowed to infiltrate into the ground based on the following conditions:

1. There is a defined site which is the source of the groundwater contamination;
2. There is no free product observed such as LNAPLs and DNAPLs;
3. Recharge pits are used to preclude run-off from the site and the pits are covered with clean soil when no longer needed;
4. The infiltrating groundwater is being returned to the same water bearing zone from which it is being purged.

If the above criteria are not met the materials will be containerized in U.S. Department of Transportation (DOT)-approved, 55-gallon steel drums. Soils and water will be drummed separately; the contents will be identified on weather-resistant labels attached to drum exteriors. Open-topped drums will be used to containerize soils and close-topped drums will be used to containerize water.

Depending on the levels of personal protection used during the field investigation, some disposable personal protective equipment (PPE) and decontamination fluids will be generated. Attempts will be made to wash surface contamination off so that PPE (e.g., Tyvek coveralls, gloves, and other disposable items) may be disposed of as ordinary solid waste. If contamination is suspected, these materials will be collected and containerized in UN-approved, 55-gallon steel drums (separately from contaminated soils and water); the contents will be identified with weather-resistant labels attached to drum exteriors. Decontamination fluids, except those containing solvents and/or nitric acid, will be disposed of with drilling fluids and cuttings generated at the site. Decontamination fluids containing solvents or nitric acid will be containerized separately from drilling fluids.

Containerized materials will be transported to, and staged at, a designated location. Malcolm Pirnie will maintain a log of the containers and their contents; the contents will be evaluated upon receipt of results of the analytical data obtained during field investigations. Handling, transportation, and disposal of these materials will be in accordance with requirements of RCRA and other applicable federal, state, and local regulations. Nonhazardous disposable items will be contained and disposed of in a dumpster or via a licensed waste hauler, as appropriate.

4.0 SAMPLE AND DOCUMENT CUSTODY PROCEDURES

4.1 SAMPLE HANDLING

The analytical laboratory will provide the sample containers necessary for all soil, groundwater, and passive soil gas samples. Container closures will be screw-on type, made of inert materials. Sample containers will be cleaned and prepared by the laboratory prior to being sent to the site. Trip blanks will be used to check for false positives due to laboratory cleaning procedures or cross contamination during sample shipment.

All samples collected will be identified with a sample label. A label will be attached to each bottle and each sample will be identified with a unique sample number.

Immediately following sample collection, each sample container will be marked with the following information:

- Sample Code
- Project Number
- Date/Time
- Sample Type
- Preservative, if used
- Sampler's Initials

The sample code will indicate the site location, media sampled and the sample station.

After all sample identification information has been recorded, each sample label will be covered with waterproof clear plastic tape to preserve its integrity. All samples will be recorded and tracked under strict chain-of-custody protocols. In the field, each sample will be checked for proper labeling. The samples will then be packed into coolers with ice and shipped to the laboratory. A chain-of-custody form will be completed for each cooler. The form will be signed and dated by the person who collected the samples, the person the samples were relinquished to for transport to the laboratory, and the laboratory sample controller/custodian who receives the samples.

4.2 COMPLETION OF CHAIN-OF-CUSTODY RECORD

A chain-of-custody record is a printed form that accompanies a sample or group of samples as custody is transferred from person to person. A sample chain-of-custody form is included in Appendix A. It documents custody transfer from person to person and sample information recorded on bottle labels. A chain-of-custody record is a controlled document.

As soon as practicable after sample collection, preferably after decontamination, the following information must be entered on the chain-of-custody form. All information is to be recorded in black ink.

1. ***Malcolm Pirnie project number.*** Enter the seven-digit alphanumeric designation assigned by Malcolm Pirnie that uniquely identifies the project site.
2. ***Project name.*** Enter site name.
3. ***Samplers.*** Sign the name(s) of the sampler(s).
4. ***Station number.*** Enter the sample number for each sample in the shipment. This number appears on the Malcolm Pirnie, Inc. sample identification label.
5. ***Date.*** Enter a six-digit number, indicating the year, month, and day of sample collection; for example, 830115.
6. ***Time.*** Enter a four-digit number indicating the military time of collection; for example, 1354.
7. ***Composite or grab.*** Indicate the type of sample.
8. ***Station location.*** Describe the location where the sample was collected.
9. ***Number of containers.*** For each sample number, enter the number of sample bottles that are contained in the shipment.
10. ***Remarks.*** Enter any appropriate remarks.

4.2.1 Transferring Custody From Malcolm Pirnie, Inc. Shipper to Common Carrier

Instructions for Malcolm Pirnie, Inc. shipper transferring custody of samples to a common carrier are given below.

1. Sign, date, and enter time under "Relinquished by" entry.

2. Enter name of carrier (e.g., UPS, Federal Express) under "Received by."

3. Enter bill-of-lading of Federal Express airbill number under "Remarks."

4. Place the original of the chain-of-custody form in the appropriate sample shipping package. Retain a copy with field records.

5. Sign and date the custody seal. The custody seal is part of the chain-of-custody process and is used to prevent tampering with samples after they have been collected in the field.

6. Wrap the seal across filament tape that has been wrapped around the package at least twice.

7. Fold the custody seal over on itself so that it sticks together.

8. Complete other carrier-required shipping papers.

Common carriers will usually not accept responsibility for handling chain-of-custody forms; this necessitates packing the record in the sample package.

4.2.2 Transferring Custody From Malcolm Pirnie, Inc. Sampler Directly to Carrier

To transfer custody of samples from the Malcolm Pirnie, Inc. sampler directly to a carrier, proceed as above, except eliminate the Malcolm Pirnie, Inc. shipper's signature.

5.0 CALIBRATION PROCEDURES AND FREQUENCY

5.1 INTRODUCTION

Instruments must be properly calibrated to produce technically valid data. Documented calibration and calibration check results verify that the instruments used for measurement are in proper working order and the data produced is reliable. The calibration requirements described or referenced in this section are necessary to support the data quality objectives for this project. When calibration requirements are met, the data will support the focussed investigation decisions dealing with the nature and extent of contamination and safety concerns. In the event that the data is used in court, documented calibrations are necessary to ensure that the data is legally defensible.

5.2 CALIBRATION PROCEDURES FOR FIELD EQUIPMENT

5.2.1 Field Equipment

The following table provides a list of the tasks that will require field equipment, and the specific field instruments that will be used for each task and which require calibration.

TASK	FIELD INSTRUMENT
Monitoring Well Installation	Mini Rae Photoionization Detector
Groundwater Sampling	Mini Rae Photoionization Detector pH Meter Temperature Probe Specific Conductivity Meter Turbidimeter Pressure Transducer and Data Logger

5.2.2 General Procedures

The operation and maintenance of the field equipment to be used during these tasks are provided in Appendix B. General calibration procedures and requirements are described below:

- All instruments will be calibrated at least once a month.
- All instruments will have the calibrations checked at a minimum at the start of each day before measurements are made.
- The calibration and calibration checks will indicate that the sensitivity of the instrument (practical detection limit) is adequate to meet project needs and that the instrument is accurate over the working range.
- All calibration information will be recorded in the field log book. This includes date and time, technician signature, calibration procedure, calibration results, calibration problems, recalibration and maintenance, and instrument serial numbers.
- All calibration standards will be of National Bureau of Standards (NBS) quality and their sources listed and documented so that standards are traceable. In addition, only technicians trained in the use of the field instruments will operate them. If the instrument readings are incorrect at the time of the initial calibration, the instrument will either be calibrated by the technician or returned to the manufacturer for calibration. If the instrument readings are incorrect after a continuing calibration check, the preceding sample results will be reviewed for validity, and reanalyzed if necessary.

5.3 LABORATORY CALIBRATION PROCEDURES

All samples (with the exception of the passive soil gas samples) analyzed according to the NYSDEC ASP/CLP shall follow the procedures described in the Statement of Work (SOW). The calibration procedures and frequency are specifically described for each analysis contained in the SOW. All calibration results shall be recorded and kept on file, and will be reviewed and evaluated by the data validator as part of analytical data validation procedures.

Instrument calibration will be checked with a reference standard prior to the analysis of any sample. The standards used for calibrations will be traceable to the National Bureau of Standards (NBS), and each calibration will be recorded in the laboratory notebook for the particular analysis. Any printouts, chromatograms, etc., generated for the calibration will be kept on file.

6.0 ANALYTICAL PROCEDURES

Environmental samples collected for laboratory analysis during the initial sampling phases of the focused SI will be analyzed by the NYSDEC ASP/CLP certified laboratory for Target Compound List (TCL) compounds and Target Analyte List (TAL) compounds according to the latest SOW. The procedures are fully described in the SOW and are written specifically for environmental samples. Table 1 summarizes the analytical procedures and their sources that will be utilized for this site. The analytical methods listed in Table 1 are sufficient to support the DQOs for this project. In particular, the detection limits of these methods are adequate to support the DQOs.

7.0 DATA REDUCTION, VALIDATION AND REPORTING

7.1 INTRODUCTION

The purpose of this section is to ensure that the large amount of data produced by the laboratory are presented in a clear and useable format. In addition, data quality and technical validity must be verified prior to data use. The majority of samples collected at this site will be analyzed according to the NYSDEC Analytical Services Protocol (ASP)/Contract Laboratory Protocol (CLP) in which data reduction and reporting schemes are well developed and clearly defined. The employment of these methods ensures comparability with other similarly analyzed environmental samples. Other samples will be analyzed via non-ASP methodologies. Reduction, validation and reporting specifications for these analyses are detailed below.

7.2 DATA REDUCTION

Data reduction is the process by which raw analytical data generated from the analytical instrument systems is converted into useable concentrations. The raw data, which takes the form of area counts or instrument responses, is processed by the laboratory and converted into concentrations expressed in terms of milligrams per liter (mg/l) or milligrams per kilogram (mg/kg), parts per million (ppm), micrograms per liter (µg/l), parts per billion (ppb) or micrograms per kilogram (µg/l). These concentrations are the standard method for expressing the level of contamination present in environmental samples.

The process used to convert the instrument output into useable concentrations is clearly defined in the NYSDEC ASP/CLP-SOW for TCL and TAL analyses. The SOW presents in detail all information, equations, and calculations used. The resulting concentrations are comparable to other environmental samples in general and will be comparable to data previously collected for this site.

7.3 DATA VALIDATION

Although rigorous validation of the data generated by the laboratory will be performed by a third party data validation subcontractor, the laboratory will be responsible for reviewing data to determine if any analytical problems exist. Specifically, the laboratory will develop a case narrative describing how closely the data meet the DQOs presented in this QAPP.

7.4 DATA REPORTING

The laboratory will report TCL data consistent with ASP/CLP reporting requirements. The information supplied in the non-ASP data packages will be sufficient to conduct a thorough validation of the data. The QA reporting for any non-ASP data packages will consist of the following accuracy and precision protocols as performed on the appropriate QA samples.

For precision, the relative percent difference (RPD) and the percent relative standard deviation (% RSD) will be calculated:

$$\text{RPD} = \frac{D_1 - D_2}{(D_1 + D_2)/2} \times 100$$

RPD = Relative Percent Difference
D_1 = First Sample Value
D_2 = Second Sample value (Duplicate)

For accuracy, the percent recovery (%R) of spikes will be calculated:

$$\%R = \frac{SSR - SR}{SA} \times 100$$

SSR = Spiked Sample Result
SR = Sample Result
SA = Amount Spike Added

Field sample precision will be assessed through analysis of duplicate samples and the above RPD equations. Accuracy will be assessed through the analysis of check standards and the above percent recovery equation. Field data will also be assessed in relation to specific project needs.

One copy of the data package will be delivered to a third party data validation subcontractor for data assessment. The data package will include the case narrative. The data validation report and the data usability report will be submitted to the NYSDEC as part of the corresponding RI Report. This package will include sampling analysis and summary forms. Section 14.0 provides greater details on the reporting requests for data assessment and validation.

8.0 INTERNAL QUALITY CONTROL CHECKS

8.1 INTRODUCTION

In order to monitor the quality of the analytical data generated for this focussed investigation, an appropriate number of quality control (QC) methods will be employed for all field and laboratory measurement systems. The employment of QC methods permits the validation of the analytical methodology utilized and provides a measure of the suitability of the methodology to meet the DQOs prior to the beginning of measurement or analysis. Once the measurement and analysis has begun, the employment of QC methods permits the monitoring of the system output for quality. The QC results, presented with the environmental sample data, allows the data to be assessed for quality, and a determination made on how well the data has met the DQOs.

Laboratory generated data is used to accurately identify and quantify hazardous substances, while field generated data is used in conjunction with the laboratory data for further investigation of contamination at the site. Both laboratory and field internal QC programs include steps to assure the data are reliable for the extent they will be used in the focussed investigation. In general, laboratory QC programs are more rigorous than field QC programs.

8.2 FIELD QUALITY CONTROL

The intended data uses have been identified and the DQOs established for all field measurement activities in Sections 3 and 5 of this QAPP. Section 3 contains SOPs which describe the use and calibration of field instruments. QC methods will be used to demonstrate that the instruments are capable of producing reliable data. The QC checks employed for field instruments are as follows:

QC METHOD	PURPOSE	FREQUENCY
Calibration Check Sample	Insures proper working order of instrument. Measures instrument accuracy and sensitivity.	Daily
Background Sample	Provides measure of instrument reliability.	Daily
Duplicate Sample	Measures instrument precision.	5%
Trip Blanks	Measures potential contamination from sample transport, the environment and/or shipping.	Minimum of one per cooler of aqueous volatile samples
Field Blanks	Measures potential contamination due to poor sampling device decontamination procedures.	One per every 20 environmental samples per media.

The calibration check samples will be analyzed daily and duplicate samples will be analyzed at a minimum frequency of five percent. The calibration check verifies that the instrument is capable of accurately identifying and quantifying contaminants of concern. The duplicates provide a quantitative measurement of the precision of the instrument. Background samples are similar to blanks and provide information regarding instrument reliability. The information is recorded in field logbooks. The results from these QC methods are used by field technicians to monitor the instrument at the time of the analysis. If QC results indicate a problem with the instrument, corrective action will be taken and, if necessary, the samples will be reanalyzed. Because field measurements are generally easy to repeat, measurements should be repeated as necessary so the data are as complete as possible. The QC results are used as an indication of data quality and reliability when the data are being reviewed.

8.3 LABORATORY QUALITY CONTROL

8.3.1 ASP Samples

The scope and description of QC samples and QC methods are well detailed in the NYSDEC ASP/CLP Statement of Work (SOW) for the particular analysis. TCL and TAL samples are characterized by rigorous QC and documentation. The SOW for organic and inorganic analyses describe the type of QC samples and required QC methods, and the required frequency of analysis. QC limits have been established for standards, blanks, duplicates, matrix spikes, and surrogates, and are contained in the SOWs. QC data will be reviewed by Malcolm Pirnie personnel to assess the validity of the data and determine if the DQOs have been met.

8.3.2 Non-ASP/CLP Quality Control

All non-ASP/CLP analyses that are conducted for this investigation shall include the following QC procedures, if applicable:

		FREQUENCY
1.	Calibration	As required
2.	Standards	Daily
5.	Method Blanks	Daily
6.	Duplicates	5%
7.	Surrogates	Each sample
8.	QC Check Samples	Daily

8.3.3 Non-ASP/CLP Quality Control Checks

The specific laboratory QC procedures will be similar to the procedures outlined in the specific laboratory subcontract agreement whenever possible. For analyses where ASP/CLP QC procedures cannot be adapted to the analysis, a written procedure of quality control checks will be developed, referencing appropriate USEPA documents such as SW-846. Malcolm Pirnie will be responsible for ensuring that QA/QC objectives are equivalent to ASP objectives when possible. Data validation and review will be the same as data validation for ASP data. The validation process should ensure that quality assurance objectives have been met by the QC procedures and will comply with the requirements of the USEPA. The laboratory internal QC checks will include the following:

(1) Duplicates
(2) Control Charts
(3) Blanks
(4) Internal Standards
(5) Reference Check Standards
(6) Surrogate Standards

9.0 QUALITY ASSURANCE AUDITS

9.1 INTRODUCTION

To monitor the capability and performance of all investigation activities, audits may be conducted by Malcolm Pirnie QA personnel. Audits are conducted to determine the suitability and capability of project activities to meeting project quality goals. On-site field audits will be conducted to monitor the field techniques, procedures and the overall implementation of the QAPP procedures. These may be conducted periodically by the site Quality Assurance Officer (QAO). Data quality audits (DQAs), are conducted to determine if the data generated by the sampling and analysis satisfies the predetermined DQOs. The site QAO will be responsible for conducting DQAs of all data generated from project activities.

9.2 FIELD AUDITS

Field audits will include an evaluation of:

1. Sample collection and analytical activities.
2. Equipment calibration techniques and records.
3. Decontamination and equipment cleaning.
4. Equipment suitability and maintenance/repair.
5. Background and training of personnel.
6. Sample containers, preservation techniques and chain-of-custody.
7. Data log books.

Field audit forms are provided in Appendix A. A written QA audit report will be prepared by the site QAO and submitted to the Project Officer and Project Manager. The report will identify any deficiencies found and recommend corrective action. Follow-up reports describing corrective actions which have been completed will be submitted to the Project Officer and Project Manager.

9.3 PERFORMANCE AUDITS (PAs)

Data Quality Audits (DQAs) are conducted to determine if the data is adequate to support the DQOs and to determine the cause of deficiencies in the event that the data quality is not adequate. This audit will be conducted by the site QAO after the data has been fully validated. The site QAO will first determine to what extent the data can be used to support the decision-making process. Secondly, the site QAO will identify the cause of any deficiencies in the data, whether technical, managerial, or both.

10.0 PREVENTATIVE MAINTENANCE

10.1 PURPOSE

The purpose of the preventative maintenance program is to ensure that the sampling, field testing and analytical equipment perform properly thereby avoiding erroneous results, and minimizing equipment downtime. The preventative maintenance program also provides for the documentation of all maintenance to be used as evidence of instrument maintenance and for scheduling of future maintenance. This section describes the equipment maintenance program for field instruments and those responsible for implementation of the program at the Karg Brothers site. The specific equipment maintenance procedures are given in the equipment SOPs and the preventative maintenance SOPs presented in Appendix B. The laboratory preventative maintenance program is the responsibility of the laboratory and only the minimum requirements are mentioned here.

10.2 RESPONSIBILITIES

TITLE	RESPONSIBILITIES
Field Team Leader	Keeping all maintenance records. Development and implementation of maintenance program.
Equipment Manager	Maintaining storage of equipment within the Malcolm Pirnie equipment inventory. Carrying out all maintenance according to schedule. Informing field team members of specific maintenance requirements. Keeping records of all maintenance performed under his care. Sending out equipment for service/repair. Maintaining adequate supply of spare parts.

Field Personnel	Maintenance of all equipment located on-site on a regular basis and after each use. Keeping supply of spare parts on-hand.

10.3 PREVENTATIVE MAINTENANCE PROGRAM

The preventative maintenance program consists of three parts, normal upkeep, service and repair, and formal recordkeeping. Normal upkeep consists of daily procedures that include cleaning, lubrication and checking the batteries of the equipment. The following is a partial list of normal upkeep procedures and a partial list of important spare parts:

- Normal upkeep for environmental monitoring equipment performed daily or after each use:
  1. Cleaning
  2. Lubrication of moving parts
  3. Check/charge battery
  4. Inspect for damage
  5. Check for operation problems
  6. Inspect all hoses and lines

- Partial list of important spare parts for environmental monitoring instruments planned for use at the Karg Brothers site:
  1. Fuses
  2. Mini rae-UV lamp
  3. Probes
  4. Spare battery

The normal upkeep is performed daily after each use and includes inspecting for damage, signs of problems, and charging the batteries if necessary. Specific equipment upkeep procedures are described in the SOP for each instrument in Appendix B.

Minor service and repair will be performed by the Equipment Manager who is trained in the service and repair of field instruments. Equipment in need of major or more complex repair and service will be sent to the manufacturer.

All maintenance, servicing and repair of equipment shall be recorded and kept on file. Field personnel shall record maintenance and instrument problems in the field instrument log books. These will ultimately be kept on file by the Field Team Leader. The

Equipment Manager shall keep a record of all equipment released to the field and a record of all maintenance and service on file.

10.4 LABORATORY INSTRUMENT MAINTENANCE

For ASP laboratories, preventative maintenance procedures will be clearly defined and written for each measurement system. Maintenance activity, preventative or repair, will be documented on standard forms which are maintained in log books. Written procedures will include maintenance schedules, problem identification procedures, space for describing problems and repair notes, and failure analysis protocols. Service contracts and regularly scheduled in-house maintenance will be included, along with a list of critical spare parts.

10.5 RENTAL EQUIPMENT

Rental equipment will be obtained only from known, reputable rental suppliers. The equipment will require a pre-receipt to verify accuracy, maintenance and upkeep of the equipment.

11.0 DATA ASSESSMENT

11.1 OVERVIEW

All analytical data received by Malcolm Pirnie from the analytical laboratories will be assessed to determine to what extent the data can be used in making sound project decisions. The goal of data assessment is to characterize the data so that project decisions are made using data that is of sufficient quality to support those decisions. The levels of quality needed to support the various project decisions have been stated in the form of the DQOs. Where the DQOs are met, the data is useful in making necessary decisions.

In order to determine how well the DQOs have been met, all ASP Level IV data will be reviewed and validated by a qualified data validation subcontractor. The data will be reviewed and validated with the intended data uses and DQOs being utilized to aid in decisions regarding data usefulness.

11.2 DATA ASSESSMENT

11.2.1 Task I – Completeness

Data assessment will include a review of the data package to determine completeness. A complete data package will consist of the following eight components.

1. All sample chain-of-custody forms.
2. The case narrative(s) including all sample/analysis summary forms.

   These forms appear as an addendum to the NYSDEC CLP forms package and will be required for all data submissions regardless of the protocol requested.
3. Quality Assurance/Quality Control summaries including all supporting documentation.
4. All relevant calibration data including all supporting documentation.
5. Instrument and method performance data.

6. Documentation showing the laboratory's ability to attain the contract specific method detection limits for all target analytes in all required matrices.

7. All data report forms including examples of the calculations used in determining final concentrations.

8. All raw data used in the identification and quantitation of the contract specified target compounds.

All deficiencies in the requirement for completeness shall be reported to the consultant immediately. The laboratory shall be contacted by the Project QAO or data validator and shall be given ten calendar days to produce the documentation necessary to remove the deficiencies.

11.2.2 Task II – Compliance

The Validator shall review the submitted data package to determine compliance with those portions of the work plan that pertain to the production of laboratory data. Compliance is defined by the following criteria.

1. The data package is complete as defined in Task 1 above.

2. The data has been produced and reported in a manner consistent with the data requirements of the QAPP and the laboratory subcontract.

3. All protocol required QA/QC criteria have been met.

4. All instrument tune and calibration requirements have been met for the time frame during which the analytes were completed.

5. All protocol required initial and continuing calibration data is present and documented.

6. All data reporting forms are complete for all samples submitted. This will include all sample dilution/concentration factors and all premeasurement sample cleanup procedures.

7. All problems encountered during the analytical process have been reported in the case narrative along with any and all actions taken by the laboratory to correct these problems.

The data validation task requires that the Validator conduct a detailed comparison of the reported data with the raw data submitted as part of the supporting documentation package. It is the responsibility of the Validator to determine that the reported data can be completely substantiated by applying protocol defined procedures for the identification and quantitation of the individual analytes. To assist the Validator in this determination the following documents are recommended; however, the EPA Functional Guidelines will be used for format only. The specific requirements noted in the Project Quality Assurance Project Plan are prerequisite, for example, holding times or special analytical project needs, to those noted in the Functional Guidelines.

1. The particular protocol(s) under which the data was generated, e.g., NYSDEC Contract Laboratory Protocol; EPA SW-846; EPA Series 500 Protocols.

2. Data validation guidance documents such as:
   a. "Functional Guidelines for Evaluation Inorganic Data" (published by EPA Region 2), or latest revision.
   b. "Functional Guidelines for Evaluation Organics Analyses" Technical Directive Document No. HQ-8410-01 (published by EPA), or latest revision.
   c. "Functional Guidelines for Evaluating Pesticides/PCB's Analyses" Technical Directive Document No. HG-8410-01 (published by EPA), or latest revision.

11.3 REPORTS

The Validator shall submit a final report covering the results of the data review process. This report shall include the following:

1. A general assessment of the data package as determined by the accomplishment of Section 11.2, above.

2. Detailed descriptions of any and all deviations from the required protocols. (These descriptions must include references to the portions of the protocols involved in the alleged deviations).

3. Any and all failures in the Validator's attempt to reconcile the reported data with the raw data from which it was derived. (Again, specific references must be included). Telephone logs should be included in the validation report.

4. A detailed assessment by the Validator of the degree to which the data has been comprised by any deviations from protocol, QA/QC breakdowns, lack of analytical control, etc., that occurred during the analytical process.

5. The report shall include, as an attachment, a copy of the laboratory's case narrative including the NYSDEC required sample and analysis summary sheets.

6. The report shall include an overall appraisal of the data package.

7. The validation report shall include a chart presented in a spreadsheet format, consisting of site name, sample numbers, data submitted to laboratory, year of CLP or analytical protocol used, matrix, fractions analyzed, e.g., volatiles, semi-volatiles, Pest/PCB, Metals, CN. Space should be provided for a reference to the NYSDEC CLP when non-compliance is involved and a column for an explanation of such violation.

12.0 CORRECTIVE ACTION

12.1 NON-CONFORMANCE REPORTS

Corrective action will be undertaken when a non-conforming condition is identified. A non-conforming condition occurs when QA objectives for precision, accuracy, completeness, representativeness or comparability are not met, or when procedural practices or other conditions are not acceptable.

A non-conformance report will be prepared by the site QAO, approved by the Technical Manager, and issued to the Project Manager and other appropriate parties. The non-conformance report will describe the unacceptable condition and the nature of corrective measures recommended. A schedule for compliance will also be provided.

12.2 CORRECTIVE ACTION

The non-conformance report will be transmitted to a responsible officer of the ASP laboratory, the City of Johnstown Representative, the Project Officer and the Project Manager. The non-conformance report will specify, in writing, the corrective action recommended including measures to prevent a recurrence of the original deficiency. Appropriate documentation of corrective action will also be prepared. The site QAO will monitor implementation of the corrective action, and provide written record as to whether the original problem has been resolved.

12.3 STOP-WORK ORDER

A Stop-Work Order may be issued, upon authorization, by the site QAO, if corrective action does not adequately address a problem or if no resolution can be reached. To issue a Stop-Work Order, written authorization is required from the Project Manager and the City of Johnstown Representative. If disagreement occurs among these individuals, it will be brought before successively higher levels of management until the issue is resolved.

12.4 DOCUMENTATION OF THE STOP-WORK ORDER

The conditions and need for a Stop-Work Order will be documented in sufficient detail to permit evaluation of the deficiency and determination of proper corrective action. Pertinent communications will be attached to the Stop-Work Order and referenced in the appropriate spaces. Such communications include discussions, correspondences, or telephone conversations which pertain to evaluation of the problem and potential solutions, and implementation of the preferred solution.

12.5 RESUMPTION OF WORK

In order for work to resume following a Stop-Work Order, the Project Manager and the City of Johnstown Representative must rescind it in writing.

12.6 COURSE AND ACTION TO PREVENT RECURRENCE

The site QAO is responsible for tracking non-conforming conditions, evaluating the effectiveness of corrective measures, and assuring that the necessary steps have been taken to prevent recurrence of the original problem.

12.7 FIELD CHANGES

The Project Manager is responsible for all site activities. In this capacity the Project Manager will at times be required to modify site programs in response to changing site conditions. At such times the responsible Field Team Leader will notify the Project Manager of the anticipated change, and obtain the approval of the Project Manager and implement the necessary changes. The Project Manager will notify in writing the site QAO, the Project Officer, and the City of Johnstown Representative. A copy of the notification will be attached to the file copy of the affected document. If an unapproved action has been taken during a period of deviation, the action will be evaluated to determine the significance of any departure from established procedures.

Changes in the program will be documented on a field change request which is signed by the Field Team Leader and the Project Manager. The Project Manager will maintain a log for the control of field change requests.

The Project Manager is responsible for controlling, tracking and implementing the identified changes. Completed field change requests are distributed to affected parties which will include as a minimum: Project Officer, Project Manager, site QAO, Field Team Leader, and the City of Johnstown Representative.

13.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Malcolm Pirnie field staff will promptly report any difficulties to the Project Manager. The laboratory will provide a written description on any quality assurance, problems to Malcolm Pirnie with submission of the analytical data packages.

Following any quality assurance audits, the site QAO will submit a Quality Assurance report to the Project Manager describing the performance of the quality assurance program. Problems or issues which arise independent of audits may be identified to project management at any time.

14.0 REFERENCES

USEPA, 1983, Methods for Chemical Analysis for Water and Wastes, EPA-600/8-79-020

USEPA, 1984, Soil Sampling Quality Assurance User's Guide, EPA-600\4-84-043.

USEPA, 1988, Region II CERCLA Quality Assurance Manual, Final Copy, Revision O.

USEPA, 1986, Test Methods for Evaluating Solid Waste, SW-846, Third Edition.

USEPA, Contract Laboratory Statement of Work for Organic Analysis, 3/90.

USEPA, Contract Laboratory Statement of Work for Inorganic Analysis, 3/90.

USEPA, 1987, Data Quality Objectives for Remedial Response Activities, CDM Federal Programs Corporation.

USEPA, 1988, Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses.

USEPA, 1988, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final.

USEPA, 1988, User's Guide to the Contract Laboratory Program, Fourth printing.

USEPA, 1990, SOP No. HW-6, CLP Organics Data Review and Preliminary Review, Revision No. 7, 3/90.

USEPA, 1990, SOP NO. HW-2, Evaluation of Metals Data for the Contract Laboratory Program Revision X, 2/90.

ATTACHMENT 1

U.S. EPA Generic Brownfields QAPP Title and Approval Page

U.S. EPA REGION 2
GENERIC BROWNFIELDS QAPP

FORM A: TITLE AND APPROVAL PAGE

GENERIC BROWNFIELDS QUALITY ASSURANCE PROJECT PLAN APPROVAL PAGE

Brownfields Assessment Demonstration Pilot
Former Karg Brothers Tannery
Johnstown, New York

The attached EPA Region 2 Generic Brownfields Quality Assurance Project Plan (QAPP) has been submitted in compliance with the provisions of the Former Karg Brothers Tannery Brownfields Assessment Demonstration Pilot Cooperative Agreement No. BP982056-01-0.

The undersigned agrees to use the Generic Brownfields Quality Assurance Project Plan Boilerplate to prepare the Site Specific Sampling, Analysis, and Monitoring Plan (SAMP) for Brownfields sites funded under the Brownfields Economic Redevelopment Initiative. The undersigned also agrees to incorporate any comments provided by the New York State Department of Environmental Conservation (NYSDEC) concerning the Site Specific SAMP.

Pilot Name: **Brownfields Assessment Demonstration Pilot**
Former Karg Brothers Tannery
Pilot State: **New York**

Pilot Project Manager Concurrence:

Signature: George Bevington

Printed Name: GEORGE BEVINGTON

Date: 3-28-00

U.S. EPA Region 2 Manager Approval:

Signature: ______________________

Printed Name: ______________________

Date: ____________

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APPENDIX A

Field Forms

QUALITY CONTROL FIELD AUDIT REPORT

SUMMARY INFORMATION

1. PROJECT NAME: ______________________________

2. PROJECT ADDRESS: ______________________________

____

3. PRELIMINARY ASSESSMENT ___ RI/FS ___ RD ___ CONSTRUCTION ___

OTHER ______________________________

4. DATE(S) OF QC FIELD AUDIT ______________________________

5. AUDITOR'S NAME ______________________________ PHONE __________

6. FACILITY CONTACT ______________________________ PHONE __________

7. CONTRACTOR CONTACT ______________________________ PHONE __________

8. PERSONNEL ON-SITE

NAME	REPRESENTING	PHONE

9. AUDITOR'S COMMENTS ______________________________

____

____

Field Audits

10. WEATHER CONDITIONS

SUNNY PARTLY SUNNY PARTLY CLOUDY CLOUDY RAIN DRIZZLE SNOW SLEET

TEMPERATURE ________ WIND SPEED ________ WIND DIRECTION ________

11. LEVEL OF PERSONNEL PROTECTION REQUIRED IN WORK PLAN LEVEL OF PERSONNEL PROTECTION ACTUALLY DONNED:

A B C D A B C D

12. FIELD SURVEY EQUIPMENT

INSTRUMENT	MODEL	CALIBRATION CHECK	CALIBRATION STANDARD	SPAN SETTING
CONDUCTIVITY METER				
DISSOLVED OXYGEN METER				
pH METER				
COMBUSTIBLE GAS INDICATOR (LEL/O_2)				
FLAME IONIZATION DETECTOR (OVA)				
PHOTOIONIZATION DETECTOR (HNU)				
TOTAL GAS INDICATOR (CO, H_2S)				
OTHER				

OBSERVATIONS ____

____

13. DID THE SAMPLING TEAM TAKE PERIODIC SURVEYS OF THE AMBIENT AIR CONDITIONS YES NO N/A

14. DID THE SAMPLING TEAM PROVIDE A DECON ZONE DESIGNATING CLEAN AND CONTAMINATED AREAS YES NO N/A

15. WERE PHOTOGRAPHS TAKEN YES NO

16. AUDITOR'S COMMENTS ____

____

____

MONITORING WELL SAMPLING SETUP AND EVACUATION

EVACUATION PROCEDURES

1. WELL CASING CONSTRUCTION   STAINLESS STEEL   TEFLON   PVC   OTHER ________

2. DIAMETER OF WELL CASING   2"   4"   6"   OTHER ________

3. LOCKING CAPS ON THE WELLS   YES   NO   N/A   PROTECTIVE CASING   YES   NO   N/A

4. METHOD UTILIZED TO DETERMINE THE STATIC WATER LEVEL   WATER LEVEL INDICATOR   OTHER ________

5. REFERENCE POINT THAT THE STATIC WATER LEVEL WAS MEASURED FROM:

SURVEY POINT	TOP OF INNER CASING	TOP OF PROTECTIVE CASING	HEIGHT OF CASING ABOVE GROUND SURFACE

6. WAS THE WATER LEVEL INDICATOR DECONTAMINATED ACCORDING TO STANDARD PROCEDURES BETWEEN EACH WELL:

YES   NO   N/A

IF NO, METHOD UTILIZED: ________________________________

____

7. EVACUATION METHOD:

BAILER   CENTRIFUGAL PUMP   PERISTALTIC PUMP   BLADDER PUMP   SUBMERSIBLE PUMP

GAS DISPLACEMENT PUMP   GAS LIFT PUMP   OTHER ________________

8. TYPE OF HOSE UTILIZED:

POLYETHYLENE (ASTM DRINKING WATER GRADE 2239)   TEFLON   SILASTIC   N/A

OTHER ________________________________

9. WAS THE HOSE DEDICATED TO EACH WELL LOCATION: YES   NO   N/A

IF NO, METHOD OF DECONTAMINATION ________________________

10. WAS THE PUMP DEDICATED TO EACH WELL LOCATION: YES   NO   N/A

11. WAS THE PUMP: LABORATORY DECONTAMINATED   FIELD DECONTAMINATED   N/A

12. WAS THE PUMP DECONTAMINATED ACCORDING TO STANDARD CERCLA PROCEDURES: YES   NO

IF NO, METHOD OF DECONTAMINATION ________________________

13. WAS THE PUMP HEAD OR END OF HOSE WITHIN 6 FEET OF THE DYNAMIC WATER LEVEL DURING EVACUATION:

YES   NO   N/A

14. WAS THE DECONTAMINATION AREA LOCATED AWAY FROM THE SOURCE OF CONTAMINATION   YES   NO   N/A

15. AUDITOR'S COMMENTS ________________________________

____

____

AQUEOUS SAMPLING PROCEDURES

1. AQUEOUS MATRIX SAMPLED:

POTABLE WELL GROUNDWATER SURFACE WATER LEACHATE RUNOFF STORM SEWER

SANITARY SEWER OTHER: ____________________

2. TYPE OF SAMPLE: GRAB COMPOSITE IF COMPOSITE, # SAMPLES/COMPOSITE ____________

3. WAS THE VOA SAMPLE COLLECTED FIRST: YES NO N/A

4. TYPE OF SAMPLING EQUIPMENT:

	MATERIAL OF CONSTRUCTION			
	STAINLESS STEEL	TEFLON	GLASS	OTHER
BAILER				
BLADDER PUMP				
SAMPLER				
COLIWASA				
KEMMERER DEPTH SAMPLER				
WHEATON DIP SAMPLER				
TUB SAMPLER				
BACON BOMB				

5. TYPE OF LEADER LINE THAT COMES IN CONTACT WITH THE WELL WATER:

TEFLON TEFLON-COATED STAINLESS STEEL N/A OTHER ____________

6. LENGTH OF THE LEADER LINE ____________________

7. WAS THE SAMPLING EQUIPMENT DEDICATED: YES ____________ NO ____________

8. WAS THE SAMPLING EQUIPMENT: LAB DECONTAMINATED FIELD DECONTAMINATED

9. WAS THE SAMPLING EQUIPMENT DECONTAMINATED ACCORDING TO STANDARD PROCEDURES: YES NO

IF NO, METHOD OF DECONTAMINATION: ____________________

10. WAS THE DECONTAMINATION AREA LOCATED AWAY FROM THE SOURCE OF CONTAMINATION YES NO N/A

11. ARE DISPOSABLE GLOVES WORN AND CHANGED BETWEEN EACH SAMPLE LOCATION: YES NO

12. AUDITOR'S COMMENTS ____________________

____

____

____

____

Field Audits

NON-AQUEOUS SAMPLE INFORMATION

1. NON-AQUEOUS MATRIX SAMPLED:

SOIL SEDIMENT SLUDGE CHEMICAL SOLIDS WASTE PILE

OTHER ____________________

2. TYPE OF SAMPLE: GRAB COMPOSITE IF COMPOSITE, # SAMPLES/COMPOSITE ____________

3. WAS THE VOA SAMPLE COLLECTED FIRST FROM A DISCRETE LOCATION PRIOR TO HOMOGENIZATION: YES NO N/A

4. WAS THE SAMPLE HOMOGENIZED PRIOR TO ACQUISTION INTO THE SAMPLE CONTAINERS: YES NO

5. TYPE OF SAMPLING EQUIPMENT:

	MATERIAL OF CONSTRUCTION			
	STAINLESS STEEL	TEFLON	GLASS	OTHER
SPOON/SPATULA				
TROWEL/SCOOP				
BUCKET AUGER				
SPLIT SPOON				
SHELBY TUBE				
TRIER				
PONAR DREDGE				

6. WAS THE DRILL RIG, AUGER FLIGHTS, RODS, ETC. DECONTAMINIATED ACCORDING TO STANDARD PROCEDURE BETWEEN EACH SAMPLE LOCATION.
YES NO N/A

IF NO, METHOD OF DECONTAMINATION ____________________

7. IF MUD ROTARY DRILLING WAS UTILIZED WHAT WAS THE SOURCE OF THE WATER: ____________

8. WAS THE SAMPLING EQUIPMENT DEDICATED: YES ____________ NO ____________

9. WAS THE SAMPLING EQUIPMENT: LAB DECONTAMINATED FIELD DECONTAMINATED

10. WAS THE SAMPLING EQUIPMENT DECONTAMINATED ACCORDING TO STANDARD PROCEDURES: YES NO

IF NO, METHOD OF DECONTAMINATION: ____________________

11. WAS THE DECONTAMINATION AREA LOCATED AWAY FROM THE SOURCE OF CONTAMINATION YES NO N/A

12. ARE DISPOSABLE GLOVES WORN AND CHANGED BETWEEN EACH SAMPLE LOCATION: YES NO

13. AUDITOR'S COMMENTS ____________________

Field Audits

QA/QC INFORMATION

1. LABORATORIES:

NAME PHONE

NAME PHONE

CONTACT PERSON

CLP CLP CAPABLE CERTIFIED OTHER

2. SAMPLE INFORMATION:

MATRIX	PARAMETER	PRESERVATIVE	CONTAINER DESCRIPTION

3. WHAT ORDER BY ANALYTICAL PARAMETER ARE SAMPLES COLLECTED:

4. FIELD BLANKS: YES NO N/A FREQUENCY

METHOD:

WAS IDENTICAL BOTTLE TO BOTTLE TRANSFER OF WATER UTILIZED: YES NO

5. TRIP BLANKS: YES NO N/A FREQUENCY

6. WHAT WAS THE SOURCE OF THE BLANK WATER: LABORATORY DEMONSTRATED ANALYTE-FREE OTHER

7. SAMPLE PACKAGING AND HANDLING:

SAMPLE CONTAINERS LABELED	YES	NO	N/A
COC FORMS COMPLETED	YES	NO	N/A
CUSTODY SEALS	YES	NO	N/A
SAMPLES PERSERVED TO 4°C:	YES	NO	N/A

8. AUDITOR'S COMMENTS

MALCOLM PIRNIE		**TEST BORING LOG**			**BORING No.**
OJECT	LOCATION				SHEET 1 OF
IENT					PROJECT No.
DRILLING CONTRACTOR					MEAS. PT. ELEV.
PURPOSE					GROUND ELEV.
WELL MATERIAL					DATUM
DRILLING METHOD(S)		SAMPLE	CORE	CASING	DATE STARTED
DRILL RIG TYPE	TYPE				DATE FINISHED
GROUND WATER DEPTH	DIA.				DRILLER
MEASURING POINT	WEIGHT		▨	▨	PIRNIE STAFF
DATE OF MEASUREMENT	FALL		▨	▨	

DEPTH FT.	SAMPLE TYPE, RECOVERY, NUMBER	BLOWS ON SAMPLE SPOON PER 6"	PID	GRAPHIC LOG	GEOLOGIC DESCRIPTION KEY - Color, Major, Minor Mositure, Etc.	ELEV. / DEPTH	WELL Constr.	REMARKS
4								
6								
8								

MALCOLM PIRNIE

DAILY DRILLING REPORT

CONTRACTOR: ____________________ DATE: ____________

ING EQUIP.: ____________________ WEATHER: ____________

CREW MEMBERS: ____________________

SITE NAME: ____________________ JOB NO.: ____________

DRILL TIME LOG:

CATEGORY	TOTAL HOURS	6	7	8	A.M. 9	10	11	12	1	2	3	4	5	P.M. 6	7	8	9	10	11	12	1	2	A.M. 3	4	5	6
MOB/DEMOB																										
DRILLING–OVERBURDEN																										
DRILLING–ROCK																										
WELL INSTALLATION																										
DEVELOPMENT/TESTING																										
GROUTING																										
STEAM/DECON																										
DOWN TIME																										
STANDBY																										
OTHER:																										

REMARKS:

CONSUMABLE: DESCRIBE NATURE, QUANTITY, SIZE, ETC.

ITEM OR SERVICE	QTY.	NOTES

BOREHOLE NO.	FROM FEET	TO FEET	FOOTAGE DRILLED FEET	METHOD, SIZE, ETC.

ONNEL TIME LOG:

POSITION	NAME	HOURS
INSPECTOR		
DRILLER		
HELPER		

DRILLER	MPI REP.

MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

WELL NO. ____________

PROJECT ____________ START DATE ____________ END DATE ____________

PROJECT NO. ____________ FIELD GEOLOGIST ____________

LOCATION ____________

DRILLING CO. ____________

____

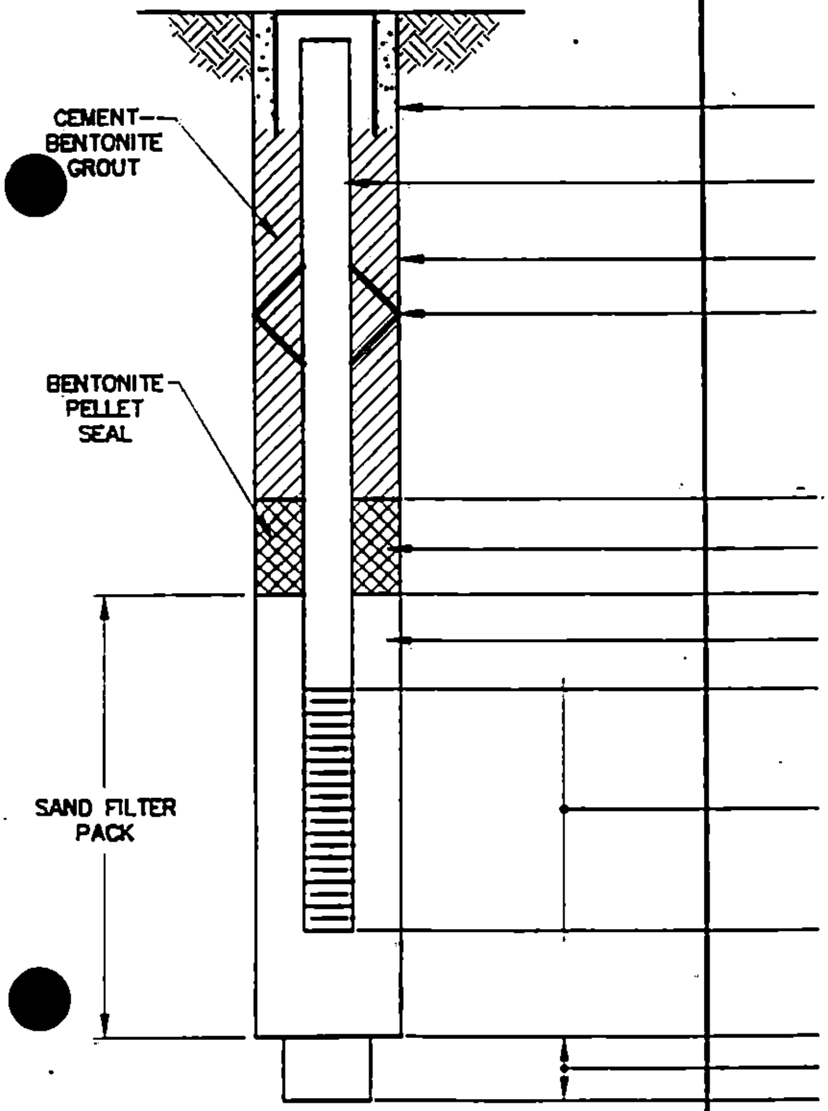
DRILLER(S) ____________

____

DRILLING METHOD(S) ____________

____

DEVELOPMENT METHOD(S) ____________



DEPTH TO TOP OF GROUT/ BOTTOM OF CEMENT ____________

RISER DIAMETER AND MATERIAL ____________

BOREHOLE DIAMETER ____________

DEPTH TO CENTRALIZERS ____________

____

____

____

____

DEPTH ________

PELLET SIZE ________

DEPTH ________

SAND SIZE ________

DEPTH ________

SCREEN DIAMETER, SLOT SIZE, AND MATERIAL ________

DEPTH ________

DEPTH ________

BACKFILL MATERIAL ________

BOTTOM OF BOREHOLE ________

NOTE: DEPTHS ARE FEET BELOW GRADE

MALCOLM
PIRNIE

Well No. ________

Well Development/Purging Log

PROJECT NAME: ____________________

PROJECT NUMBER: ____________________

DATE: ____________________

SAMPLERS: ____________________

____

① Total Casing and Screen Length (ft.) ________

② Casing Internal Diameter (in.) ________

③ Water Level Below Top of Casing (ft.) ________

④ Volume of Water in Casing (gal.) ________

Well I.D.	Vol. Gal./Ft.
1"	0.04
2"	0.17
3"	0.38
4"	0.66
5"	1.04
6"	1.50
8"	2.60

$$v = 0.0408\,(②)^2 \times (① - ③) = ④$$

$$v = 0.0408\,(\qquad)^2 \times (\qquad - \qquad) = \underline{\qquad}\ \text{gal.}$$

PARAMETER	ACCUMULATED VOLUME PURGED										
Gallons											
Time											
Conductivity (mohm/cm)											
Dissolved Oxygen (ppm)											
Eh (mV)											
pH											
Temp (°C)											
Turbidity (NTUs)											

MMENTS:

PAGE___OF___

ALCOLM
PIRNIE

TEST EXCAVATION LOG

MALCOLM PIRNIE INC.

DATE STARTED __________ TIME ______ JOB NO. ________

DATE FINISHED __________ TIME ______ TEST EXCAVATION NO.______

CLIENT __________ SITE __________

SURFACE ELEVATION __________ CONTRACTOR __________

LOCATION __________ EQUIPMENT __________

__________ INSPECTOR __________

DEPTH	SAMPLE	PPM	DESCRIPTION OF SOIL	REMARKS
0				

LOCATION SKETCH

NOTES:

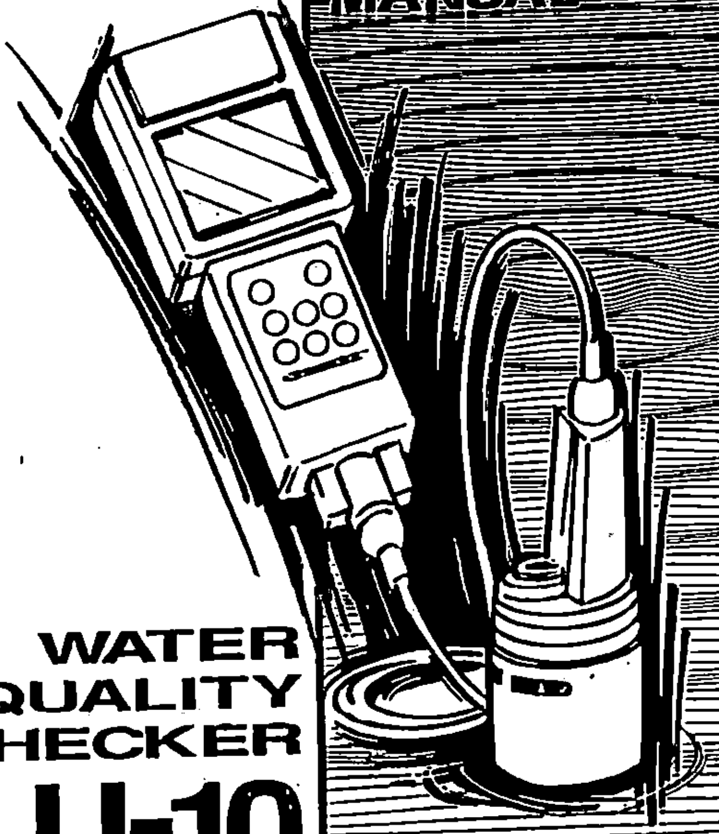
AUSMANN : 026F 01900\TEST-LOG SCALE: 1:1i 01/23, 1992 at 14:52

APPENDIX B

Field Equipment Calibration and Maintenance Procedures

HORIBA

INSTRUCTION MANUAL



WATER QUALITY CHECKER U-10

CODE: 040801000HK-5

WARNING

The DO sensor contains a strong alkaline solution. Should any of this solution come in contact with your clothing or skin, wash it away immediately with plenty of water.

Be especially careful not to allow any of the alkaline liquid in the DO sensor to get in your eyes.

⚠CAUTION

Insert the battery with ample care to the polarity. Reverse insertion on the polarity will make damage to the inner PCB.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provede reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

-10 Water Quality Checker is a state-of-the-art instrument for simultaneous multiparameter measurement of water quality. The HORIBA U-10 measures six different parameters of water samples: *pH, conductivity, turbidity, dissolved oxygen, temperature,* and *salinity.*

The U-10 is compact enough to be held in one hand while taking measurements. It has a large easy-to-read LCD readout. Measurements are taken simply by immersing the probe right into the water sample.

The U-10 is extremely versatile and sophisticated, yet easy to use. You will find it a valuable addition to on-site water control operations, whatever your needs -- from testing factory discharges to urban drainage, river water, lake and marsh water, aquatic culture tanks, agricultural water supplies, and sea water.

To get the most out of you Water Quality Checker, please r this *Instruction Manual* carefully before you begin to take measurements.

Note that Horiba cannot be held responsible for any equipment malfunction or failure should the U-10 Water Quality Checker be operated incorrectly or in a manner other than specified in this *Instruction Manual.*

Horiba's aim is to produce the best possible equipment and documentation for our products. We welcome comments, questions, or suggestions for improvement concerning both our products and the accompanying documentation, such as this *Instruction Manual.*

Note that the contents of this Instruction Manual are subject to change without prior notice as design changes are made on the instrument.

Second edition: November, 1991
First edition: July, 1991

CONTENTS

Section 1 Getting Started

Section 2 Making Measurements

Section 3 Calibrating the U-10

Section 4 Data Storage and Printout

Section 5 Daily Maintenance and Troubleshooting

Section 6 Reference Materials

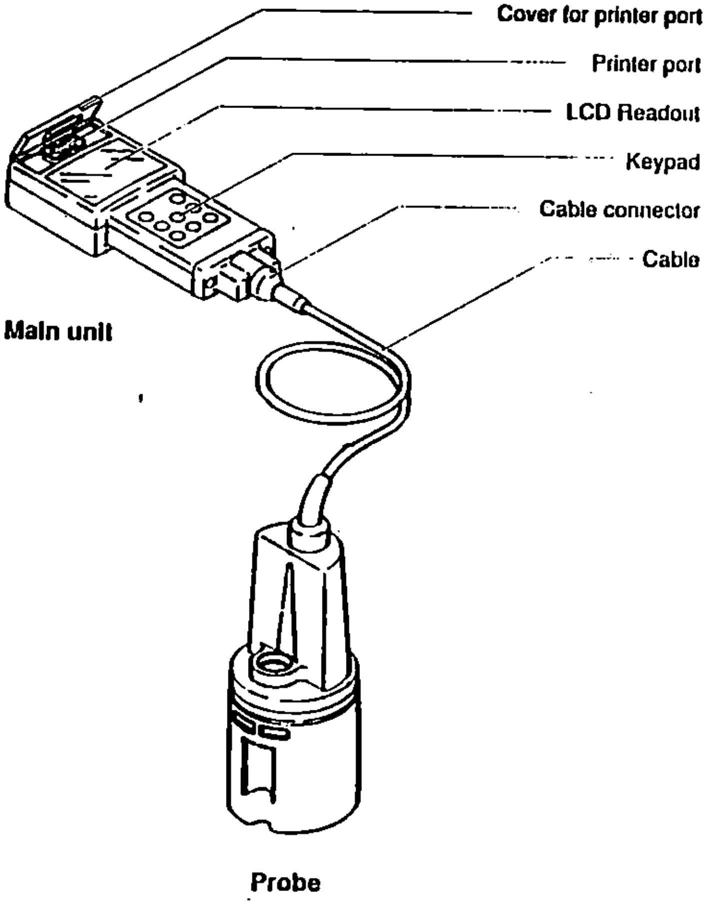
Contents of Tables

Section 1
Getting Started

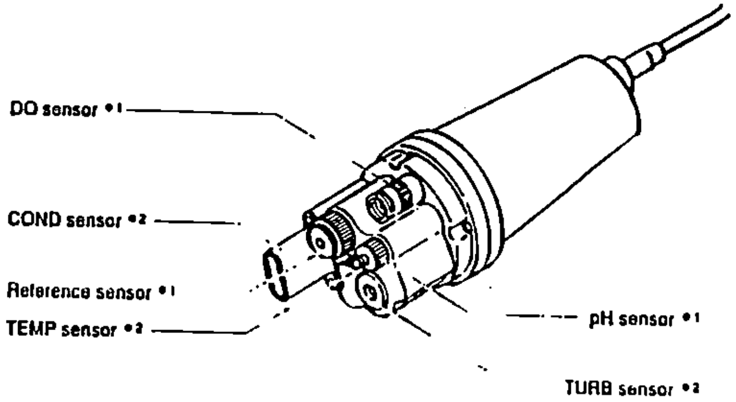
This section first gives an overview of the U-10. It then shows how to set up your U-10 by inserting the DO sensor and the battery.

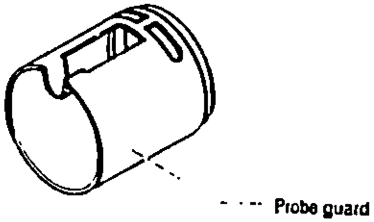
Configuration of the U-10

Main unit



Probe



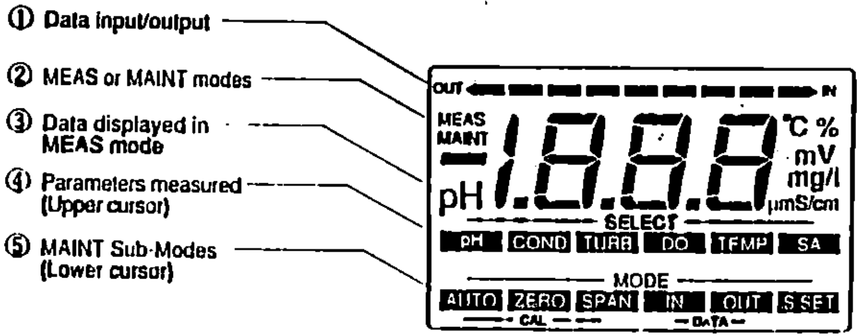


*1. Removable
DO (Dissolved oxygen)
Reference
pH

*2. Non-removable
COND (Conductivity)
TEMP (Temperature)
TURB (Turbidity)

The Readout

The readout has two main functions: (1) it displays the results of measurements, and (2) it serves as a message board to show the operating status of the U-10.



① Data input/output

OUT -- Data output
-- IN Data input

② MEAS or MAINT modes

The U-10 may be used in one of two modes: Measurement (MEAS) mode or Maintenance mode.

MEAS	the U-10 is ready to make 6-parameter measurements
MAINT	the U-10 is ready for other operations, e.g., calibration, data input/recall, or salinity setting

③ Data displayed in MEAS mode

- 6-parameter results:
  pH, conductivity, turbidity, DO, temperature, and salinity
- Designated value for salinity setting
- Error codes

④ Parameters measured

Value displayed on readout is highlighted by upper cursor.

pH	pH
COND	Conductivity
TURB	Turbidity
DO	Dissolved-Oxygen
TEMP	Temperature
SAL	Salinity

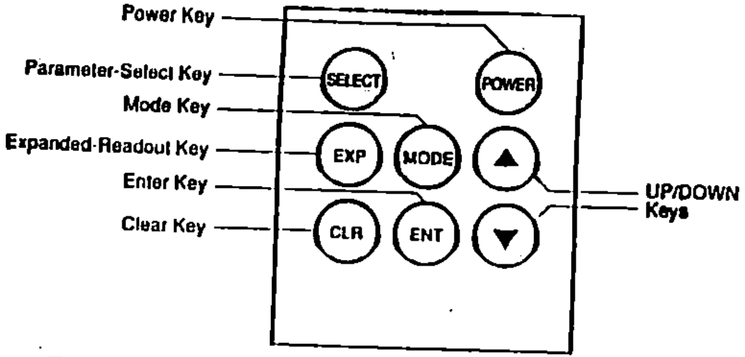
⑤ MAINT Sub-Modes

One of six Sub-Modes selected is highlighted by lower cursor.

AUTO	Automatic 1-point calibration
ZERO	Manual zero calibration
SPAN	Manual span calibration
IN	Data input
OUT	Data output (recall)
S.SET	Salinity setting correction

The Keypad

The U-10 is operated by the keypad on the main unit, which has eight surface-sealed keys, as illustrated.



Power Key (POWER)
Turns the main unit ON/OFF.

When this key is pressed to turn the U-10 ON, the readout comes in the MEAS mode, showing the parameter last displayed in the previous measurement. If the U-10 is left with the power ON for 30 minutes without any of the keys being activated, the power will be turned OFF automatically.

Parameter-Select Key (SELECT)
Use this key to move the upper cursor to the measured parameter you want to show on the readout. It toggles through the six parameters in order:

pH - COND - TURB - DO - TEMP - SAL

Mode Key (MODE)
Toggles back and forth between MEAS and MAINT modes. When in the MAINT mode, this key toggles the lower cursor through the six maintenance Sub-Modes.

AUTO - ZERO - SPAN - IN - OUT - S.SET

EXP

Expanded-Readout Key (EXP)
Toggles between (1) standard readout value and (2) expanded readout, for greater resolution, with decimal point moved one digit to the left.

ENT

Enter Key (ENT)
This acts like the RETURN Key or Enter Key on a computer keyboard. The U-10 Enter Key has four main functions, depending on which mode the unit is in.

1. In the AUTO Sub-Mode: Press this key to start automatic calibration.
2. In either the ZERO or SPAN Sub-Modes: Used in manual calibration to set the value for the standard solution being used.
3. In the IN Sub-Mode: Inputs data being measured to memory.
4. In the OUT Sub-Mode: Recalls values from one of the 20 Data-Set Nos. that is now shown on the readout. Prints data when a printer is connected.

CLR

Clear Key (CLR)
This acts like the ESCAPE Key on a computer keyboard. It has three main functions, depending on which mode the unit is in.

1. In the AUTO Sub-Mode: Aborts the auto-calibration now in progress.
2. In the IN Sub-Mode: Deletes data in memory from all 20 Data-Sets.
3. When the readout shows an error code: Clears the error code from the readout.

▲
▼

UP/DOWN keys
Use these keys to select values when in one of the MAINT Sub-Modes. They have two main functions.

1. In either the ZERO or SPAN Sub-Modes: Use these keys to select value for the standard solution.
2. In the OUT mode: Used to toggle through the 20 Data-Set Nos. to select the one you wish to recall.

Setting up the U-10

Preparations of the pH sensor and the reference sensor

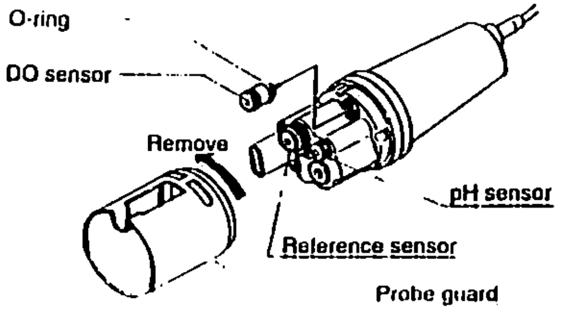
1. Remove the protective rubber cap from the pH sensor.
2. Remove the sealing tape from the reference sensor.

Inserting the DO sensor

WARNING
The DO sensor contains a strong alkaline solution. Should any of this solution come in contact with your clothing or skin, wash it away immediately with plenty of water.
Be especially careful not to allow any of the liquid in the DO sensor to get in your eyes.

The Dissolved-Oxygen (DO) sensor has a delicate membrane that can easily be ruptured. For safety's sake, the U-10 is shipped to you with the DO sensor packed separately. You should insert the DO sensor when you unpack your U-10 unit.

1. Make sure that the DO sensor has the correct O-ring, as shown.
2. First, fit the DO sensor lightly into its socket, and then put on the probe guard to align it correctly.
3. Then, tighten the DO sensor securely to the probe body. When doing this, be especially careful not to damage the membrane, which is located in the front of the DO sensor.



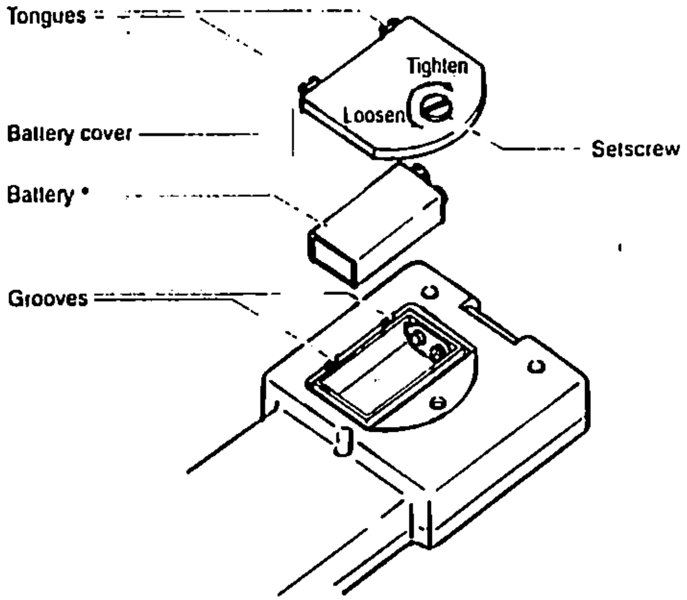
Inserting the battery

The U-10 is shipped from the factory with the battery packed separately.

The battery may be inserted by loosening the set-screw on the battery cover and pulling up the cover. Make sure that the plus and minus poles of the battery match the terminals correctly.

If the readout shows the message Er 1, it means that the battery is defective or exhausted and should be replaced.

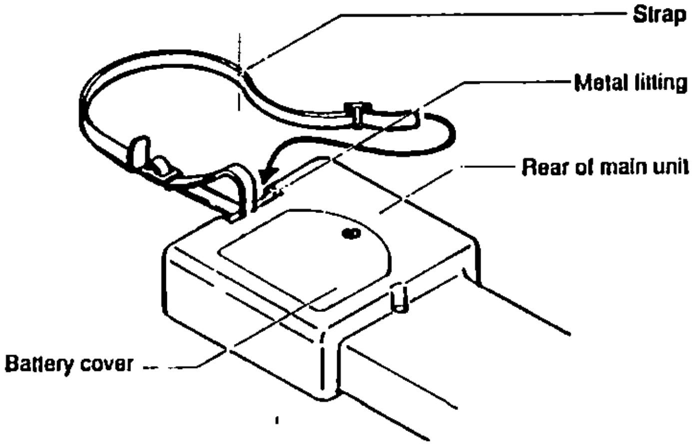
If you are replacing the battery and already have data stored in the U-10 memory that you wish to save, be sure to turn OFF the POWER Key before you remove the old battery. This will assure that data stored in memory will be maintained by the internal backup battery.



• Use a 9V-battery

Attaching the carrying strap

Hook both ends of the strap through the metal fitting on back of the main unit, as illustrated.



Section 2

Making Measurements

Making a measurement with the U-10 Water Checker is extremely simple. Just turn on the power and place the probe in the sample of water you wish to measure.

All six parameters are measured simultaneously. These parameters may be stored in memory, printed out, or viewed one-by-one on the LCD readout. For printing and data storage, see the appropriate sections following this one. To view the parameters one-by-one on the readout, use the SELECT Key to toggle the upper cursor through them.

While the U-10 is both rugged and precise, the key to accurate measurements is cleanliness and frequent calibration. It is essential to clean the U-10 thoroughly after each measurement, and it is recommended that you re-calibrate your U-10 as frequently as possible. For best results, you should recalibrate it before each measurement session. Cleaning and calibration procedures are described below in this section and in the following one.

How to make a measurement

POWER **1** Turn the power on.

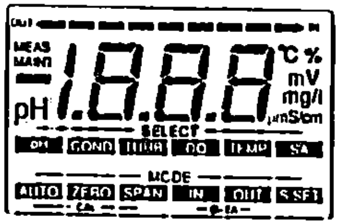
2 Gently place the probe into the water sample.

Basically, that's all there is to it: just turn it on and put the probe in the sample. Of course, the U-10 can do many sophisticated things with the sample data, and for best results, you should be careful about calibrating the unit and maintaining it in good condition. This is explained in detail below and in the next section.

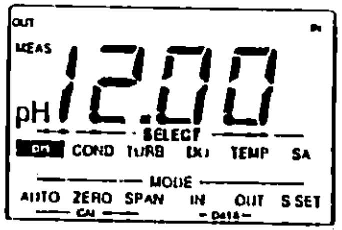
Be careful!
Never drop or throw the probe into the water. It is a precision instrument containing five delicate sensors and five pre-amps; you can damage it beyond repair by unnecessary rough handling.

Initial readout

When you first turn the power on, the U-10 will be in the MEAS mode, the readout will look like this, with all the LCD segments activated.



After about two seconds, the readout will change to show that a new measurement is being made. The readout will show the last parameter that the upper cursor was on when the previous measurement was made, i.e., pH as illustrated here.



(Expanded readout shown)

The display of the decimal point in the readout mode will also be in the same format as was selected with the EXP Key in the previous measurement, i.e., standard or expanded (as illustrated here).

Select the parameter you want shown on the readout of the measured data

All six parameters are automatically measured at once. Use the SELECT Key to toggle the upper cursor to the parameter you want.

pH	: pH
COND	: Conductivity
TURB	: Turbidity
DO	: Dissolved oxygen
TEMP	: Temperature
SAL	: Salinity

To get a uniform reading, slowly move the probe up and down to circulate the water through it. (Move it 1 foot (30 cm) per sec.) Then wait for the readout to stabilize while doing this.

Expanded readout

EXP

Use the EXP readout mode when you wish to see the results with one additional decimal place of accuracy. The EXP Key toggles the readout back and forth between standard to expanded display. The table below shows the result of using the EXP readout mode for each of the six parameters.

Table 1. Accuracy of expanded readout

Parameter	Range of measurement	Accuracy	
		Standard readout	Expanded readout
pH	0-14 pH	0.1 pH	0.01 pH
COND	0-1 mS/cm 1-10 mS/cm 10-100 mS/cm	0.01 mS/cm 0.1 mS/cm 1 mS/cm	0.001 mS/cm 0.01 mS/cm 0.1 mS/cm
TURB	0-800 NTU	10 NTU	1 NTU
DO	0-19.9 mg/l	0.1 mg/l	0.01 mg/l
TEMP	0-50°C	1°C	0.1°C
SAL	0-4%	0.1%	0.01%

Note that the salinity parameter is the only value not measured directly with its own sensor. The U-10 obtains salinity by converting the conductivity value. If large amounts of conductive ions other than salt-water components are present in the sample, an error may occur. Be cautious when interpreting the salinity results.

Measuring fresh water or salt water?

The U-10 can be set to the salinity for either fresh water or salt water when measuring DO. This is done by using the S.SET Sub-Mode.

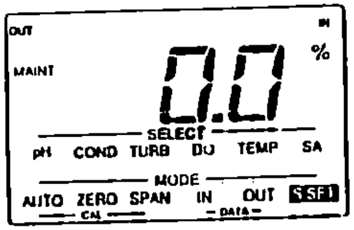
Measuring fresh water

MODE

1. First, use the MODE Key to put the U-10 in the MAINT mode. Keep pressing the MODE Key to toggle the lower cursor to the S.SET Sub-Mode.

▲ ▼

2. Once you are in the S.SET Sub-Mode, use the UP/DOWN Keys to select the salinity value. For fresh water, set the salinity to 0.0%.



ENT

3. Finally, press the ENT Key to complete the salinity setting while in the S.SET Sub-Mode.

MODE

4. When the salinity setting has been made, switch back to the MEAS mode by pressing the the MODE Key.

Measuring salt water

1. First, use the MODE Key to put the U-10 in the MAINT mode. Keep pressing the MODE Key to toggle the lower cursor to the S.SET Sub-Mode.

2. For salt water, set it to *A* *i.e.*, for auto-salinity.
   The *A* setting should be sufficient for measurements of normal sea water with a salinity value close to 3.3%. For sea water of an unusual salinity, however, and where the value is otherwise known, you may wish set the value manually to any salinity within the range of 0.0%-4.0%. (You may also possibly want to use a manual setting if, for example, the COND sensor is malfunctioning but it is still desirable to take readings of the other parameters.)

3. Finally, press the ENT Key to complete the salinity setting while in the S.SET Sub-Mode.

4. When the salinity setting has been made, switch back to the MEAS mode by pressing the the MODE Key.

After measurement: Cleaning and storing the U-10

1. Turn OFF the power.

2. Wash the probe thoroughly with tap water. Be sure to flush off all of sample solution from the probe.

Storing the U-10 for brief periods, *i.e.*, about 1 week or less:

Fill the calibration beaker with tap water and fit the probe over it.

For longer storage

The pH sensor must always be kept moist. Fill the small rubber cap with water and use it to cover the pH sensor.

The KCl internal solution in the reference sensor may seep out over time. Place vinyl tape around the O-ring portion to prevent this.

If you are going to store the U-10 for a prolonged period without using it, remove the battery from the main unit.

Section 3

Calibrating the U-10

The U-10 Water Checker may be calibrated either manually or automatically. The 4-parameter auto-calibration procedure is quite handy and should be sufficient for most measurement operations.

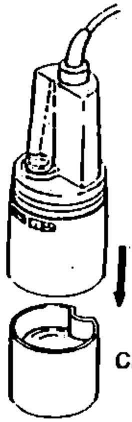
Manual calibration for each of the four parameters is more accurate but, of course, also more time-consuming. This method should be used for more precise measurement. The manual calibration procedure is explained below in detail, following the description of the auto-calibration procedure.

The auto-calibration procedure is extremely simple. The U-10 Water Checker uses just a single solution to do a simultaneous calibration of four parameters: *pH*, *COND*, *TURB*, and *DO*. Your U-10 comes with a bottle of standard phthalate pH solution and a calibration beaker for this purpose.

Auto-calibration procedure

Fill the calibration beaker to about 2/3 with the standard solution. Note the line on the beaker.

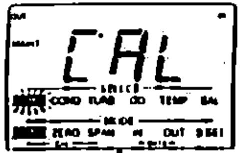
Fit the probe over the beaker, as illustrated. Note that the beaker is specially shaped to prevent the DO sensor from being immersed in the standard solution. This is because the DO auto-calibration is done using atmospheric air.



MODE With the power on, press the MODE Key to put the unit into the MAINT mode. The lower cursor should be on the AUTO Sub-Mode; if it is not, use the MODE Key to move the lower cursor to AUTO.

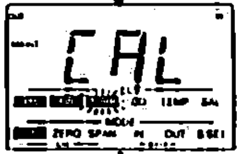
ENT With the lower cursor on AUTO, press the ENT Key. The readout will show *CAL*. Wait a moment, and the upper cursor will gradually move across the four auto-calibration parameters one-by-one: *pH*, *COND*, *TURB*, and *DO*. When the calibration is complete, the readout will briefly show *End* and then will switch to the MEAS mode.

The upper cursor will blink while the auto-calibration is being made. When the auto-calibration has stabilized, the upper cursor will stop blinking.

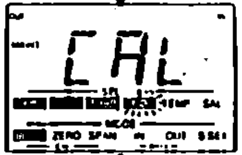


First, pH is being auto-calibrated

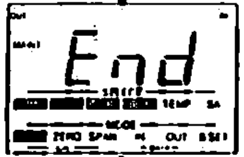
Then, COND is being auto-calibrated



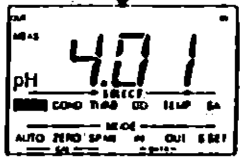
Next, TURB is being auto-calibrated



Finally, DO is being auto-calibrated



Auto-calibration now ends

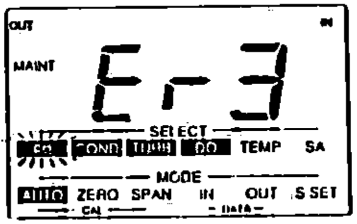


And the readout switches to the MEAS mode

Note: If you wish to abort the auto-calibration for any reason, press the CLR Key. The parameters auto-calibrated so far will be stored in memory.

Auto-calibration error

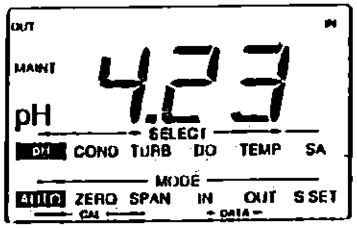
After the DO auto-calibration, if the unit does not switch to the MEAS mode as it should, and the readout shows either Er-3 or Er-4, an auto-calibration error has occurred. Parameters will blink where an error occurred.



pH auto-calibration error

CLR

If this happens, re-do the auto-calibration. First, press the CLR Key to cancel the error code.



ENT

Then press the ENT Key to re-start the auto-calibration. Restart the auto-calibration beginning again with pH.

Manual (2-point) calibration procedures

For normal measurements, the 4-parameter auto-calibration described above is sufficiently accurate. However, you may wish to do a parameter-by-parameter, 2-point manual calibration of one or more of the four parameters. This is recommended either for high-accuracy measurements, especially when using the expanded readout mode. It is necessary if a new probe is being used for the *first time*.

Parameters to be calibrated manually.

pH	• Zero	(see page 24.)
	• Span	(see page 25.)
COND	• Zero	(see page 28.)
	• Span	(see page 29.)
TURB	• Zero	(see page 31.)
	• Span	(see page 31.)
DO	• Zero	(see page 32.)
	• Span	(see page 33.)

Parameters not to be calibrated.

Sample temperature
Salinity

pH calibration

pH calibration on the U-10 is done using two commercially-available standard solutions of different pH values, one for the zero calibration, the other for the span calibration. Note that the temperature characteristics of the various standard solutions that are available may differ; therefore, before using these two solutions to make the pH calibration, carefully measure the temperature and determine the temperature characteristics of each.

Preparation

Wash the probe 2-3 times, using de-ionized or distilled water. Place it in a beaker of each standard solution.

1. Zero calibration

Use a pH7 standard solution for the zero calibration.

Operation

MODE

1. With the power on, press the MODE Key to put the unit into the MAINT mode.

MODE

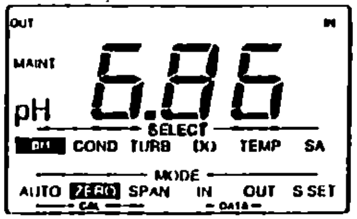
2. Press the MODE Key again to move the lower cursor to ZERO.

SELECT

3. Use the SELECT Key to move the upper cursor to pH.

▲ ▼

4. When the readout has stabilized, use the UP/DOWN Keys to select the value of the pH 7 standard solution at the temperature of the sample. Refer to Table 2 for pH values of standard solutions at various temperatures.



ENT

5. Press the ENT Key to complete the zero calibration for pH.

2. Span calibration

Use either a pH4 or a pH9(10) standard solution for the span calibration.

Operation

MODE 1. Use the MODE Key to move the lower cursor to SPAN.

▲ ▼ 2. As in Step 4. above in zero calibration, when the readout has stabilized, use the UP/DOWN Keys to select the value of the standard solution (i.e., either pH4 or pH9) at the temperature of the sample. Again, refer to Table 2 for pH values of standard solutions at various temperatures.

ENT 3. Press the ENT Key to complete the span calibration for pH.

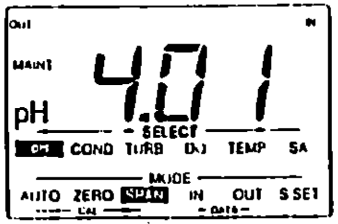


Table 2 pH values of standard solutions at various temperatures*

Temperature ℃ / °F	pH2ᵃ	pH4ᵇ	pH7ᶜ	pH9ᵈ	pH10ᵉ	pH12ᶠ
0 / 32	1.67	4.01	6.98	9.46	10.32	13.43
5 / 41	1.67	4.01	6.95	9.39	10.25	13.21
10 / 50	1.67	4.00	6.92	9.33	10.18	13.00
15 / 59	1.67	4.00	6.90	9.27	10.12	12.81
20 / 68	1.68	4.00	6.88	9.22	10.06	12.63
25 / 77	1.68	4.01	6.86	9.18	10.01	12.45
30 / 86	1.69	4.01	6.85	9.14	9.97	12.30
35 / 95	1.69	4.02	6.84	9.10	9.93	12.14
40 / 104	1.70	4.03	6.84	9.07	9.89	11.99
45 / 113	1.70	4.04	6.83	9.04	9.86	11.84
	1.71	4.06	6.83	9.01	9.83	11.70

a : oxalate, b : phthalate, c : neutral phosphate, d : borax,
e : carbonate, f : Sat.calcium hydroxide solution

* These pH valves are for Japanese standard solutions. Should you prefer to use different standard solutions, be sure to make the proper adjustments in calibration.

COND calibration

The U-10 can measure conductivity in the range of 0-100 mS/cm. Depending on the sample concentration, however, the U-10 automatically selects the proper range out of its three possible ranges of 0-1 mS/cm, 1-10 mS/cm, and 10-100 mS/cm.

Therefore, if you are doing a manual calibration for COND, this must be done for each of the three ranges. However, since the zero point is common for all three ranges, only the three one-point span calibrations need be done separately.

Preparing the standard solution for COND span calibration

This solution uses a potassium chloride as a reagent. For greater accuracy, the solution should be freshly prepared each time. If it is unavoidable to use a stored solution, be sure to keep it tightly capped in a polyethylene or hard glass bottle. The shelf life of this solution is six months. Date-stamp the bottle for reference. Never use a KCl standard solution that has been stored for more than six months. the calibration accuracy may be adversely affected.

Use potassium chloride powder of the best quality commercially available. Dry the powder for two hours at 105°C, and cool it down, in a desiccator. Weigh out an appropriate amount of dried and cooled potassium chloride powder according to the table below. Make the potassium chloride standard solution as shown.

Table 3 Making the potassium chloride standard solution

KCl standard solution	KCl weight g	Conductivity* mS/cm	Range to be calibrated mS/cm
0.005N	0.373	0.718	0-1
0.05N	3.73	6.67	1-10
0.5N	37.28	58.7	10-100

* Value at the temperature, 25°C

To prepare the standard solution, use a 1-liter volumetric flask. First, dissolve the KCl in a small amount of de-ionized or distilled water. Then fill the flask with de-ionized or distilled water up to the 1-liter line. Finally, shake the solution to mix it thoroughly.

1. Zero calibration

This calibration is carried out in atmospheric air; no solution is needed.

Preparation

Wash the probe 2-3 times, using de-ionized or distilled water. Shake the probe to remove any water droplets from the COND sensor. Then allow it to dry by exposing it to fresh air.

Operation

MODE

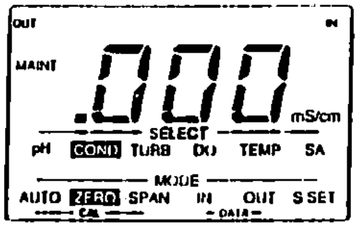
1. Use the MODE Key to move the lower cursor to ZERO.

SELECT

2. Use the SELECT Key to move the upper cursor to COND.

▲ ▼

3. Use the UP/DOWN Keys to set the readout to zero.



ENT

4. Press the ENT Key. This completes the zero calibration for COND.

2. Span calibration

This procedure uses a standard solution of potassium chloride. For best results, a fresh batch of the solution should be prepared each time. See page 27 for details.

Preparation

Wash the probe 2-3 times using de-ionized or distilled water. Following this, wash it 2-3 times in the KCl standard solution you have prepared. Then place the probe in a beaker of the KCl solution maintained at a temperature of 25±5°C.

Operation

MODE

1. Use the MODE Key to move the lower cursor to SPAN.

▲ ▼

2. After the readout stabilizes, as you did for the pH calibration, use the UP/DOWN Keys to select set the value of the KCl standard solution, referring to the KCl table.

ENT

3. Press the ENT Key to complete the span calibration for this COND range.
4. Repeat this procedure for the three ranges, using each of three values of KCl standard solutions.

TURB calibration

Use good-quality de-ionized water, which may be considered as having a turbidity of zero. If that is not readily available, distilled water may be used instead. When doing the turbidity zero calibration, it is particularly crucial that you clean the probe thoroughly. Never use a dirty probe; otherwise the calibration will be unreliable.

Preparing the standard solution for TURB span calibration

1. Weigh out 5.0 g of hydrazine sulfate.
2. Dissolve this in 400 m*l* of de-ionized or distilled water.
3. Then weigh out 50 g of hexamethylenetetramine, and dissolve it in 400 m*l* of de-ionized or distilled water.
4. Mix these two solutions, add enough de-ionized or distilled water to make 1,000 m*l*, and stir the mixed solution thoroughly.
5. Allow this solution to stand for 24 hours at a temperature of 25±3°C.

   The turbidity of this solution is equivalent to 4000 NTUs. The shelf-life of this solution is six months; i.e., this 4,000-NTU value will remain accurate for a maximum of six months.

   Each time you carry out this calibration, it is necessary to dilute the 4,000-NTU standard solution to prepare an 800-NTU standard solution for calibration. To do this, measure out 50 m*l* of the 4,000-NTU solution into a 250-m*l* measuring flask.

   It is recommended that you use a rubber pipette aspirator for this. Then add de-ionized or distilled water up to the 250-m*l* line.

   The standard solution used here for the turbidity calibration will precipitate easily. Therefore, be sure to stir the solution thoroughly before use.

1. Zero calibration

Preparation

Wash the probe thoroughly 2-3 times using de-ionized or distilled water. Shake off excess water droplets, and then place it in a beaker of de-ionized or distilled water.

Operation

1. Use the MODE Key to move the lower cursor to ZERO.
2. Use the SELECT Key to move the upper cursor to TURB.
3. After the readout has stabilized, set it to 0.0, using the UP/DOWN Keys.
4. Press the ENT Key to complete the zero calibration for TURB.

2. Span calibration

Preparation

Wash the probe thoroughly, using de-ionized or distilled water. Shake off excess water droplets. Then place it in a beaker of the 800-NTU solution you have prepared for this purpose.

Operation

1. Stir this 800-NTU span standard solution thoroughly.
2. Use the MODE Key to move the lower cursor to SPAN.
3. After readout has stabilized, i.e., about 60 to 90 seconds, set the readout to "800" NTU, which is the value for this standard solution.
4. Press the ENT Key to complete the span calibration for TURB.

DO calibration

Unlike the other calibration procedures, the solution for the DO calibration cannot be stored for use; because the amount of dissolved oxygen in the solution is crucial, a fresh batch must be prepared each time, just before it is used in the DO calibration.

1. Zero calibration

Use a solution of sodium sulfite dissolved in either de-ionized water or tap water.

Preparation

1. Add about 50g of sodium sulfite to 1,000 ml of water (either de-ionized water or tap water will do). Stir this mixtuer to dissolve.
2. Wash the probe 2-3 times in tap water, and place it in the zero standard solution.

Operation

1. Use the MODE Key to move the lower cursor to ZERO.
2. Use the SELECT Key to move the upper cursor to DO.
3. After the readout has stabilized, set it to 0.0, using the UP/DOWN Keys.
4. Press the ENT Key. This completes the zero calibration for DO.

2. Span calibration

Use either de-ionized water or tap water that has been saturated with oxygen in air.

Preparation

1. Put 1 or 2 liters of water in a container (either de-ionized water or tap water will do). Use an air pump to bubble air through the solution until it is oxygen-saturated.

2. Wash the probe 2-3 times in tap water, and put it in the span calibration solution.

Operation

1. First, be sure the U-10 is set for fresh water readings. To do this, set the S.SET Sub-Mode to 0.0%.

MODE

2. Then, use the MODE Key to move the lower cursor to SPAN.

3. After the readout has stabilized, while slowly moving the probe up and down in the solution, set the readout value to the appropriate DO value for the temperature of this solution. For DO values at various temperatures, refer to Table 4.

ENT

4. Press the ENT Key to complete the span calibration for DO.

Table 4 Amounts of saturated dissolved oxygen in water at various temperatures, salinity = 0.0%

Temperature	DO	Temperature	DO
0 °C	14.16 mg/l	21 °C	8.68 mg/l
1	13.77	22	8.53
2	13.40	23	8.39
3	13.04	24	8.25
4	12.70	25	8.11
5	12.37	26	7.99
6	12.06	27	7.87
7	11.75	28	7.75
8	11.47	29	7.64
9	11.19	30	7.53
10	10.92	31	7.42
11	10.67	32	7.32
12	10.43	33	7.22
13	10.20	34	7.13
14	9.97	35	7.04
15	9.76	36	6.94
16	9.56	37	6.86
17	9.37	38	6.76
18	9.18	39	6.68
19	9.01	40	6.59
20	8.84		

Section 4

Data Storage and Printout

The U-10 can store up to 20 sets of data, 120 data points, of the values measured for each of the six parameters: pH, COND, TURB, DO, TEMP, and SALINITY. Values stored in memory can be recalled to the readout as desired.

If a printer is connected to the U-10 printer port, whenever a Data-Set is either stored in memory or recalled to the readout, it can also be simultaneously output to the printer.

Storing data

MODE

1. Press the MODE Key to put the U-10 in the MAINT mode.

MODE

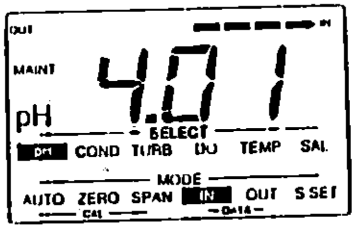
2. Continue to press the MODE Key to move the lower cursor to IN, the *Input* Sub-Mode.

SELECT

3. Use the SELECT Key to move the upper cursor to the parameter you wish to see on the readout.

ENT

4. When the readout stabilizes on a value, press the ENT Key. This will automatically input the set of six parameters for this measurement into memory.



The readout will first show the Data-Set No. for about two seconds. At the top right-hand corner, a dashed arrow points to IN, showing that data is being input. Then each parameter is automatically read into memory, one-by-one from pH to salinity. The upper cursor skips along to show this. If a printer is connected, these six values will also be printed out at the same time.

The upper cursor then returns to pH, with the U-10 still in the IN Sub-Mode.

ENT

5. You may now continue and input another set of data: simply press the ENT Key again.

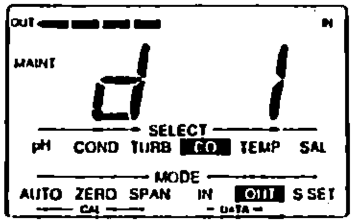
   The Data-Set No. will automatically advance one digit, and the next set of six parameters will be read into memory in the same manner. This procedure can be repeated for up to a total of 20 Data-Sets.

If 20 Data-Sets have been read into memory, the storage capacity is full and no more data may be input. The U-10 will beep three times to indicate the memory is full.

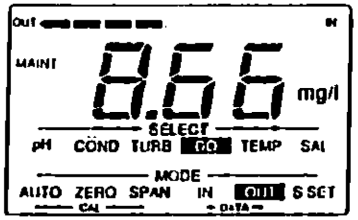
6. To return the readout to the previous setting in the MEAS mode, press the MODE Key again.

Recalling data

1. Press the MODE Key to put the U-10 in the MAINT mode.
2. Continue to press the MODE Key to move the lower cursor to OUT, the *Output* Sub-Mode. The readout will show d.1, meaning Data-Set No. 1.
   At the top left-hand corner, a dashed arrow points to OUT, showing that data can be output now to the readout.



3. Use the UP/DOWN Keys to display the Data-Set No. of the values you wish to recall.
4. Use the SELECT Key to move the upper cursor to the parameter you wish to view.
5. Press the ENT Key to display the data on the readout.

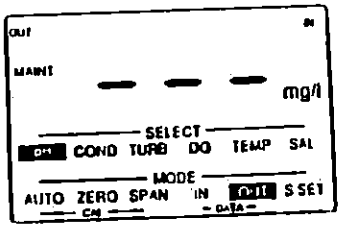


If a printer is connected, all six parameters in this Data-Set will also be printed out at the same time.

ENT

6. When the ENT Key is pressed again, the next Data-Set No. is displayed in order, i.e., d2, if two data sets are in memory. At this point, you can either press the ENT Key again to view the contents of this Data-Set, or you can use the UP/DOWN Keys to go up or down to another Data-Set No.

   If a particular Data-Set is empty, three dashes appear on the readout.



MODE

7. To return the readout to the previous setting in the MEAS mode, press the MODE Key again.

Deleting data

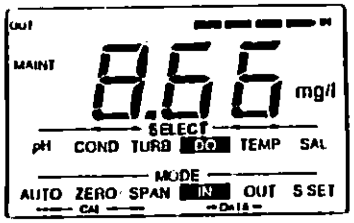
Set the U-10 as if you were going to input data:

MODE

1. Press the MODE Key to put the U-10 in the MAINT mode.

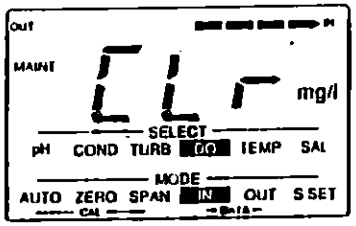
MODE

2. Continue to press the MODE Key to move the lower cursor to IN, the Input Sub-Mode.



CLR

3. Then, to erase all the data from all the Data-Sets in memory, press the CLR Key. The readout will show the message CLr for about two seconds.

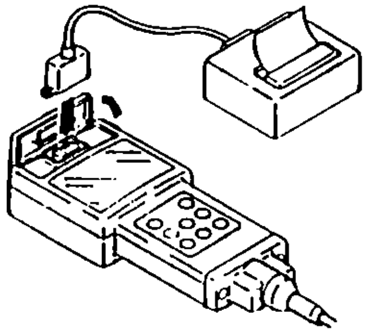


Be careful!
You cannot delete individual Data-Sets. The CLR Key always erases all data from memory.

Printing out data

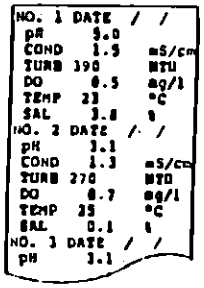
If a printer is connected to the U-10 printer port, whenever a Data-Set is either stored in memory or recalled to the readout, it is also simultaneously output to the printer.

The U-10 printer port is a standard Centronics parallel port. To connect a parallel printer to the U-10: Open the rubber printer-port cover, located directly over the readout on the main unit, and connect the printer cable.



Note:
When a printer is not being used, disconnect the cable from the U-10 printer port, and close the cover tightly.

- **Sample printout**



```
NO. 1 DATE  /  /
 pH      5.0
 COND    1.5   mS/cm
 TURB 390      NTU
 DO      8.5   mg/l
 TEMP  23      °C
 SAL     3.8   %
NO. 2 DATE  /  /
 pH      3.1
 COND    1.3   mS/cm
 TURB 270      NTU
 DO      8.7   mg/l
 TEMP  25      °C
 SAL     0.1   %
NO. 3 DATE  /  /
 pH      3.1
```

Section 5

Daily Maintenance and Troubleshooting

For accurate measurements and prevention of malfunction, routine careful maintenance of the U-10 is important. In particular, failure to maintain the sensors properly can lead to serious trouble or incorrect measurements. The U-10 is provided with error-code functions for the ready detection of potential problems.

Error Codes

The U-10 has an easy-to-understand error message function so you can spot trouble readily. Error codes are displayed on the readout and the unit will beep if an error occurs.
(Note that if you press an incorrect sequence of keys, the unit will beep three times to indicate you have pushed the wrong key.)

Error Code	Cause	Action
Bad battery Er 1	• Defective or low battery	• Replace battery
Failure in main unit Er 2	• Malfunction of memory backup IC	• Push POWER Key to turn the U-10 ON again. If this error code is still displayed, contact your Horiba dealer for repair or replacement.
Zero-calibration error Er 3	*for all parameters*	
	• Poor connection in probe-to-main unit cable	• Connect the cable securely.
	• Water in one of the sensor sockets	• Dry out the sensor sockets.
	• Temperature of sample exceeds maximum scale of U-10	• Replace the probe.
	for pH	
	• Contaminated pH sensor.	• Clean the pH sensor.
	• Improper concentration of reference solution in reference sensor	• Replace the reference solution.
	for COND	
	• Contaminated COND sensor	• Clean the sensor, using tooth brush and neutral detergent.

Error Code	Cause	Action
	for TURB	
	• Contaminated or defective LED sensor	• Clean out the tube containing the LED turbidity sensor, using test tube brush and neutral detergent. Never use an abrasives or cleansers for this.
	for DO	
	• Broken DO sensor membrane.	• Check the LED turbidity sensor. If it defective, the entire probe must be replaced. Check DO sensor. If defective, replace.
Span-calibration error Er 4	*for all parameters*	
	• Poor connection in probe-to-main unit cable	• Connect the cable securely.
	• Water in one of the sensor sockets	• Dry out the sensor sockets.
	• Temperature of sample exceeds maximum scale of U-10	• Replace the probe.
	for pH	
	• Contaminated pH sensor.	• Clean the pH sensor.
	• Improper concentration of reference solution in reference sensor	• Replace the reference solution.
	for COND	
	• Contaminated COND sensor	• Clean the sensor, using tooth brush and neutral detergent.
	for TURB	
	• Contaminated or defective LED sensor	• Clean out the tube containing the LED turbidity sensor, using test tube brush and neutral detergent. Never use an abrasives or cleansers for this. • Check the LED turbidity sensor. If it defective, the entire probe must be replaced.

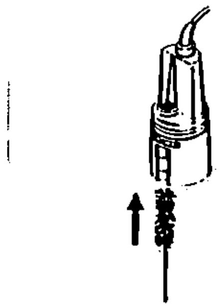
Error Code	Cause	Action
Span-calibration error Er4	*DO Auto-calibration* • Broken DO sensor membrane.	• Check DO sensor membrane. If defective, replace.
	• Excessive difference between DO sensor temperature and atmospheric temperature.	• Leave DO sensor in atmosphere for 30-60 min.
	DO aqueous solution calibration • Broken DO sensor membrane.	• Check DO sensor membrane. If defective, replace.
	• Contaminated electrode.	• Clean the electrode using a soft brush, taking care not to scratch membrane.
	• Insufficient agitation of solution.	• Agitate solution thoroughly.
Memory full Er5	• Data-sets for 20 samples are already in memory.	• To delete all data from memory, put the U-10 in the IN Sub-Mode mode and press the CLR Key.
Printer error Er6	• Jammed printer paper.	• Eliminate jamming of printer paper.
	• Poor cable connection.	• Replace the cable.
	• Wrong printer.	• Use proper parallel Centronics printer.
	• Defective printer.	• Replace the printer as necessary.

Normal probe maintenance

Washing the turbidity sensor

The sensor is a glass tube. Wash out the tube and remove stains carefully, using tap water and a test tube brush.

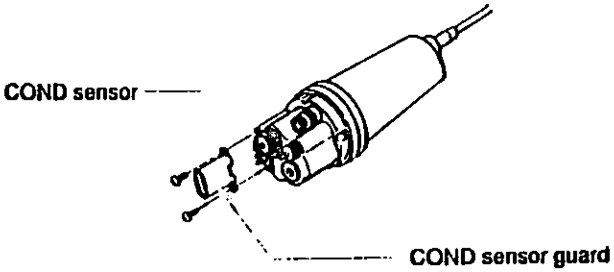
Be careful not to scratch the inside of the glass tube. Never use abrasives or cleansers.



Cleaning the conductivity sensor

Remove COND sensor guard, and carefully use a soft brush to clean off any dust from the sensor unit.

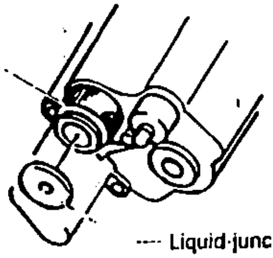
Be sure to replace the COND sensor guard before taking measurements.



Recharging the reference sensor with reference solution

Recharge the reference sensor with reference solution about once every two months, as follows.

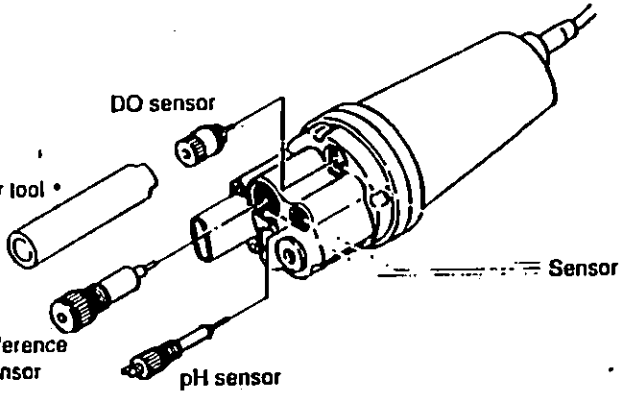
1. Remove the liquid-junction rubber cap from the reference sensor, and pour out the old solution.
2. Fill the reference sensor completely with new reference solution. Make sure there are no air bubbles.
3. Replace the liquid-junction rubber cap.
4. Carefully wash off all excess reference solution from the probe.



Replacing faulty sensors

Three of the U-10's sensors are replaceable: the *pH sensor*, the *reference sensor*, and the *DO sensor*.
These may be replaced as follows.

1. Wipe off any water droplets from the probe.
2. Remove faulty sensor.
3. Insert the new sensor carefully with your fingers.
4. Be careful not to let the sensor sockets get wet.

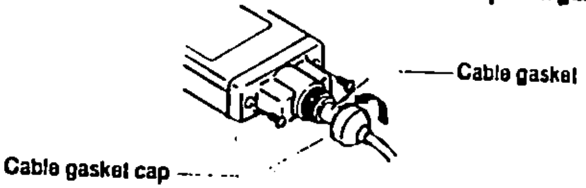


- When replacing the DO sensor, use the sensor tool provided as an accessory.

Replacing a faulty probe

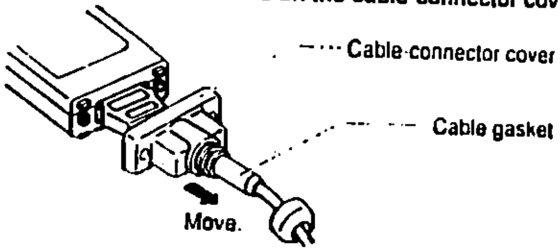
Disconnect the cable from the main unit

1. Loosen the cable gasket cap, and remove cap from gasket.



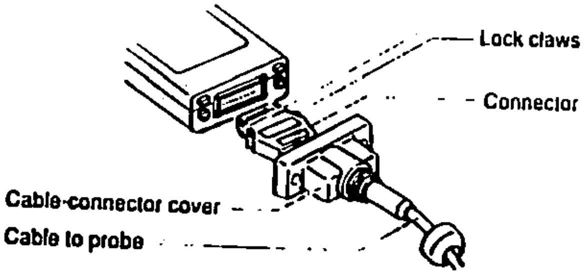
2. Slide back the gasket.

3. Back off the two screws on the cable-connector cover.



4. Slide off the cable-connector cover to expose the connector lock claws.

5. Press lock claws on both sides with your fingers to release the connector. Pull out the connector from the main unit.



Connect the new probe

1. Insert the connector until it clicks.

2. Re-attach the cable-connector cover to the main unit.

3. Slide the cable gasket toward the cable-connector cover, and screw on the cable gasket cap.

Before you use a new probe for the first time, it is necessary to calibrate it manually for all four parameters. Refer to Section 3, "Calibrating the U-10," for instructions on manual calibration.

MiniRAE Plus

PROFESSIONAL PID

OPERATION AND MAINTENANCE MANUAL

(Document No: 002-4001)

Rev. E

CE

RAE SYSTEMS INC.
680 West Maude Avenue, Suite #1
Sunnyvale, CA 94086

July 1998

RAE SYSTEMS

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Table of Contents

THIS DEVICE IS NOT INTENDED TO DETECT COMBUSTIBLE LEVELS OF GASES. THIS DEVICE IS CLASSIFIED FOR USE IN ATMOSPHERES CONTAINING COMBUSTIBLE LEVELS OF GASES.

CET APPAREIL CEST NE PAS INTENDER POUR DETECTER DES NIVEAUX DE COMBUSTION DES GAZ. CET APPAREIL EST CLASSIFIE POUR USAGE DANS DES ATMOSPHERES CONTENANT DES NIVEAUX DE COMBUSTION DES GAZ.

! WARNING !

-DO NOT PROCEED BEFORE READING-

THIS MANUAL MUST BE CAREFULLY READ BY ALL INDIVIDUALS WHO HAVE OR WILL HAVE THE RESPONSIBILITY FOR USING, MAINTAINING, OR SERVICING THIS PRODUCT. The product will perform as designed only if it is used, maintained, and serviced in accordance with the manufacturer's instructions.

CAUTION!!

TO REDUCE THE RISK OF ELECTRIC SHOCK, TURN OFF POWER BEFORE REMOVING THE SENSOR CAP FOR SERVICE. THE SENSOR CAP PROVIDES AN ELECTROSTATIC SHIELD. NEVER OPERATE THE UNIT WHILE THE CAP IS REMOVED.

TO REDUCE THE RISK OF IGNITION OF HAZARDOUS ATMOSPHERES, RECHARGE BATTERY ONLY IN AN AREA KNOWN TO BE NON HAZARDOUS.

NE CHARGER LES BATTERIES QUE DANS EMPLACEMENTS DESIGNES NON DANGEREUX

THE MODEL PGM-76 EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A,B,C,D OR NON-HAZARDOUS LOCATIONS ONLY.

THE MODEL PGM-76IS EQUIPMENT IS CLASSIFIED AS TO INTRINSIC SAFETY FOR USE IN CLASS I, DIVISION 1, GROUPS A,B,C,D OR NON-HAZARDOUS LOCATIONS ONLY.

WARNING

EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I , DIV 2 AND CLASS I, DIV 1

AVERTISSEMENT

RISQUE D'EXPLOSION - LA SUBSTITUTION DE COMPOSANTS PEUT RENDRE CE MATERIEL INACCEPTABLE POUR LES EMPLACEMENTS DE CLASSE I, DIVISION 2 / CLASSE I, DIVISION 1

Special Note

-1-

When the MiniRAE Plus (PGM-76) Professional PID is taken out from the transport case and turned on for the first time, there may be some residual organic vapor trapped inside the ionization chamber. The reading may therefore show a fe ppm. Connect the zero gas adapter supplied with the unit will clear the residual vapor and reduce the reading to zero quickly.

-2-

The battery of the MiniRAE Plus unit drains slowly even when turned off. If the unit has not been charged for 4-5 days, the battery voltage will be low. Therefore, it is a good practice to leave the unit in the charger so that it is fully charged and ready for immediate use. It is also recommended to fully charge the unit FOR AT LEAST 24 HOURS before using it. If the unit is going to be put on the shelf for more than 4-5 days, it is highly recommended to turn off the battery switch at the back of the unit. This will prevent the battery from being deeply discharged.

-3-

The battery switch also serves as a reset switch for the microprocessor inside the MiniRAE Plus Professional PID unit. If for some reasons, the unit is hang up (foe example, no response to key press or display funny characters on LCD display), turn off the switch and then turn it on again should reset the microprocessor.

1.0 GENERAL INFORMATION

MiniRAE Plus is a Programmable Professional Photo-Ionization Detector (PID) to measure organic vapors in hazardous or industrial environments. It incorporates a sampling pump and data download capabilities for continuous toxic monitoring, site survey and leak detection applications. It can measure two classes o toxic gases: (1) organic vapors with the supplied 10.6 eV gas discharge lamp, and (2) chlorinated compounds with the interchangeable 11.7 eV lamp available as in optional accessory. Features are:

- **Lightweight and Compact**
  - 18 oz , cellular phone size
- **Dependable and Accurate**
  - rugged design, microprocessor control
- **User Friendly**
  - menu driven, intuitive end-use operation
- **Programmable Alarm Thresholds**
  - audio buzzer & flashing display alar

MiniRAE Plus (PGM 76K) consists of : a Professional PID unit, AC charging adapter, interface cable, user manual, calibration accessories and a hard transport case.

1.1 General Specifications

Table 1.1

Professional PID Unit Specification	
Size	7.1"L x 2.7"W x 1.8"H (18.0 cm x 6.9 cm x 4.6 cm)
Weight	18 oz with battery (0.510 kg)
Detector	Interchangeable 10.6eV or 11.7eV electrodeless ultraviolet discharge lamp with Teflon/stainless steel chamber
Operating Hours	10 hours continuous operation
Batter	Two rechargeable, 6V, 500 mAh, sealed, lead-acid. Field replaceable.
Gas Sampling:	Piston pump with >400 ml/min intake flow rate
Gas Inlet Probe:	6" flexible 5/32" tube
Gas Outlet :	5/32" diameter barb fitting
Attachment:	wrist strap
Display	7 digit LCD with LED back light
Analog Output:	0 to 1 V
Range	0 - 999.0 ppm with 0.1 ppm resolution, 1000-1999 ppm with 1 ppm resolution
Accurac	+/- 2 ppm or +/- 10% of reading, calibrated to 100 ppm Isobutylene
Response Time	< 3 seconds to reach 90% of exposed concentration
Key-pads	2 operation keys, 2 programming keys, and an ON/OFF key
Alarm Setting	Separate alarm limit settings for TWA, STEL, and Peak in Hygiene Mode; low and high alarm limits for Survey Mode
Alarm	95 dB buzzer and flashing red LED to indicate exceeded preset limits, low battery, or lamp failure
Calibration	Two points field calibration for zero gas and standard gas
Protection	Password protected calibration settings, alarm limits, and data in Hygiene Mode
Data Storage	48 STEL readings (15 minutes interval) in Hygiene Mode; 50 site readings in Survey Mode
Temperature	-10° to 40°C (14° to 104° F)
Humidit	0 % to 100% relative humidit (non-condensing)

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2.0 OPERATION OF MINIRAE PLUS

The MiniRAE Plus Professional PID Unit is a portable organic vapor monitor/sampler. It gives the real time measurements and activates alarm signals whenever the exposure exceeds preset limits. Prior to factor shipment the MiniRAE Plus is preset with default alarm limits and the sensor is pre-calibrated with 100 ppm Isobutylene gas. After receiving the unit, first turn on the battery switch on the back of the unit. Then charge the unit for at least 24 hours to full charge the battery. The unit is ready for immediate operation.

2.1 Physical Description

Figure 2.1 shows the main components of the MiniRAE Plus Professional PID Unit which includes :

- 5 keys for user to interact with the unit : power key and 2 operation keys for normal operation; two programming keys for setting up the unit
- LCD display with back light to show real time and calculated measurements
- Buzzer and red LED for alarm signal whenever the exposures exceed preset limits
- Probe assembly (including gas inlet tube and sensor cap) to draw air sample
- Battery charging jack for connection to AC or DC charging adapter and a battery switch to disconnect battery from the unit
- Gas outlet port for connection to sample collection bag
- Multi-interface jack for connection to PC, audio interface or analog output

The operation details are explained in the following sections.

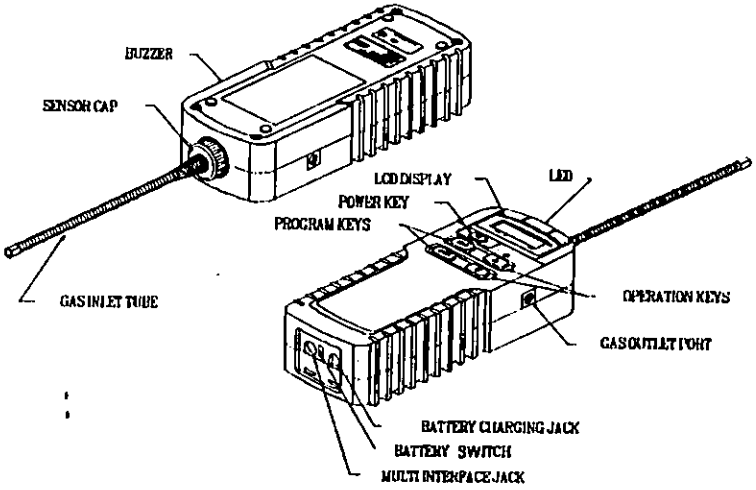


Figure 2.1 Major parts of the MiniRAE Plus

2.2 Two Modes of Operation

The MiniRAE Plus PGM-76 Profession PID unit offers two different operating modes:

1) Industrial Hygiene Mode (simplified as Hygiene Mode): In this mode of operation, the unit measures the air sample once each second and compares it with a preset peak alarm limit. These same measurements are also averaged over one minute intervals with the resulting value used to compute Time Weighted Average (TWA) and Short Term Exposure Level (STEL) values, which are themselves compared to preset alarm limits.

In addition, the STEL values are captured and recorded every 15 minutes for up to 12 hours. A time stamp indicates when the unit was last turned on and off.

2) Site Survey / Leak Detection Mode (simplified as Survey Mode): In this mode of operation, the unit measures air sample once each second and compares it with a preset low alarm limit. A variable frequenc alarm signal is generated in proportion to the magnitude of the measurement. When datalog is enabled, the average value or the peak value over a sampling period which can be programmed from 1 second to 9999 seconds (166 hours) is stored.

The datalogging can be initiated manually (event driven) or the unit can perform continuous sampling (automatic). Up to 50 sets of sample readings with 24 hour time stamps can be recorded in this mode.

Selection of Operation Mode:

Users can configure the instrument to be in either one of the two operating modes using a software package - "ProRAE -76" which is supplied with the Basic Kit o MiniRAE Plus. This software runs on any Personal Computer (PC) under Window™ 3.1 or DOS environment. Please refer to section 6 on how to install this software package , how to interface MiniRAE Plus instrument to PC and how to configure the instrument for either Hygiene or Survey Mode.

After the configuration is downloaded to the instrument as described in section 6, the instrument will be setup to operate in the appropriate mode.

Indication of Current Operation Mode:

When the MiniRAE Plus Professional Unit is first turned on, a software version message will appear in the LCD display. If the unit is configured for Hygiene Mode, the message will be " HG - x.xx". If it is configured for Survey Mode, the message will be "Su - x.xx" where x.xx is the version number of each operating software.

2.3 Keys and Displa

Figure 2.2 shows the LCD display and the keypad on the front panel of the unit. The function of the 5 keys during normal operation are summarized bellow:

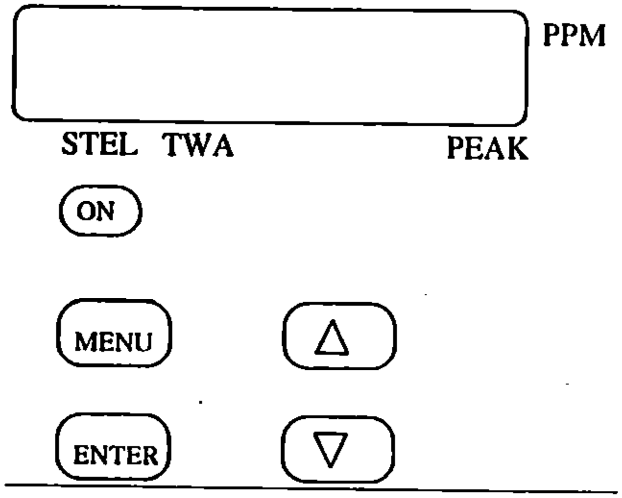


Figure 2.2 Key-pad and display of MiniRAE Plus

Table 2.1

Key	**Function in Normal Operation**
[on]	-Toggle on/off the power;
[up]	-Toggle on/off the back light
[down]	-Choose display readings
[enter]	-Confirm to turn off the power*
[menu]	-Enter into programming task** **Caution: entering programming task will interrupt normal gas monitoring operation of the unit.**

Note:

* - **[enter]** key is also used to turn off buzzer during Hygiene Mode operation, and to start/stop datalogging operation in Survey Mode (see section 2.8 and 2.9 for details).

** - **[menu]** key is also used in conjunction with the **[on]** key to clear previously saved data in Hygiene Mode during a special power on sequence (see section 2.11 for details).

The MiniRAE Plus Professional PID includes a 7-digit LCD display with 4 labels of STEL, TWA, PEAK, and PPM marked on the window, as shown in Figure 2.2. The display will show the following five types of readings:

- Real time gas concentration in pp
- Short term exposure level (STEL) of the gas concentration in ppm*
- Time weighted average (TWA) value of the gas concentration in ppm **
- Peak gas concentration in ppm
- Battery voltage in volt (from 5.3 to 6.4 V)

Note:

* - the 15 minute STEL reading is only available in Hygiene Mode operation.

** - the TWA reading is based on fixed 8 hours average value define by OSHA in Hygiene Mode operation. In Survey Mode, the TWA reading is the average value over each sampling period.

2.4 Power On/Off

To turn on the MiniRAE Plus Professional PID Unit, press **[on]** key. The audio buzzer will beep once and the display will show "HG- x.xx" or "Su- x.xx" to indicate the operating mode and software version number. The unit will then go through a self-diagnostic routine to check the key components of the unit. A ".dIAG.." message will be displayed with red back light turned on while the self-diagnostic routine is executing. The red LED and back light will flash once and buzzer beep once to ensure that they are functional. The sampling pump will be turned on and start to draw air sample.

After about 30 seconds, the display will change to instantaneous reading of the gas concentration in pp if the unit passes diagnostics tests. If there is an problem with the unit, an error message will be displayed (Refer to section 9 for troubleshooting o the particular error condition).

To turn off the MiniRAE Plus Professional PID Unit, press **[on]** key. The message "Off" will flash on the LCD display. If users really want to turn off the unit, press **[enter]** key to confirm and the unit will be turned off. Press any other key will return the unit to normal operation.

2.5 Display Readings

The MiniRAE Plus Professional PID Unit can displa five different readings: instantaneous gas concentration , STEL*, TWA, peak and battery voltage. Here is a brief explanation of each reading:

1) The **instantaneous** reading is the gas concentration in parts per million (ppm). The reading is updated once a second and is shown as " xxx.x" in the LCD display without any arrow cursor or character display. Note: in Survey Mode, a two digit site number will also be displayed together with the instantaneous reading as "00 xxx.x". The site number starts from 00 and ends at 49.

2) The **STEL*** reading is the last 15 minute average reading of the gas concentration. The reading is updated once a minute and is shown as "xxx.x" with a small arrow cursor pointing to the "STEL" label on the LCD window.

3) The **TWA** reading in Hygiene mode is the accumulated reading of the gas concentration divided by 8 hours since the data was cleared last time. The reading is updated once a minute and is shown as "xxx.x" with a small arrow cursor pointing to the "TWA" label on the LCD window. In Survey mode, the **TWA** reading is the average gas reading during the previous sampling period.

4) The **peak** reading in Hygiene mode is the maximu reading of the gas concentration since the data was cleared last time. The reading is updated at one second interval and is shown as "xxx.x" with a small arrow cursor pointing to the "PEAK" label on the LCD window. In Survey mode, the **peak** reading is the peak gas reading druing the previous sampling period.

5) The **battery voltage** reading is the current batter voltage in volt. The reading is updated once a minute and is shown as "bAt xxx.x" in the LCD window.

Choose a reading :
The five readings are arranged in a "round robin" order:

instantaneous => STEL* => TWA => Peak => battery voltage => instantaneous

To choose a specific reading, press the **[down]** key one or more times in normal operation mode until the desired reading shows. For example, to display STEL reading, press **[down]** once. To display TWA reading. press **[down]** key twice, and so on.

* - the STEL value is not displayed in Survey Mode.

2.6 Alarm Signal

The built-in microcomputer constantly updates and monitors real time gas concentration and compares it with the programmed alarm limits (TWA, STEL, and peak limits for Hygiene Mode, low and high limits for Survey Mode). Whenever the concentration exceeds any of the preset limits, the alarm buzzer and red flashing LED will be activated immediately to warn user of the alarm condition.

Note: a fully charged battery should show 6.3 volt or higher. Whenever the battery voltage falls bellow 5.5 volt or the UV lamp or sensor module fails, the unit will also activate the buzzer and red LED alarm signal. When the low battery alarm occurs, there will be about 20-30 minutes operating time left from the battery. When the battery voltage falls bellow 5.3 volt, the unit will be turned off automatically.

Note: in <u>Hygiene Mode</u>, the alarm signal of the gas concentration exceeding preset limits is a " two beeps" and "two flashes" per second. The lamp or sensor failure alarm signal is a "single beep" and a "single flash" per second. The battery low alarm signal is a "single flash" per second. A flashing message of "Err xxx.x" in the LCD display indicates the lamp or sensor failure condition. A flashing message of "bAt xxx.x" indicates the low battery condition. In addition, there will be a "single beep" per minute to remind users that battery voltage is low.

Note: it is extremely important that when the lamp or sensor failure alarm occurs, users should stop the operation of the unit immediately and follow the troubleshooting guide in section 9 to diagnose the problem.

In <u>Survey Mode</u>, the alarm signal is proportional to the magnitude of the gas concentration. Therefore, when gas concentration exceeds preset limits, the alar signal may vary from a "single beep" and a "single flash" per second to a rapid " 7 beeps" and " 7 flashes" per second when the high threshold level has been exceeded. The higher frequency of alarm signal indicates higher gas concentration.

The lamp or sensor failure alarm signal is a single beep and a single flash per second. The battery low alar signal is a single flash per second. A flashing message of "Err xxx.x" in the LCD display indicates the lamp or sensor failure condition. A flashing message of "bAt xxx.x" indicates the low batter voltage condition. In addition, there will be a "single beep" per minute to remind users that battery voltage is low.

2.7 Preset Alarm Limits and Calibration

The MiniRAE Plus Professional PID Unit is factor calibrated with standard isobutylene gas, and is programmed with default alarm limits as listed below. Refer to section 4 and 5 for programming procedures i new calibration or new alarm limits are required.

Table 2.2

Factory Calibration and Preset Alarm Limits	
Calibration Standard Gas isobutylene	100 ppm
Hygiene Mode:	
TWA Alarm Limit	10 ppm
STEL Alarm Limit	25 ppm
Peak Alarm Limit	50 ppm
Survey Mode:	
Low Alarm Limit	10 ppm
High Alarm Limit	100 ppm
Battery Low Level	5.5 volt
Power Off Level	5.3 volt

2.8 Datalogging

The MiniRAE Plus Professional PID Unit is capable o recording crucial data during normal operation. The recorded data can be down loaded to Personal Computer later on for record keeping or report generation. The data recorded in two operating modes are different:

Hygiene Mode:
In Hygiene Mode, MiniRAE Plus Professional PID Unit calculates and stores the values of TWA, STEL, Peak concentration and 12 hours of STEL readings taken at 15 minutes interval (a total of 51 readings). In addition, the time stamps which indicate: when the unit was last turned on and off, when the peak occurred and when the TWA alarm occurred (if any) will also be recorded.

In Hygiene Mode, the datalogging operation is activated automatically when the unit is turned on. When power is turned off, the data will be retained in non-volatile memory. At each "turn on" time, the previously stored data will not be cleared and the unit will continue to record data. If users wish to clear the data at power on, they need to follow the special power on sequence as described in section 2.11.

When the data memory is full (12 hours of STEL readings), the unit will stop recording new data and the previously stored data will not be over written.

Survey Mode:

In Survey Mode, the MiniRAE Plus Professional Unit will allow users to record up to 50 readings of average or peak gas concentration over a specified sampling period. In addition, a time stamp and a site number will also be recorded together with each reading. The sampling period can be programmed from 1 second up to 9999 seconds.

Users are allowed to select one of the following two different datalog options:

1) <u>manual sampling option:</u> in this option, users have to press **[enter]** key to start each sampling period. When a sampling period is over, the datalogging operation will stop.

2) <u>continuous sampling option:</u> in this option, users press **[enter]** key once to start the first sampling period. At the end of each sampling period, next sampling period will start automatically. The datalogging operation will not stop until another **[enter]** key is pressed.

Note: in either option, the datalogging operation will stop when **[enter]** key is pressed any time during a sampling period.

User is also allowed to choose to datalog the **average** value or the **peak** value of each sampling period (see section 5.14 for details).

The site number will automatically advance to next one when a sampling period is over. Users can use "select site number" menu in programming task to change to a different site number (see section 5.4 for details).

When datalogging is in progress during a sampling period, the unit will not respond to **[menu]** key input to prevent disruption of the datalogging operation. A small letter "d" will also flash next to the site number to indicate that the datalogging is in progress.

When the data memory is full (48 readings), the unit will start to over write old data.

<u>Default sampling period:</u>

The default sampling period for Survey Mode is set to 1 second. With this setup, every time the **[enter]** key is pressed, a single reading will be recorded. This is particularly convenient for leak detection applications.

2.9 Turn Off Buzzer

In Hygiene Mode, the alarm buzzer can be turned o for 60 seconds by pressing **[enter]** key. After the 60 second time interval expires, the buzzer will resume i the alarm condition still exists.

Note: this feature is not available in Survey Mode because the **[enter]** key is used to start and stop datalogging operation.

2.10 Back Light

The LCD display is equipped with a red LED back light to assist the readings under poor lighting conditions. This back light can be turned on b pressing the **[up]** key. When the back light is alread on, press **[up]** key will turn it off.

Note: the LED back light consumes higher amount o energy from the battery and will shorten the operating time of the unit. Therefore, it is important to turn the back light off when it is not needed.

2.11 Special Power-on Sequence

In MiniRAE Plus Professional PID Unit, all data are automatically retained in non-volatile memory even i the power is turned off. Users can therefore turn o the unit and turn it back on to resume the operation without losing previously stored data during normal operation.

The MiniRAE Plus also provides a special power on sequence in Hygiene Mode **to clear all data** (i.e. the values of TWA, STEL, Peak concentration and 48 STEL readings taken at 15 minutes interval) and start recording new data at power on time. This is accomplished by pressing **[menu]** key first, holding it down and then pressing **[on]** key to turn on power.

Note: during the special power on sequence, the display will show a " CLr .." message to indicate that all the data is being cleared.

2.12 Diagnostic Power-on Sequence

The MiniRAE Plus Professional PID Unit offers a special diagnostic power on sequence to allow user to read "raw" (or un-calibrated) instrument readings during zero gas calibration procedure. This feature can provides additional information to users regarding the sensor performance. This is accomplished b pressing **[up]** key first, holding it down and then pressing **[on]** key to turn on power.

Note: using the special diagnostic power on sequence, the unit will perform normally except during zero gas calibration procedure (see section 4.7.1). The displa will show a "raw" reading, instead of the "ppm" reading. Typically, the reading should be between "330.0" to "370.0". When exposed to a calibration gas, the reading should go down quickly. The reading can be anywhere between "0.0" to "300.0".

If the reading does not change when exposed to a calibration gas, then it is an indication that the lamp is very weak or the sensor module is defective.

2.13 Disconnect Batter

The MiniRAE Plus Professional PID Unit provides a mechanical switch to allow user to disconnect the battery from the unit. This is to prevent the batter from being deeply discharged when the unit is placed on the shelf or during shipment.

To disconnect the battery, open the rubber cover at the rear side of the unit, find a small switch between the battery charging jack and the multi-interface jack. Use a ball pen to move the switch to OFF position (down). When the switch is in OFF position, the battery will retain 85% of its charge after 6 months.

Note : when the battery is switched off, the real time clock will stop. However, the calibration and datalog information will be preserved for at least 10 years.

Reset Microprocessor

The battery switch also serves as a reset switch for the microprocessor inside the MiniRAE Plus Professional PID unit. If for some reasons, the unit is hung up (no response to key press or display funny characters on LCD display), turning off the switch and then turning it on again should reset the microprocessor.

3.0 OPERATION OF ACCESSORIES

There are a number of accessories for MiniRAE Plus Professional PID Unit:

- 110 V AC charging adapter
- Gas outlet port adapter and sample collection Tedlar bag
- Remote access probe (8 ft.)
- Audio interface adapter cable and earphone
- Analog interface adapter cable
- Water trap disk
- Dilution probe
- UV attenuator ring

The operation details of these accessories are explained in the following sections.

3.1 Charging of the MiniRAE Plus

On the rear side of the MiniRAE Plus Professional PID Unit, there is a battery charging jack which is normall covered by a protective rubber cover. Open the rubber cover and connect the AC adapter (or the automotive DC charging adapter, depending on the power source) to the charging jack.

There is a bi-colored LED inside the LED window which will provide an indication of the charging status:

Red - battery is being charged
Green - charging is completed
No Light - bad connection or defective batter

Plug in the AC (or DC) adapter which will turn on the red charge status LED first. If the battery is full charged, it will turn to green quickly. A completel discharged battery will be charged to its full capacit within 10 hours.

WARNING:
TO REDUCE THE RISK OF IGNITION OF HAZARDOUS ATMOSPHERES, RECHARGE BATTERY ONLY IN AREA KNOWN TO BE NON HAZARDOUS. REMOVE AND REPLACE BATTERY ONLY IN AREA KNOWN TO BE NON HAZARDOUS.

Note: the factory-supplied battery is designed to last 10 hours of normal operation for a new battery under the best conditions. As the battery becomes older or operated under adverse conditions, the battery capacit will be reduced significantly.

The battery of the MiniRAE Plus unit will be drained slowly even if the unit is turned off. If the unit has not been charged for 4-5 days, the battery voltage will be low. The charging circuit is designed to prevent over charging. Therefore, it is a good practice to always leave the unit in the charger when it is not used so that it is fully charged and ready for immediate use.

There is an optional **single station battery charger** accessory for the MiniRAE Plus Professional PID Unit. This charger will allow users to charge a spare battery outside the unit. Plug the battery to the jack on the back of the charger to charge the spare battery.

There is also an optional **automotive charging adapter cable** which allows user to charge the MiniRAE Plus unit directly from the 12 V cigarette lighter socket inside a car.

3.2 Sample Gas Collection

On the right side of the MiniRAE Plus Professional PID Unit, there is a gas outlet port where the gas sample can be collected after going through the sensor module and pump unit.

A gas outlet port adapter with 2 ft. Tygon tubing is supplied with the basic kit. Insert the threaded end o the adapter into the gas outlet port and turn clock wise to tighten the adapter. The open end of the Tygon tubing can be connected to a sample gas collection bag. A complete gas collection kit which includes a gas outlet adapter, 2 ft. Tygon tubing and a three liter Tedlar sample collection bag is also available as an accessory.

3.3 Remote Access Probe

A remote access probe is available as an optional accessory for the MiniRAE Plus Professional PID Unit. This probe is constructed with an aluminu telescoping pointer and 6.5 ft. Teflon tubing. The telescoping pointer allows the probe unit to be stored in a compact space when not in use and convenientl extended into a 4 ft. long pointer to reach difficult to reach sampling space, e.g. above a ceiling or inside a large container, etc. The other end of the Teflon tubing can be inserted directly into the gas inlet tube o the PID unit.

Note: when the remote probe is used, there will be an additional delay of about 2-3 seconds of the instrument response because the sample gas has to travel through the 8 ft tubing before it reaches the sensor module inside the unit. The traveling speed of air sample inside the tubing is 3 ft per second.

The sampling pump can pull in sample gas from as far as 200 ft horizontally or 100 ft vertically.

3.4 Audio Interface Adapter and Earphone

On the rear side of the MiniRAE Plus Professional PID Unit, there is an 8 pin round multi-interface jack which is normally covered by a protective rubber cover. An audio interface adapter cable and a small earphone is available as an optional accessory for the MiniRAE Plus Professional PID Unit. Open the rubber cover and connect the interface cable to the jack.

The audio buzzer signal is brought out through this interface cable. Plug the earphone into the mini-RCA jack on the end of the interface cable. Users can now hear the same alarm signal through the earphone.

WARNING:
TO REDUCE THE RISK OF IGNITION OF HAZARDOUS ATMOSPHERES, DO NOT CONNECT THE EARPHONE OR EXTERNAL ALARM DEVICES TO MINIRAE PLUS IN AREA KNOWN TO BE HAZARDOUS.

Audio alarm signal

The audio alarm signal consists of a series of 2 kHz pulses appearing at pin 7 of the multi-interface jack. The duty cycle of the signal is 50%. Figure 3.1 shows the specification and waveform of the alarm signal:

Alarm signal specification:

voltage :	6 V peak to peak
current :	14 mA max
frequency :	2 kHz
duty cycle:	50% square wave
duration:	50 mili-seconds
pin out:	Pin 7 - signal
	Pin 8 - ground

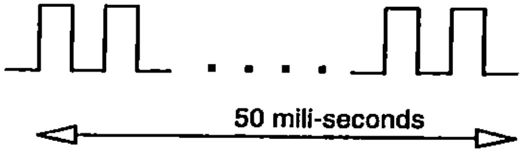


Figure 3.1 Alarm signal wavefor

Note: the audio interface can be connected an external alarm box which can amplify the alarm signal or produce a strong flash light signal, if needed. If users need to use their own earphones, make sure that the earphones have at least 200 ohm impedance.

3.5 Analog Interface Adapter

An analog interface adapter cable is available as an optional accessory for the MiniRAE Plus Professional PID Unit. Open the rubber cover and connect the interface cable to the multi-interface jack.

The analog signal output from the sensor module (0 - 1 V) is brought out through this interface cable. Connect the mini-RCA plug on the other end of the interface cable to any external recording equipment, such as a strip chart recorder, or an analog datalogger. Users can readily interface the MiniRAE Plus Professional Unit to external equipment for extended datalogging or other field applications.

WARNING:
TO REDUCE THE RISK OF IGNITION OF HAZARDOUS ATMOSPHERES, DO NOT CONNECT THE ANALOG INTERFACE CABLE TO MINIRAE PLUS IN AREA KNOWN TO BE HAZARDOUS.

Analog output signal

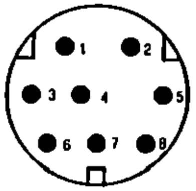
Pin 1 of the multi-interface jack carries the un-calibrated analog signal directly from the PID sensor. The output impedance of the signal is 3.5 k Ohm. The range of the voltage output is from 0 to 1 Volt. **Note:** the analog signal output has a built-in offset o about 160-170 mV. When a 100 ppm Isobutylene gas is applied to the instrument, the output signal will increase by about 20-30 mV.

Note: in order to prevent overloading of the analog output signal, when connecting to external device, only high impedance inputs should be used.

Multi-interface pin assignment

The multi-interface jack at the bottom of the unit is a circular DIN receptacle with 8 holes. The signal assignment on this connector is shown in Figure 3.2

Pin #	Description
1	analog output
2	reset (from PC)
3	data input (from PC)
4	R6 output (to PC)
5	data output (to PC)
6	clock (to PC)
7	alarm output
8	Ground



Rear View

Figure 3.2 Pin diagram of the multi-interface connector

3.6 Water Trap Disk

A water trap disk device is offered as an accessory to the MiniRAE Plus Professional PID unit. This device is constructed with a polypropylene housing and PTFE membrane filter. This device is to be inserted into the front end of the gas inlet probe during operation.

The water trap disk will prevent liquid to be suck into the PID unit by accident. If water is suck into the disk, the air flow will be reduced significantly and the pump will stall. Users can stop the unit immediately when observing water inside the disk or hearing the pump stalling.

3.7 Dilution Probe

A dilution probe device is offered as an accessory to the MiniRAE Plus Professional PID unit. This device mixes one part of incoming gas sample with 9 parts o clean air to dilute the concentration of the gas sample by 10 times. The clean air is obtained through a charcoal filter.

Install dilution probe :
Remove the regular probe. Make sure that O-ring and a membrane filter remain inside the hole on the front o the sensor block. Screw on the dilution probe.

Calibrate dilution probe :
In the factory, the dilution probe is preset at approximately 10: 1 ratio with about 5-10% error. User can adjust the dilution probe during calibration using a 5/64" Allen wrench to achieve exact 10:1 ratio. Here is how:

Step 1 : Connect the "zero gas" to the probe, follow the instructions in section 4.8.1 to calibrate the zero gas.
Step 2 : Follow the instruction in section 4.8.2 to enter the standard reference gas value. **Note: enter only 1/10 of the actual value of the standard gas, not the actual value.** For example, if the calibration gas is 500 ppm, enter 50 in this step, do not enter 500.

<u>Step 3 :</u> Connect the standard reference gas to the probe. Turn on the gas, press [enter] key on the MiniRAE. Wait for about 30 seconds until the gas reading appear on the LCD display. This reading should be very close to 1/10 of the actual gas value. I the value is off a little bit, use the Allen wrench to adjust the set screw. <u>Note:</u> user has to loosen the lock nut first, then turn the set screw. Turn set screw clock-wise will decrease the ratio and increase the reading. Turn set screw counter clock-wise will increase the ratio and decrease the reading.

<u>Step 4 :</u> After the exact ratio of 10:1 is achieved, tighten the lock nut. Press [enter] key to accept the value and turn off gas. This complete the calibration procedure. Now the dilution probe will always dilute the incoming sample by a ratio of 10:1.

Special consideration for calibrating the dilution probe using Tedlar bag method :
When calibrating the dilution probe, it is highl recommended that a Tedlar bag be used, instead o using a fixed flow regulator with the gas bottle directly, because the fixed flow regulator will try to force a fixed amount of gas sample into the probe while the clean air is sucked into the probe by the sampling pump of the MiniRAE. This will create uneven pressure between the two passages inside the dilution probe and causes errors in the mixing ratio. Using Tedlar bag method can avoid this uneven

pressure problem and achieve more accurate mixing ratio.

Routine maintenance for dilution probe :
<u>(1) Replace membrane filter :</u>
The membrane filter needs to be replaced every 3-4 weeks or when it is dirty. The membrane filter is located inside the cavity on the front of the probe where the Teflon tube is connected to the body of the probe. Use a pliers to unscrew the tube adapter fro the body. Replace the membrane filter. Make sure that the Teflon washer remains inside the cavity. Replace the tube adapter.

<u>(2) Replace charcoal filter :</u>
The charcoal filter needs to be replaced every six months or sooner. Use a screw driver to remove the two screws that hold the front piece with a set screw from the body of the probe. Replace the charcoal filter. Make sure that the O-ring inside the front piece remain inside the hole. Re-attach the front piece to the body by two screws.

After replacing membrane filter or charcoal filter, always re-calibrate the probe.

3.8 UV Attenuator Ring

An UV attenuator ring has been included inside the sensor block of the MiniRAE Plus Professional PID unit. This ring is made of Teflon material with 0.5" outside diameter and 0.2" hole diameter. This ring is to be put in front the lamp window against the sensor block. This ring reduces the UV light intensity to about 16% of the original intensity from the lamp. The purpose of this ring to allow the unit to use a stronger UV lamp. The stronger UV lamp will provide better stability and a longer operating life. However, such a strong lamp may cause the sensor to saturate when high concentration of vapor is measured.

When to use the Attenuator Ring ?
When high concentration of vapor (greater than 500 ppm) is expected during normal operation.

Installation of the Attenuator Ring :
To install the ring, open the sensor block from the lamp housing, put the ring on the 0.5" hole opening on the sensor block. Then close the lamp housing, making sure that the lamp window is pressed against the ring. After the ring is installed, go through normal calibration procedures, and the unit is ready to operate.

Removal of the Attenuator Ring :
1) When the vapor concentration of interests are usually small (less than 500 ppm) or
2) When the 11.7 eV lamp is used or
3) When the UV lamp has been used for a long period of time (over 6 months) and the UV light intensity is low (This condition can be detected if you get an "Sensor Error" message or "Calibration Error" message from time to time during regular operation.).
In this case, removing the Attenuator Ring will increase the light intensity by about 3 times and prolong the usage of the lamp before needing to replace with a new one.

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4.0 PROGRAMMING IN HYGIENE MODE

The MiniRAE Plus Professional PID Unit is built with a microcomputer to provide programming flexibility. In Hygiene Mode operation, authorized users can re-calibrate the unit, change the gas concentration alar limits and set the date and time of the internal real time clock.

The programming is menu-driven to provide intuitive end-use operation. The display shows the menu option, and the keypad is used for the selection or data entry to each menu option.

Note: in Hygiene Mode, a 3 level security protection strategy is offered for programming flexibility:

security level	protection
0	change not allowed
1	change allowed, need password
2	change allowed, no password

The security level and password can be set up in the instrument configuration software "ProRAE-76" that runs under PC-Window™ 3.1 or DOS. The securit level and password are then downloaded into the instrument (see section 4.11 and 4.12 for details).

4.1 Menu Options

The Hygiene Mode programming provides ten menu options as shown in Table 4.1 below. The first menu option allow entry into the programming menu b keying a four digit password (Note: this menu option will be displayed for level 1 security only). Once inside the programming menu, menu option 2 to 10 can be selected by toggling the **[menu]** key through the list of menu options until the desired option is displayed. **Note:** <u>At the end of last menu option, the unit will automatically exit the programming task and return to normal operation.</u> In order to return to programming task, press **[menu]** key again.

During the programming task, press **[menu]** key will abort and exit the current menu option and go on to the next menu option on the list. At the completion o each menu setup entry, the unit will automaticall advance to next menu option. Each option is explained in the following sections. The flow chart o the Hygiene Mode programming task is shown in Appendix A.

Note: the security level of the instrument determines which menu option will be displayed during programming task. The security levels associated with each menu option is listed in Table 4.1. For example, if an instrument is setup to have level 1 security, then all ten menu options will be displayed. during

programming task. If the security level is set to 0, then only five menu options will be displayed.

Table 4.1

	Menu Option	**Displa**	**level**
1	Verify password	Pd-0000	1
2	Set STEL limit	SA xxx.x	0 1 2
3	Set TWA limit	tA xxx.x	0 1 2
4	Set Peak limit	PA xxx.x	0 1 2
5	Zero gas calibration	C0 xxx.x	1 2
6	Standard gas value	C1u xxx.x	1 2
7	Standard gas calibration	C1 xxx.x	1 2
8	Clear all data	CLr ALL	1 2
9	Change hour and minute	Hr xx.xx	0 1 2
10	Change month and date	dA xx.xx	0 1 2

Note 1: xxxx is the previously stored data.

4.2 Keys for Programming Task

The five keys perform a different set of functions during the programming task as summarized below.

Table 4.2

Key	Function in Programming Task
[on]	This key does not function during programming task
[up]	Increment numerical value for data entr
[down]	Decrement numerical value for data entry
[enter]	Confirm menu selection
[menu]	Exit current menu selection and go to next menu option

4.3 Entering into Programming Task

CAUTION

Do not operate programming task in the potentially hazardous environments that require continuous protection. The real time monitoring of gas concentration will be interrupted during programming task.

1. The Professional PID Unit should already be turned on before entering the programming task. If it is not on, refer to section 2.4 for the power on sequence.

2. Press **[menu]** key to enter programming task.
   -Display then shows "Pd- 0000" with the left-most digit* (the most significant digit) flashing. User should enter a password starting from this flashing digit.

(**Note 1:** Prior to factory shipment, the Professional PID unit was installed with "0000" as the default password. Enter "0000", if the password has not been changed by an authorized users)

(**Note 2:** For added security, "0000" is always displayed instead the actual password at this step.)

3. If the correct digit value is not "0", use **[up]** arrow key or **[down]** arrow key to increase or decrease the digit value. Then press **[enter]** key to confirm the value.
    - Display then shows the actual digit entered and moves the flashing digit to the next digit (to the right).

4. Repeat step 3 until all four digits are entered.

5. If the entered password is correct, the unit shows the first programming menu. The first menu option is to set STEL alarm limit. The LCD display will show a message of " SA xxx.x". If the entered password is not correct, the unit will display an error message and return to normal mode operation. Should **[menu]** key be pressed prior to step 4, the unit will abort the password entry and return to normal mode operation.

* **Note:** if the security level of the unit is set to either "no change allowed" (level 0) or "change without password" (level 2), this "password entry" menu option will not be displayed.

4.4 Set STEL Alarm Limit

1. "Set STEL alarm limit" option is the 2nd menu option in Table 4.1.
    - Display shows "SA xxx.x" with the left-most digit flashing, where "xxx.x" is the previously stored STEL alarm limit.

2. To modify this limit, starting from the left-most digit, use **[up]** or **[down]** arrow key to change the digit value and **[enter]** key to confirm the digit, the flashing digit will move on to next digit to its right. Repeat this process until all 4 digits of the new STEL alarm limit are entered.

3. To preserve the previously stored STEL alarm limit, press **[menu]** key at step 1 or in the middle of step 2, the unit will abort the STEL alarm limit entr and move to the next menu option.

4. **Note:** if the security level of the unit is set to "no change allowed"(level 0), step 2 will not have an effect on the previously stored alarm limits. Users can view the limit but can not alter the limit.

4.5 Set TWA Alarm Limit

1. Set "TWA alarm limit" option is the 3rd menu option in Table 4.1.
    - Display shows "tA xxx.x" with the left-most digit flashing, where "xxx.x " is the previously stored TWA alarm limit.

2. To modify this limit, starting from the left-most digit, use **[up]** or **[down]** arrow key to change the digit value and **[enter]** key to confirm the digit, the flashing digit will move on to next digit to its right. Repeat this process until all 4 digits of the new TWA alarm limit are entered.

3. To preserve the previously stored TWA alarm limit, press **[menu]** key at step 1 or in the middle of step 2, the unit will abort the TWA alarm limit entry and move to the next menu option.

4. **Note:** if the security level of the unit is set to "no change allowed" (level 0), step 2 will not have an effect on the previously stored alarm limits. Users can view the limit but can not alter the limit.

4.6 Set Peak Alarm Limit

1. Set "Peak alarm limit" option is the 4th menu option in Table 4.1.
    - Display shows "PA xxx.x" with the left-most digit flashing, where "xxx.x " is the previously stored Peak alarm limit.

2. To modify this limit, starting from the left-most digit, use **[up]** or **[down]** arrow key to change the digit value and **[enter]** key to confirm the digit, the flashing digit will move on to next digit to its right. Repeat this process until all 4 digits of the new Peak alarm limit are entered.

3. To preserve the previously stored Peak alarm limit, press **[menu]** key at step 1 or in the middle of step 2, the unit will abort the Peak alarm limit entry and move to the next menu option.

4. **Note:** if the security level of the unit is set to "no change allowed"(level 0), step 2 will not have an effect on the previously stored alarm limits. Users can only view the limit but can not alter the limit.

4.7 Calibration of MiniRAE Plus

In the Hygiene Mode, the user may re-calibrate the MiniRAE Plus Professional PID Unit. This is a two-point calibration process using "zero gas" and standard reference gas. First, a "zero gas" which contains no detectable organic vapors is used to set the zero point (C0). Then a standard reference gas which contains a known concentration of a specific gas is used to set the second point of reference (C1). The calibration procedures are detailed below.

Note: if the security level of the unit is set to "no change allowed"(level 0), both zero gas and standard gas calibration menu will not be displayed.

4.7.1 Zero Gas Calibration

The organic vapor zeroing kit, see Figure 4.1, is supplied to perform zero gas calibration. This kit consists of

- Calibration adapter to link up with the gas inlet tube of the Professional PID Unit
- Charcoal filter to exclude any organic gas

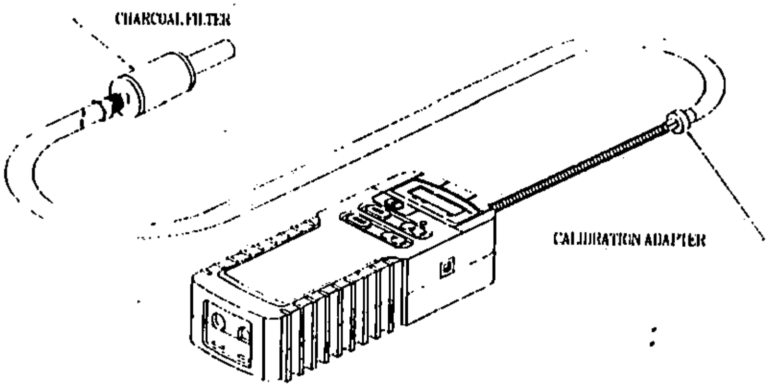

Figure 4.1 Zero gas calibration setup

Zero Gas Calibration Procedure

1. "Zero gas calibration" option is the 5th menu option in Table 4.1.
   - Display shows "C0 xxx.x" where "xxx.x" is the gas reading based on current calibration of the instrument. Note: this reading may not be zero due to back ground gas concentration, dirty charcoal filter or instrument drift .

2. Insert the zero gas adapter into the gas inlet tube o the Personal PID Unit, as shown in Fig. 4.1.

3. The sampling pump draws air sample into the sensor chamber through the charcoal filter of the organic zeroing kit. The air entering the sensor chamber should be free of any organic vapors.
   - Display then shows the reading of the gas free of organic vapor. Again, this reading may not be zero due to dirty charcoal filter or instrument drift .

4. If this reading is not zero, press **[enter]** key to zero it. If the reading still shows a small value after a few seconds, press **[enter]** key again to zero it. Repeat this process until the reading is stabilized around zero or 0.1 ppm. This completes the zero gas calibration procedure. Press **[menu]** key to exit zero gas calibration and move on to next menu item.

5. Remove the zero gas calibration adapter from the Personal PID unit.

6. One may press **[menu]** key before pressing **[enter]** key in step 4 to skip the zero gas calibration. In this case, the previously stored zero gas calibration data is not changed.

Note: even if the reading shows a zero during step 4, it is recommended to press **[enter]** key at least once to ensure that the zero gas calibration is updated properly.

4.7.2 Enter Standard Calibration Gas Value

1. "Enter standard gas value" option is the 6th menu option in Table 4.1.
   - Display shows "C1u xxx.x" where "xxx.x" is the previously stored standard calibration gas value. For example, "C1u 100.0" will be shown when the unit is first shipped from the factory because it is calibrated using 100 ppm isobutylene gas as standard calibration gas.
2. If the concentration of the standard calibration gas to be used is the same as the displayed value, press **[enter]** key 4 times to accept the displayed calibration value one digit at a time and move to step 4.

3. If the concentration of the standard calibration gas to be used is different from the displayed value, user needs to enter the new value. Starting fro the left-most digit of the displayed value, use **[up]** or **[down]** arrow key to change the digit value and **[enter]** key to confirm the digit, the flashing digit will move to next digit to its right. Repeat this process until all 4 digits are entered.

4. Now the standard calibration gas value is entered.
   - Display shows a flashing message of " GAS On" to remind user to turn on the standard calibration gas bottle now. After the gas bottle is turned on, press **[enter]** key to continue the standard gas calibration procedure as described in section 4.7.3.

5. Any time during step 2 or step 3, if the **[menu]** key is pressed, the data entry operation will be aborted. It is also assumed that user want to skip the standard gas calibration procedure and move on to the next menu item. Therefore, it is very important that all 4 digits are entered (i.e. press **[enter]** key 4 times) even if user does not want to change the standard calibration gas value in step 2.

4.7.3 Standard Reference Gas Calibration

Figure 4.2 shows the typical installation of standard reference gas calibration. It includes:

- Calibration adapter with flow controller
- Reference gas bottle of 100 ppm isobutylene

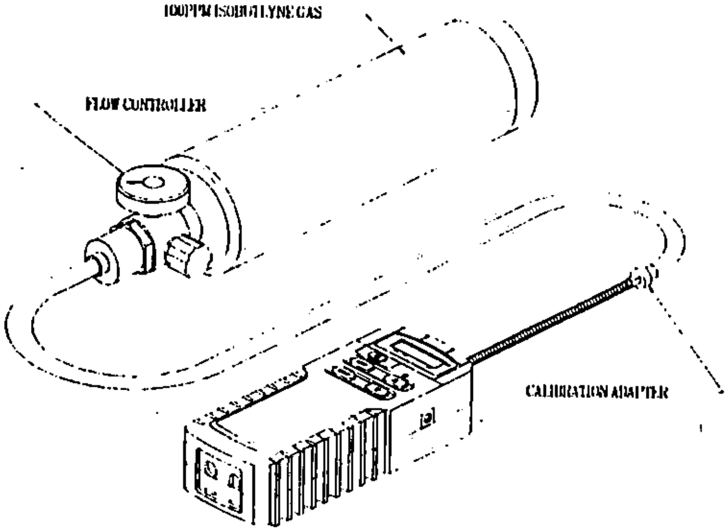

Figure 4.2 Standard reference gas calibration setup

Standard Gas Calibration Procedure

1. Insert the calibration adapter into the gas inlet tube of the Personal PID Unit, and connect the calibration adapter with the standard gas bottle, as shown in Figure 4.2.

2. Continue from the step 4 of the previous section, the display should show a flashing message o "GAS On". Turn the flow controller knob counter-clockwise about half a turn to start the flow of gas then press **[enter]** key.
   - Display shows " CAL ..." for about 30 seconds while the instrument performs calibration. Afterward, the display shows "C1 xxx.x" where C1 indicates that this is the standard calibration gas and "xxx.x" is the actual gas reading in ppm based on new calibration data.

   Note: the reading should be very close to the value of the given calibration gas (e.g. 100.0 ppm). If the reading is higher or lower than the standard gas value and continues to rise slowly, it means that the calibration gas has not been stabilized yet. Wait a few more seconds until the reading is stabilized then press **[enter]** key again. Every time the **[enter]** key is pressed, the instrument measures the current gas concentration and calibrate accordingly. The new reading should be closer to the standard gas value. Repeat this process a few more times if necessary until the reading is stable and sufficiently close (within 1 or 2 ppm) to the standard gas value. This completes the standard gas calibration procedure.

3. Press **[menu]** key to exit the standard gas calibration procedure and move to next menu item.

4. Turn the flow controller knob fully clockwise to turn off the flow of gas. Disconnect the calibration adapter from the Personal PID Unit.

5. One may press **[menu]** key any time before pressing **[enter]** key in step 2 to abort the calibration. In this case, the previously stored calibration data is not changed.

Note 1: If **[enter]** key is pressed inadvertently during step 2 before the standard reference gas starts to flow, an error message of " CAL Err" will be displayed. Simply turn on the gas flow, wait for it to stabilize and press the **[enter]** key. This should allow the instrument to be calibrated. In case user does not have a calibration gas, then press **[menu]** key to exit step 2. A factory preset value will be used to calculate the standard gas calibration.

Note 2: The other possible cause for the "CAL Err" message to be displayed is that the instrument does not have enough sensitivity for the given calibration gas. There are several reasons for low sensitivity. First, the instrument and lamp is not sensitive to the specific calibration gas. In this case, user needs to use a higher concentration of the given calibration gas as the calibration standard, use a different calibration gas or use a higher energy lamp. The second reason is that the UV light intensity of the lamp is weak. In this case, replace the UV lamp with a newer and stronger one.

4.7.4 Alternative Calibration Methods

There are two alternative calibration methods of the reference gas which often are used by some users. These methods are described briefly here:

A) Sampling Bag Calibration method:
First, fill a Tedlar sampling bag with the reference gas from a standard gas bottle. The size of the Tedlar bag should be at least 1 liter or more. Make sure that the bag is only partially inflated so that there will not be excessive pressure build up inside the bag. Then connect the air intake probe of the MiniRAE Plus to the Tedlar bag and perform the gas calibration procedures as described in Section 4.7.3.

In general, the sampling bag calibration method will allow the air flow from the bag matches the flow rate of the sampling pump of each individual PID unit. Therefore, it should provide a slightly more accurate calibration result. The disadvantage of the sampling bag calibration method is that it uses more gas for each calibration.

B) Adjustable Flow Regulator method:
There is a new adjustable flow regulator in the market today. This new regulator allows user to control the flow of the gas output from the standard gas bottle to match the flow rate of the sampling pump of each

individual PID unit. A small flow indicator (a small steel ball inside a clear acrylic tube) is included as part of the regulator. Normally, the ball sit on the botto of the tube. User can turn the knob of the regulator slowly to increase the gas flow from the bottle until the ball start to float up in the tube. At this point, the flow rate of the regulator matches the flow rate of the sampling pump.

Again, the adjustable flow regulator calibration method allows a better matching of the flow rate between the regulator and the sampling pump of MiniRAE Plus. Therefore, it should provide a slightly more accurate calibration result. The disadvantage of this method is that the adjustable flow regulator is more expensive.

C) Tee Connection method:
In order to match the flow rate between the fixed regulator and the sampling pump, it is possible to insert a Tee connector between the regulator and the MiniRAE Plus unit. The Tee connector will allow the excessive gas from the regulator to flow out through the third opening on the Tee connector. This method will also improve the calibration result.

4.7.5 Calibration for Other Gases

It is often impractical to carry a range of different standard gases into the field for calibration. If the type of the organic vapor to be measured in the field is known and the relative sensitivity of this gas compared to the standard reference gas (such as 100 pp isobutylene) for the PID instrument is available, then one can calibrate the instrument using a standard reference gas and then convert the instrument readings into actual ppm of a specific gas based on the relative sensitivity, also known as **calibration factor**.

The **calibration factor** for a specific gas is defined as:

$$\text{Calibration factor} = \frac{\text{sensitivity to a standard gas}}{\text{sensitivity to a specific gas}}$$

For example, when the PID sensor is exposed to 100 ppm isobutylene gas, the instrument will measure sa 10 mV from the sensor. When exposed to 100 ppm benzene gas, the instrument will measure say 17.5 mV. Then the calibration factor for benzene, relative to isobutylene is :

$$\text{Calibration factor (benzene)} = \frac{10\text{ mV}}{17.5\text{ mV}} = 0.57$$

Appendix C contains a list of calibration factors for common organic vapors. There are two ways to use

these calibration factors to obtain a calculated concentration of another gas:

1) Direct reading of a specific gas in ppm:

step 1: Obtain the calibration factor of a given organic vapor. For example, benzene has a calibration factor of 0.57 relative to the standard 100 ppm isobutylene gas.

step 2: Multiply the standard calibration gas value (such as 100 ppm of isobutylene) by the calibration factor to obtain a compensated calibration standard value for the given gas, i.e.

cal factor x standard value = compensated value
(0.57 x 100 ppm = 57 ppm for benzene)

step 3: Enter the compensated calibration standard value, instead of the actual calibration standard value in step 3 of section 4.7.2. For example, enter 57 ppm instead of 100 ppm in step 3. Continue to finish gas calibration using the standard calibration gas (100 ppm isobutylene).

After the calibration is completed, the unit will give direct reading in ppm when exposed to a specific gas. In this example, the instrument will displa 100 ppm when exposed to 100 ppm benzene gas.

2) Manual conversion of readings for a specific gas:

step 1: Calibrate the instrument using standard calibration gas as described in sections 4.7.2 - 4.7.3.

step 2: Obtain the calibration factor of a given organic vapor (see the list in Appendix C). For example, benzene has a calibration factor of 0.57.

step 3: When exposed to a specific gas, multipl the instrument reading by the calibration factor manually. The result is the calculated value in pp for the specific gas. For example, if the instrument is calibrated using isobutylene gas. When exposed to 100 ppm benzene gas, it reads 175.4. Multipl this value by the calibration factor of benzene (0.57). The result is 100 ppm which is the actual concentration of benzene.

Note: the calibration factor is used to provide an approximate reading for a given gas while using another gas (such as Isobutylene) as reference gas during calibration. The specified measurement accuracy of MiniRAE Plus Professional PID can be met only through using the actual gas directly during the calibration process.

4.8 Clear Data

The Professional PID unit calculates and stores the values of TWA, STEL, Peak concentration and 12 hours of STEL readings taken at 15 minutes interval (a total of 51 readings). In addition, the time stamps which indicate: when the unit was last turned on and off, when the peak occurred and when the TWA alar occurred (if any) will also be recorded. These stored data can be cleared by selecting the "clear data" menu option.

1. Clear data option is the 8th menu option in Table 4.1.
   - Display shows a flashing "Clr ALL" message

2 If users want to clear data, press **[enter]** key to confirm the menu selection. All 51 datalog values and time stamp numbers will be erased.

3. Press **[menu]** key will move to the next menu option without clearing the data.

4.9 Set Hour and Minute

In Hygiene Mode, users are allowed to change the hour and minute of the built-in real time clock. A 24 hour format is used for the hour value.

1. "Set hour and minute" option is the 9th menu option in Table 4.1.
    - Display shows "Hr hh.mm" with the left-most digit flashing, where "hh" is the current hour and "mm" is current minute.
2. To modify this time, starting from the left-most digit, use **[up]** or **[down]** arrow key to change the digit value and **[enter]** key to confirm the digit, the flashing digit will then move on to next digit to its right. Repeat this process until all 4 digits of the new time are entered.
3. To preserve the current hour and minute, press **[menu]** key at step 1 or in the middle of step 2, the unit will abort the "hour and minute" entry and move to the next menu option.
4. **Note:** if the security level of the unit is set to "no change allowed" (level 0), step 2 will not have an effect on the current hour and minute. Users can view the time but can not alter the time.

4.10 Set Month and Date

In Hygiene Mode, users are allowed to change the month and date of the built-in real time clock.

1. Set "month and date" option is the 10th menu option in Table 4.1.
    - Display shows "dA mm.dd" with the left-most digit flashing, where "mm" is the current month and "dd" is current date.
2. To modify this date, starting from the left-most digit, use **[up]** or **[down]** arrow key to change the digit value and **[enter]** key to confirm the digit, the flashing digit will then move on to next digit to its right. Repeat this process until all 4 digits of the new month and date is entered.
3. To preserve the current month and date, press **[menu]** key at step 1 or in the middle of step 2, the unit will abort the "month and date" entry and exit the programming task.
4. **Note:** if the security level of the unit is set to "no change allowed"(level 0), step 2 will not have an effect on the current month and date. Users can view the date but can not alter the date.

4.11 Set Security Level

In Hygiene Mode, authorized users are allowed to set the security level from the PC so that three levels o different data protection can be setup for the operator of the instrument.

1) <u>level 0 security:</u> in this level, users can view three alarm limits and the current time and date in programming task. They are not allowed to make any changes.

2) <u>level 1 security:</u> in this level, users have to enter a 4 digits password before they can enter the programming tasks. Once in the programming task, they are allowed to change all menu items.

3) <u>level 2 security:</u> in this level, users are allowed to make any changes in programming task. There is no need for a password to enter the programming task.

The security level has to be set up by "ProRAE-76" software in PC. See section 6 for details on how to install the ProRAE-76 software on PC, how to interface the MiniRAE Plus instrument to PC, and how to set up security levels in PC.

A brief summary on how to set up security level in PC includes:

<u>Step 1:</u> From the main menu of the ProRAE software, **Open** the Hygiene Mode configuration (hygiene.CFG) file from the **File** sub-menu, then choose **Instrument Setup** function from the **Options** sub-menu. The PC display will show a dialog box as shown in Screen 6.9.

<u>Step 2:</u> Move cursor to the security level section o the menu and choose one of the three security levels b clicking the mouse on one of the three radio buttons.

<u>Step 3:</u> After the instrument configuration is completed, send it to the instrument as described in section 6.9. The security level should now be setup correctly in the instrument.

4.12 Change Password

In Hygiene Mode, authorized users are allowed to set a password for the instrument so that when level 1 security is selected for the instrument, users have to enter a valid password in order to enter the programming task.

The password has to be set up by "ProRAE-76" software in PC. See section 6 for details on how to install the ProRAE-76 software on PC, how to interface the MiniRAE Plus instrument to PC and how to change password in PC.

A brief summary of the steps includes:

Step 1: From the main menu of the ProRAE software, **Open** the Hygiene Mode configuration (hygiene.CFG) file from the **File** sub-menu, then choose **Instrument Setup** function from the **Options** sub-menu. The PC display will show a dialog box as shown in Screen 6.9.

Step 2: Move cursor to the password section of the menu and type in the 4-digit password.

Step 3: After the instrument configuration is completed, send to the instrument as described in section 6.9. The new password will now take effect in the instrument.

5.0 PROGRAMMING IN SURVEY MODE

The MiniRAE Plus Professional PID Unit is built with a microprocessor to provide programming flexibility. In Survey Mode operation, users can choose a new site number, select one of two calibration data, re-calibrate the unit, change the sampling period, clear data memory, change the gas concentration alarm limits, and change time and date of the real time clock.

The programming is menu-driven to provide intuitive end-use operation. The display shows the menu option, and the key pad is used for the menu selection or data entry to each menu option.

A sampling pump continuously draws air sample into the ionization chamber. The ionization chamber for the MiniRAE Plus Professional PID unit is constructed as a small cavity in front of the UV lamp. The electrode is made of wired mesh so that the high energy UV light can shine through the mesh and excite the gas molecules when they across the face of the UV window. The ions collected on the electrode are measured by an electrometer.

A single chip microcomputer is used to control the operation of the lamp, alarm buzzer, LED, sampling pump, power supply and the electrometer. It measures the electrometer readings and calculates the gas concentrations based on calibration to a known reference gas. A 7-digit LCD display is used to show the readings. The user interacts with the unit through 5 keys on the front panel.

The unit is powered by a rechargeable lead acid batteries. A built-in charging circuit allows the batteries to be charged directly from a 12 VDC source.

8.0 MAINTENANCE

As shown in Figure 8.1, the major items of MiniRAE Plus Professional PID Unit that require periodic maintenance are:

- Batter
- Probe Assembl
- Sensor module
- Lamp
- Sampling Pump

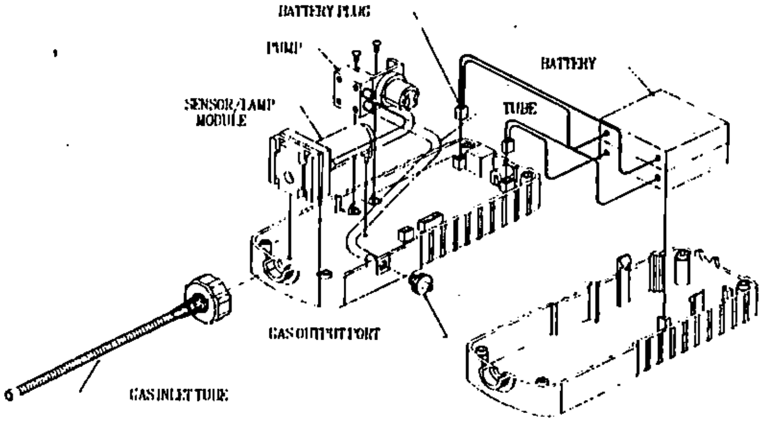

Figure 8.1 Main components of MiniRAE Plus Professional PID

8.1 Battery Charging and Replacement

When the display flashes "bAt" message, the batter requires recharging. The battery may be replaced in the field if required. It is recommended to recharge the MiniRAE Plus Professional PID unit upon returning from field work. A fully charged batter powers MiniRAE Plus Professional PID unit for 10 hours continuous operation. The charging time is less than 10 hours for a fully discharged battery. The charging circuit uses a two-step constant voltage charging method to prevent over-charging.

WARNING:
TO REDUCE THE RISK OF IGNITION OF HAZARDOUS ATMOSPHERES, RECHARGE BATTERY ONLY IN AREA KNOWN TO BE NON HAZARDOUS. REMOVE AND REPLACE BATTERY ONLY IN AREA KNOWN TO BE NON HAZARDOUS.

Recharging Professional PID Unit

1. Turn off power of the Professional PID unit.

2. Open the rubber cover on the bottom side of the PID unit and connect the AC adapter (or the automotive DC charging adapter, depending on the power source) to the power jack.

3. There is a bi-colored LED inside the LED window which will provide an indication of the charging status:
   Red -battery is being charged
   Green -charging is completed
   No Light - bad connection or defective batter

4. Make sure that the indicator LED turns red to indicate that the unit has made good contact and is being charged. After the LED turns green, the unit is fully charged.

Replacing Battery

1. Turn off power of the MiniRAE Plus Professional PID unit.

2. Refer to Figure 8.1, unscrew the probe assembly, remove four screws that hold the back cover of the unit to gain access to the battery compartment.

3. There are two batteries inside the unit. Unplug one battery from the battery jack on the top cover of the unit. Plug a fully charged battery into the jack. After the first battery is replaced, replace the second battery. **Note:** there is a real time clock inside the unit. If both batteries are disconnected from the unit at the same time, the real time clock will be disabled. Users have to re-program the real time clock after the batteries are installed (see section 4.9 and 4.10 on how to program real time clock).

4 Ensure the battery plug is securely connected to the MiniRAE Plus Professional PID unit.

5 Close the MiniRAE Plus Professional PID unit covers and tighten screws.

6. There is an optional battery charger accessory for the MiniRAE Plus Professional PID Unit. This charger will allow users to charge a spare batter outside the unit. Plug the battery to the jack on the back of the charger to charge the spare battery.

8.2 Filter Replacement

During the course of normal operation, dust and residual gas vapor may build up on the membrane filter. The build up rate depends on the working environment and the concentration of the the vapors being sampled. As a guide, it is recommended to replace the membrane filter once a week or when the filter is dirty upon visual inspection.

1. Turn off power of the MiniRAE Plus Professional PID Unit. Remove the probe assembly.

2. Use a tweezers to remove and replace the small O-ring and the membrane filter from the round hole on the front of the sensor block. Make sure that the O-ring is seated correctly. Otherwise, the sampling probe will not be air tight.

3. Attach the probe assembly. Check for air leakage. (see section 8.4)

8.3 Sensor Module Cleaning

During the course of normal operation, a film of gas vapor may build up inside the sensor module. The rate at which the film develops depends on the type and concentration of the vapors being sampled. As a guide, it is recommended to clean the sensor module upon returning from field work.

The sensor module is made of four major components, as shown in Figure 8.2:

Moisture filter and O-ring
Sensor block
Lamp house
Lamp and O-ring

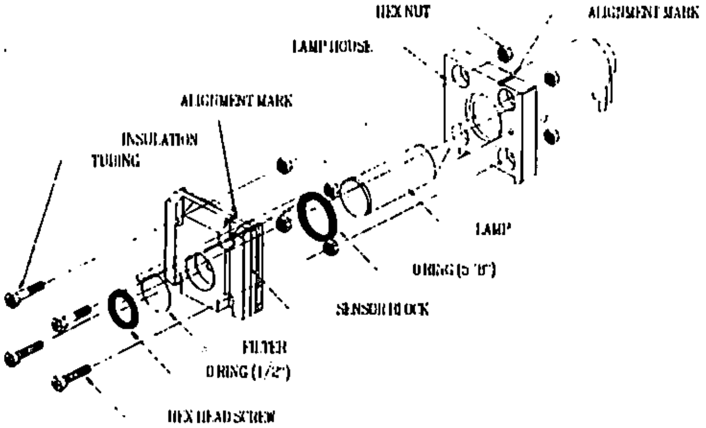

Figure 8.2 Disassembly and Assembly of Sensor Module of Professional PID Unit

Sensor Module Cleaning Procedure

1. Turn off power of the MiniRAE Plus Professional PID Unit.

2. Refer to Figure 8.1, unscrew the probe assembly, remove four screws and open the MiniRAE Plus Professional PID Unit. Remove the sensor module by gently pulling the module away from the PCB of the top cover.

3. Refer to Figure 8.2, and carefully remove 4 hex nuts from the back of the lamp house. Remove the lamp and O-ring. Also remove the membrane filter and small O-ring which are held together inside the round hole on the front cover.

   Note: the sensor block is hold together by another 4 hex nuts at the back of the sensor block. It is not recommended to remove these 4 inner hex nuts and completely disassemble the sensor block for cleaning. Simply loosen these 4 inner hex nuts for cleaning. This way all the individual pieces of the sensor block can be cleaned easily without the hassle of disassembling and assembling the entire sensor block.

4. Clean the sensor block using GC grade methanol, followed by water to rinse the sensor block thoroughly. It is highly recommended that a ultrasound bath to be used to clean the sensor block for at least 3 minutes.

5. Make sure the sensor block is fully dried before it is reassembled. A damp sensor block will cause excessive leakage and sensor failure. It is recommended to blow dry the sensor block or bake it at 75° C for 5 to 10 minutes to ensure it is full dried.

6. Replace the membrane filter and small O-ring into the front hole of the sensor block.

7. Refer to Figure 8.2, insert the lamp into the large O-ring first. Then push the lamp and O-ring into the lamp house, attach the cleaned sensor block to the lamp house by 4 hex nuts. Make sure that the 4 inner hex nuts are tight before putting on the 4 outer hex nuts. Note: tighten these nuts by hand using a nut driver while using a screw driver on the front to hold the screw in place. Do not over tighten these hex nuts because the soft Teflon parts can be damaged easily.

   Make sure that the coaxial cable (tan color) with a lug is attached to the lower right screw (opposite to the screw with yellow cable attached) before putting on the nut.

   Note: it is easy to put the sensor block upside down. Make sure that the sensor block with a slanted edge and an alignment mark is line up with lamp housing having a similar alignment mark on the edge. If the sensor block is installed upside down, the round hole on the front of the sensor block will not line up with the opening on the front of the unit housing.

8. Referring to Fig. 8.1, insert the sensor module into the three holes on the PCB. Make sure that the two Tygon tubes are free of any "kink" and are not caught under the sensor module.

9. Close the MiniRAE Plus Professional PID Unit covers and replace probe assembly.

8.4 Probe Assembly Cleaning

During the course of normal operation, significant amount of dust and particles can be drawn into the sensor module. A dust filter (steel wool) is inserted into the cavity at the base of the probe assembly to remove these dust and particles.

The rate at which the dust and particles accumulate depends on the working environment. As a guide, it is recommended to replace this dust filter once a week.

1. Turn off power to the MiniRAE Plus Professional PID Unit.
2. Remove the probe assembly. Use a small tweezers to remove the steel wool inside the cavity. Insert a new one into the cavity. Make sure that it stays snugly fit inside the cavity.
3. Replace the probe assembly.
4. Turn on the MiniRAE Plus Unit. Wait for the pump to come on. Check to see if air is drawn into the gas inlet probe. If the probe is air tight, when the gas inlet is blocked by a finger, the pump noise should change and a strong suction force will be felt.

8.5 Lamp Cleaning and Replacement

If the lamp does not turn on or there is excessive fil build -up on the lamp window, the unit will display a message of " Err xxx.x " to indicate that a cleaning or replacement of the lamp may be required. Periodic cleaning of the lamp window will also remove fil deposits and restore lamp sensitivity. **Care must be exercised when cleaning the window so that window surface is not damaged.**

1. Turn off power of MiniRAE Plus Professional PID Unit.
2. Refer to Figure 8.1, unscrew the probe assembly, remove four screws and open the PID covers. Remove the sensor module from the PCB. Disassemble the sensor block from the lamp house as described in section 8.2.
3. Gently pull out the lamp, avoiding contact with the flat window surface.
4. Clean or replace a new lamp, avoiding contact with the flat window surface.
5. Assemble the sensor block and the lamp house. Put back the sensor module. Close the PID covers and replace screws. Replace probe assembly.

Lamp Window Cleaning Procedure:

For lamps with 10.6 eV or 11.7 eV windows, clean the window surface with anhydrous methanol using a cotton swab. Rub in a circular motion at moderate pressure. After cleaning, hold the lamp up to the light at an angle to detect any remaining film. Repeat the process until the lamp window is clean. Rinse thoroughly with anhydrous methanol to remove any residues on the window.

Never touch the window surface with fingers or anything which may leave a film.

(CAUTION: WATER WILL DEGRADE BOTH 10.6 OR 11.7 EV WINDOW SURFACES. DO NOT USE WATER TO CLEAN THE LAMP WINDOW AT ANY TIME)

8.6 Pump Replacement

The sampling pump is rated for 4000-5000 hours o continuous operation. It will consume higher amount of energy and reduce its sample draw capabilit significantly when approaching the end of the specified life time of the pump. As a guide, it is recommended to replace the pump at six month intervals, if the instrument is heavily utilized during the period.

1. Turn off power of the MiniRAE Plus Professional PID Unit.

2. Refer to Figure 8.1, unscrew the probe assembly, remove four screws and open the Professional PID Unit.

3. Refer to Figure 8.1, and carefully remove two screws that hold the pump to the top cover. Disconnect two Tygon tubes connected to the pump. Note which tube goes to the inlet barb and which goes to the outlet barb of the pump. Disconnect the electrical wire from the pump to PCB. Remove the pump.

4. Replace a new pump. Connect the electric wire. Connect two Tygon tubes to the pump and tighten the pump to the top cover with two screws. Make sure that the two Tygon tubes are free of any "kink" and are not caught under the sensor module.

5. Close the MiniRAE Plus Professional PID Unit covers and replace screws.

6. Replace the probe assembly.

7. Turn on the MiniRAE Plus Unit. Wait for the pump to come on. Check to see if air is drawn into the gas inlet tube. If the pump works correctly, when the gas inlet is blocked by a finger, the pump noise should change and a strong suction force will be felt.

9.0 TROUBLESHOOTING

Table 9.1

Problem	Possible Reasons & Solutions
Can not turn on power after charging the batter	**Reasons:** Bad battery connection Discharged battery Defective batter Microprocessor hang-up Battery switch is o **Solutions:** Check battery connection Charge or replace batter Reset microprocessor b turning off and then on battery switch
no LED or LCD back light	**Reasons:** Defective LED or LCD back light **Solutions:** Call authorized service center
Buzzer inoperative	**Reasons:** Bad buzzer **Solutions:** Call authorized service center

Problem	Possible Reasons & Solutions
Reading abnormall high	**Reasons:** Dirty or wet sensor Dirty probe assembl Dirty membrane filter **Solutions:** Clean sensor module Clean probe assembl Replace membrane filter Use water trap disk
Reading abnormall low	**Reasons:** Lamp dirty or weak **Solutions:** Clean or replace lamp (see section 8.4)
"Err xxx.x" message during operation	**Reasons:** Dirty sensor Weak or defective lamp **Solutions:** Clean sensor Replace lamp, filter
Read a small background value	**Reasons:** There is actually a background gas level Instrument zero drift **Solutions:** Do zero gas calibration (see section 4.7.1)

Problem	Possible Reasons & Solutions
Reading jump around randomly	**Reasons:** Incorrect gas calibration Low sensitivity to cal gas **Solutions:** Re-calibrate Use different cal gas
Slow response to gas input	**Reasons:** Leakage in probe assembl or sensor module **Solutions:** Tighten the probe assembly and sensor module
No air draw at gas inlet tube	**Reasons:** Defective pump or leakage in probe assembly and sensor module **Solutions:** Replace pump, tighten the probe assembly and sensor module
"Lo bAt" message at power on	**Reasons:** Discharged battery **Solutions:** Recharge batter

Problem	Possible Reasons & Solutions
Can not turn off unit or corrupted characters in LCD display	**Reasons:** Microprocessor hang-up **Solutions:** Turn off then turn on battery switch Reload software from PC
Full scale measurement in humid environment	**Reasons:** Dirty or wet sensor **Solutions:** Clean and dry sensor Use water trap disk to block out moisture
Measurement max out at certain level	**Reasons:** Dirty lamp/ sensor module Weak lamp **Solutions:** Clean lamp/ sensor module Replace new lamp
Calibration error message	**Reasons:** No standard gas input Low sensitivity to cal gas **Solutions:** Make sure standard gas flows into inlet probe Change cal gas

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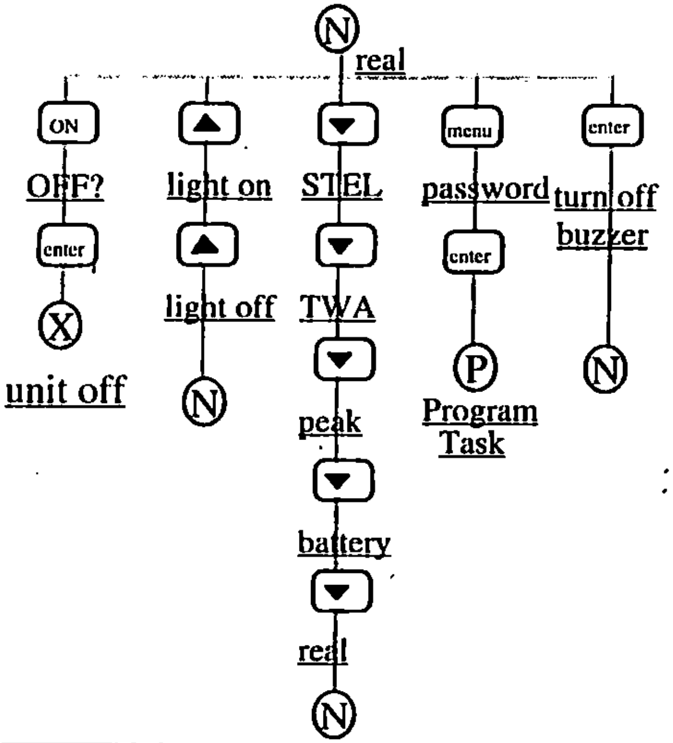
APPENDIX A.

FLOW CHART OF HYGIENE MODE OPERATION

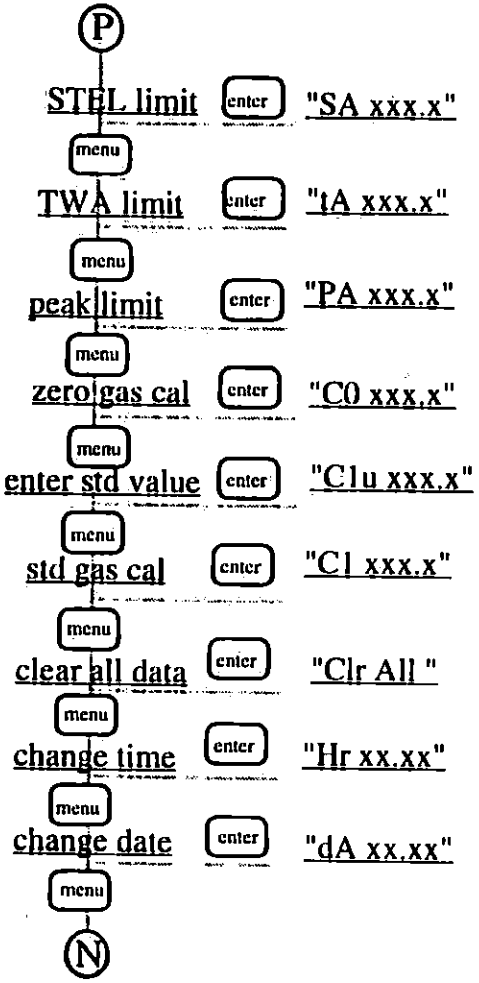
NORMAL OPERATION



APPENDIX A.

FLOW CHART OF HYGIENE MODE OPERATION

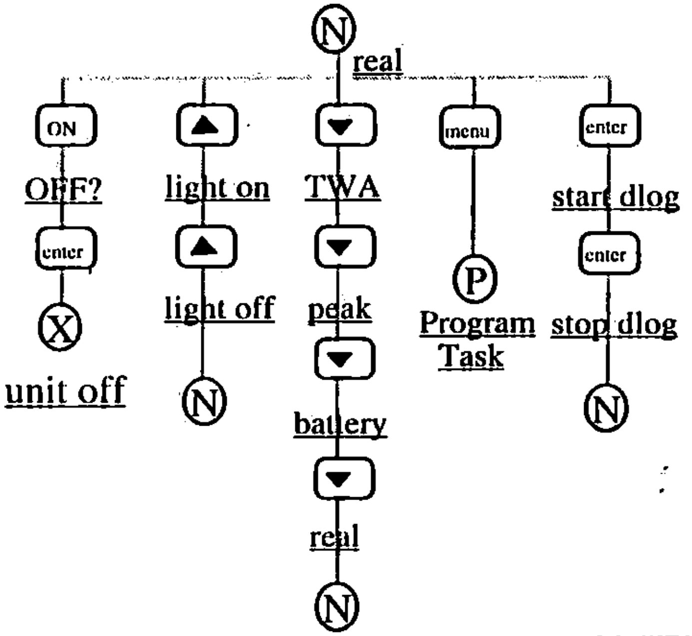
PROGRAMMING TASK



APPENDIX B.

FLOW CHART OF SURVEY MODE OPERATION

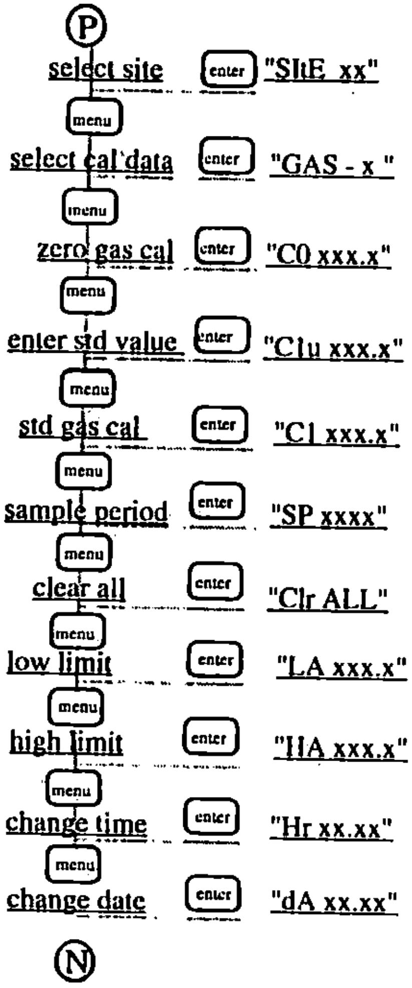
NORMAL OPERATION



APPENDIX B.

FLOW CHART OF SURVEY MODE OPERATION

PROGRAMMING TASK



APPENDIX C.

RESPONSE INFORMATION

Calibration factors for a number of commonl used organic vapor for 10.6 eV lamp is included in Table C.1

Table C.1

Correction Factors for the 10.6 eV lamp:

Compound	Correction Factor
Acetaldehyde	5.5
Acetone	1.1
Allyl alcohol	2.4
Benzene	0.53
Butadiene	1.0
Butyl acetate	2.6
Carbon disulfide	1.2
Cyclohexane	1.4
Cyclohexanone	1.0
Cyclohexene	0.90
Diethyl amine	0.97
Diethyl sulfide	0.51
Ethyl acetate	4.6
Ethyl alcohol	12
Ethyl benzene	0.52
Ethyl ether	1.1
Ethylene	9.9
Heptane (n-)	2.6
Hexane	4.2
Hydrogen sulfide	4.1

Isopropyl alcohol	6.0
Methyl ethyl ketone	0.86
Methyl isobutyl ketone	1.2
Methyl methacrylate	1.4
Octane (n-)	1.8
Perchloroethylene	0.58
Pinene (a-)	0.31
Pinene (b-)	0.37
Propylene	1.7
Styrene	0.42
Tetrahydrofuran	1.8
Toluene	0.50
Trichloroethylene	0.52
Vinyl chloride	2.14
Xylene (m-)	0.43
Xylene (o-)	0.59
Xylene (p-)	0.45

The calibration factors in Table C.1 are measured relative to 100 ppm Isobutylene gas at 50% relative humidity and 25°C. These factors may change at higher concentration level or different temperature and humidity conditions.

APPENDIX D.

QUICK REFERENCE GUIDE

HYGIENE MODE

Key	Display	Meaning
ON	HG - x.xx	power on and version #
	dIAg ..	diagnostic in progress
	0.0	real time reading (ppm)
∇	v 0.0	STEL reading (ppm)
∇	v 0.0	TWA reading (ppm)
∇	0.0v	Peak reading (ppm)
∇	bAt 6.0	battery voltage (V)
Δ		on / off backlight
ENTER		mute buzzer for 1 minute
MENU + ON	CLr ...	power on and clear data
Δ + ON	HG - x.xx	power on with diagnostics
ON	OFF 0.0	turn off power (Y or N)
→ENTER		confirm power off

MENU	Pd-000.0	verify password
→ENTER (4 times)		enter 4 digit password
MENU	SA 025.0	Set STEL limit (ppm)
MENU	tA 010.0	Set TWA limit (ppm)
MENU	PA 050.0	Set Peak limit (ppm)
MENU	C0 0.0	Zero gas reading (ppm)
→ENTER		reset reading to zero
MENU	C1u 100.0	Enter standard gas value
→ENTER (4 times)		enter 4 digit (0 - 999.9)
	GAS On	turn on gas bottle
→ENTER	CAL...	calibration in progress
	C1 100.0	standard gas reading
→ENTER		reset reading to std value
MENU	Clr ALL	Clear all data (Y or N)
MENU	Hr 00.00	Set hour and minute
MENU	dA 01.01	Set month and date

General Message

Err 0.0	sensor or lamp failure
Lo bAt	low battery voltage
CLr ...	clear data in progress
C1 Err	calibration error

SURVEY MODE

Key	Display	Meaning
ON	Su - x.xx	power on and version #
	dIAg ..	diagnostic in progress
	00 0.0	site # (00) and real time reading (ppm)
∇	v 0.0	TWA reading (ppm)
∇	0.0v	Peak reading (ppm)
∇	bAt 6.0	battery voltage (V)
Δ		on / off backlight
ENTER	00d 0.0	start / stop datalog
Δ + ON	Su - x.xx	power on with diagnostics
ON	OFF 0.0	turn off power (Y or N)
→ENTER		confirm power off

MENU	SItE 00	enter site number (0-49)
MENU	GAS -1	select gas cal data (1 or 2)
MENU	C0 0.0	Zero gas reading (ppm)
→ENTER		reset reading to zero
MENU	C1u 100.0	Enter standard gas value
→ENTER (4 times)		enter 4 digit (0 - 999.9)
	GAS On	turn on gas bottle
→ENTER	CAL...	calibration in progress
	C1 100.0	standard gas reading
→ENTER		reset reading to std value
MENU	SP 0001	enter sample period (sec)
MENU	Clr ALL	Clear all data (Y or N)
MENU	LA 010.0	Set low alarm limit (ppm)
MENU	HA 100.0	Set high alarm limit (ppm)
MENU	Hr 00.00	Set hour and minute
MENU	dA 01.01	Set month and date

Key	Function in Programming Mode
ON	- does not function in programming mode
Δ	- increment numerical value for data entr
∇	- decrement numerical value for data entr
ENTER	- confirm menu selection or accept data entr
MENU	- exit current menu selection, go to next menu

RAE Systems Inc.
680 West Maude Ave. #1
Sunnyvale , CA 94086
Tel: 408-481-4999
Fax: 408-481-4998

MALCOLM PIRNIE

COMMUNITY INVOLVEMENT PLAN

USEPA BROWNFIELDS ASSESSMENT DEMONSTRATION PILOT PROJECT

Former Karg Brothers Tannery
Johnstown, New York

CITY OF JOHNSTOWN, NEW YORK

Prepared by:

Malcolm Pirnie, Inc.
15 Cornell Road
Latham, New York 12110

March 2000
2384010

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A	Contact List
B	Location for Document Repository
C	Glossary for Commonly Used Citizen Participation Terms
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1.0 INTRODUCTION

The Community Involvement Plan (CIP) for the former Karg Brothers Tannery site in Johnstown, New York has been developed to provide a site-specific outline and guidance for citizen participation in the USEPA Brownfields Demonstration Pilot (Project) at the site. The CIP was prepared in accordance with USEPA guidelines, 6 NYCRR Part 375, and the New York State Department of Environmental Conservation (NYSDEC) guidance document, New York State Inactive Hazardous Waste Site Citizen Participation Plan (August, 1988).

The City of Johnstown and the USEPA are committed to a citizen participation program as a part of the Project. Citizen participation promotes public understanding of the responsibilities, planning activities, and remedial activities associated with this process. Citizen participation provides the City of Johnstown and the USEPA with an opportunity to gain public input to support a comprehensive remedial program that is protective of both public health and the environment.

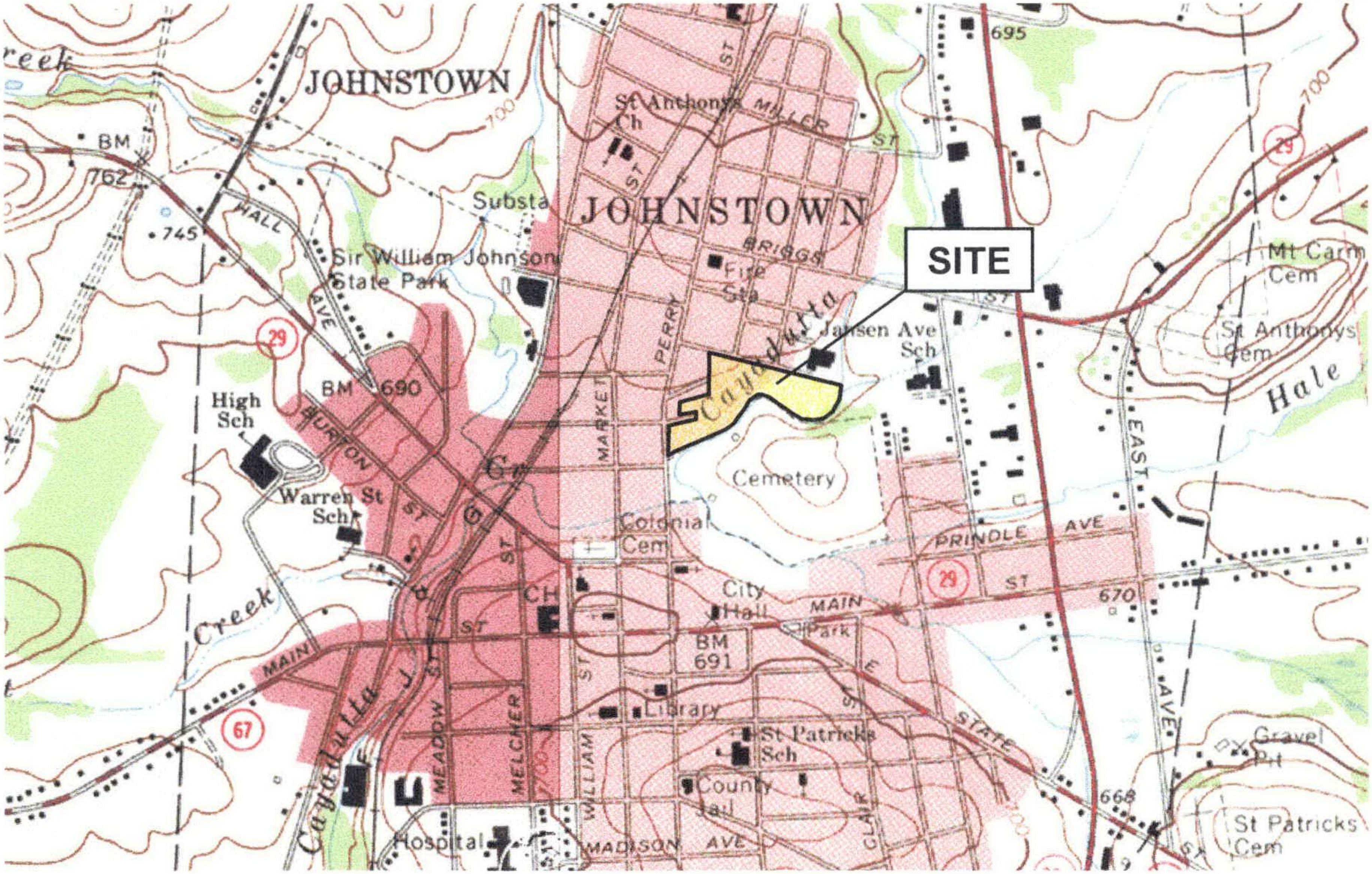
2.0 SITE BACKGROUND

2.1 Site Location

The site is located at the intersection of North Perry Street and Crescendoe Road in the City of Johnstown, Fulton County, New York (Figure 2-1). The Cayadutta Creek borders the site to the east and south. The site is approximately 10 acres. The site consists of four separate structures. The structure on the eastern portion of the site (former Warehouse) is currently being redeveloped and is occupied by the City of Johnstown Department of Public Works and a private textile company. The remaining structures are unoccupied.

2.2 Site History

The former Karg Brothers Tannery was established in the early 1900s. From the 1900s to the early 1980s, the tannery underwent a series of expansions. The most recent expansion included the construction of a 93,000 square foot warehouse on the eastern portion



SOURCE: U.S.G.S 7.5 MIN. PECK LAKE AND GLOVERSVILLE QUADS

MALCOLM PIRNIE

FORMER KARG BROTHERS TANNERY
JOHNSTOWN, NEW YORK

LOCATION MAP

FIGURE 2-1

of the property. The tannery operated continuously at this location until 1993, when the facility was shut-down and abandoned. Operations performed at the facility included degreasing, pickling, beaming (hair removal), tanning, and finishing of animal hides. These operations required the use of Stoddard solvent, acids, lime, chromium compounds, dyes, and pigments.

3.0 PROJECT DESCRIPTION

The focus of this work is to collect sufficient information to characterize the nature and extent of contamination in the on-site structures (i.e., waste materials), in the groundwater and subsurface soils, and in the surface water and sediment of the Cayadutta Creek. This information will be utilized in the Site Investigation and Remedial Alternatives Evaluation report (SI/RAE) to evaluate remedial alternatives and to assess the need for removal actions at the site. The base scope of work, includes: site survey, sampling of waste and building materials, soil borings, groundwater monitoring well installation, soil and groundwater sampling and analysis, and surface water and sediment sampling and analysis.

The objectives of the Project include:

- Use of a community-focused approach to conduct the Pilot;
- Assess environmental conditions at the site;
- Evaluation of remedial options, which are protective of human health and the environment, based on community needs and end-use planning for the property;
- Enhancement of the Cayadutta Creek watershed through pollution prevention measures and possible integration with the adjacent Schriver Pond Linear Park; and
- Planning to support revitalization of the property.

4.0 CITIZEN PARTICIPATION ACTIVITIES

Citizen participation activities are planned to promote communication, understanding and involvement between the community surrounding the former Karg Brothers Tannery site, the City of Johnstown, and the NYSDEC. The citizen participation activities are intended to address the following questions:

- What concerns does the public have about the site?
- Who is interested in or affected by the site?
- What are the potential opportunities for redevelopment/re-use of the site?
- What information does the public need to know about the site?
- What information can the public contribute about the site?

These questions will be re-addressed at the beginning of each major project element to determine if the planned citizen participation activities are adequate to meet the needs of the community or if additional activities should to be planned.

4.1 Document Repository

A local document repository (Appendix B) will be established at the Johnstown Public Library at the start of project activities. Documents related to the SI/RAE and citizen participation activities will be placed at the document repository for public review.

4.2 Site Investigation Work Plan Documents

A copy of the Site Investigation Work Plan documents will be placed in the local document repository. A fact sheet which will briefly describe the site, the project objectives, and activities planned for the project will be mailed to the Contact List (Appendix A). In addition, the fact sheet will indicate the location of the local document repository and identify appropriate points of contact. Prior to initiating field work, a public meeting will be held to review the proposed Work Plan and to address any questions or concerns. Representatives of the City of Johnstown will attend this meeting.

4.3 Community Education

Community support is essential for successful Brownfields redevelopment. Community support can only be obtained if information about the process is made available and community participation is sought actively. Public participation is vital for the success of this project since the site is adjacent to residential areas.

The City will conduct public information meetings at key points throughout the Project. Notice of the meetings will be published as a display advertisement in the Daily Gazette and Leader-Herald, distributed throughout the City, and fact sheets will be mailed to the project mailing list. City officials, the City's technical representatives, and the USEPA will provide information on the program's planned activities and solicit public comment and questions. The City will establish an on-going forum with the various stakeholders in which Brownfields issues can be discussed. This forum could include presentations by regulatory agencies, including USEPA, NYSDEC, New York State Department of Health (NYSDOH) and economic development entities, on issues related to Brownfields. Possible topics could include methods used to identify and investigate the site, the role of risk assessment in establishing Brownfields cleanup goals, and long-term monitoring of Brownfields properties.

EPA Region 2 has formed an inter-agency work group with the United States Economic Development Administration (EDA), United States Department of Housing and Urban Development (HUD), and the United States Army Corps of Engineers (USACE) to assist communities in identifying areas and/or neighborhoods which may benefit from brownfields redevelopment. The City solicit the assistance of this workgroup early in the project to bring together representatives of stakeholder groups for a discussion of community needs and the brownfields redevelopment process.

The City will also solicit the assistance of the Northeast Hazardous Substance Research Center (NHSRC), a consortium of colleges and universities headed by the New Jersey Institute of Technology (NJIT), which is funded by the USEPA. The NHSRC supports two programs, Technical Outreach Services for Communities (TOSC) and Technical Assistance to Brownfields Communities (TAB), which provide free technical assistance to communities to promote effective community participation in Brownfields projects. This assistance includes leadership development, site and risk assessment workshops, cleanup alternative evaluation, and instruction on the overall Brownfields process.

Representatives of the City's technical consultant, Malcolm Pirnie, Inc., will also be available to participate in meetings and outreach activities as needed.

4.4 Site Investigation Report

When the SI has been completed, an SI report will be placed in the local document repository. This type of report typically presents the results of environmental sampling and describes conditions at the site.

4.5 Remedial Alternatives Evaluation (RAE)

An RAE report will be developed and a copy will be placed in the local document repository. A public meeting will be held during to review the results of the investigation and to discuss the remedial alternatives. Representatives of the City of Johnstown and interested regulatory agencies will attend this meeting.

5.0 SCHEDULE

The estimated Project Schedule is presented below.

ACTIVITY	TIME FRAME
Mailing describing SI activities	Spring 2000
Field activities	Spring/Summer/Fall 2000
Mailing announcing availability of SI Report	Spring 2001
Mailing announcing availability of the Remedial Alternatives Evaluation	Summer 2001
Public Meeting to discuss Remedial Alternatives	Summer 2001

APPENDIX A

Contact List

APPENDIX A

CONTACT LIST

Adjacent Property Owners

Ms. Nina Lathers
225 N. Perry Street
Johnstown, NY 12095

Ms. Ina Oliver
223 N. Perry Street
Johnstown, NY 12095

Ms. Nina Lathers
225 N. Perry Street
Johnstown, NY 12095

Ms. Ina Oliver
223 N. Perry Street
Johnstown, NY 12095

Mr. Aleks Hunter
221 N. Perry Street
Johnstown, NY 12095

Mr. Donald Erickson
215 N. Perry Street
Johnstown, NY 12095

Joann Enterprises
2609 State Hwy. 30A
Fonda, NY 12068

Mr. Herschel Akers
230 N. Perry Street
Johnstown, NY 12095

Mr. Keith Dwyer
9 Dove Street
Johnstown, NY 12095

Mr. Richard Robbins
9 Crescendoe Road
Johnstown, NY 12095

Mr. Marvin Herrick
7 Crescendoe Road
Johnstown, NY 12095

Mr. Alan Dwyer
Crescendoe Road
Johnstown, NY 12095

Joann Enterprises
2609 State Hwy. 30A
Fonda, NY 12068

Mr. James Subik
PO Box 45 State Hwy. 10
Caroga Lake, NY 12032

Mr. Charles Rebecca
224 N. Perry Street
Johnstown, NY 12095

Mr. Christopher Moister
226 N. Perry Street
Johnstown, NY 12095

McCloskey Comm. Service Corp.
40 N. Main Street
Albany, NY 12203

Mr. Richard Jung
6 Spring Street
Johnstown, NY 12095

Adjacent Property Owners (cont'd)

Ms. Diana Klein
8 Spring Street
Johnstown, NY 12095

Mr. Anthony Pochile
10 Spring Street
Johnstown, NY 12095

Ms. Patricia Locatelli
12 Spring Street
Johnstown, NY 12095

Mr. Clarence Miller
136 Hoosac Street
Johnstown, NY 12095

Mr. John Kubina
7 Grand Street
Johnstown, NY 12095

Mr. James Walker
5 Grand Street
Johnstown, NY 12095

Mr. Richard Frasier
PO Box 59 Ext. E State
Johnstown, NY 12095

Mr. Gary Luck
19 Crescendoe Road
Johnstown, NY 12095

Ms. Barbara Watkins
17 Crescendoe Road
Johnstown, NY 12095

Mr. John Witzke
233 Sweet Road
Johnstown, NY 12095

J. Mihalik
c/o Linda Keller
11 Crescendoe Road
Johnstown, NY 12095

Mr. Joseph Stegel
2 Dove Street
Johnstown, NY 12095

Mr. Joseph Stegel
4 Dove Street
Johnstown, NY 12095

Ms. Margaret Joyal
211 N. Perry Street
Johnstown, NY 12095

Ms. Maureen Vanskiver
209 N. Perry Street
Johnstown, NY 12095

Mr. Barry Bump, Sr.
RR#3 Box 126
Gloversville, NY 12078

Ms. Mary Vangelakos
205 N. Perry Street
Johnstown, NY 12095

Mr. Robert Jewell
1 West Fulton Street
Johnstown, NY 12095

Mr. Robert Jewell
1 West Fulton Street
Johnstown, NY 12095

Ms. Cheryl Auty
PO Box 633
Johnstown, NY 12095

Adjacent Property Owners (cont'd)

Wm. Smith & R. Walters
129 N. Perry Street
Johnstown, NY 12095

A. Hunter & M. Yoshido
297 N. Perry Street
Johnstown, NY 12095

Mr. Joseph Bonville
125 N. Perry Street
Johnstown, NY 12095

Lexington Hostels Fund
123 N. Perry Street
Johnstown, NY 12095

Mr. Alan Mukucki
RD 1 Box 465G Kunkle Pt. Rd.
Mayfield, NY 12117

Mr. Joseph Lagreca
6 Crescendoe Road
Johnstown, NY 12095

Mr. Robert Frenyea
10-1/2 Crescendoe Road
Johnstown, NY 12095

Mr. Fred Volpp
21 Crescendoe Road
Johnstown, NY 12095

Ms. Maria Stefka
2 Grand Street
Johnstown, NY 12095

Mr. David Zemanek
4 Grand Street
Johnstown, NY 12095

J. Loucks & T. McSpirit
6 Grand Street
Johnstown, NY 12095

Ms. Lavern Jaquay
8 Grand Street
Johnstown, NY 12095

Joseph & Sheila Lander
10 Grand Street
Johnstown, NY 12095

Mr. Wayne Matousek
12 Grand Street
Johnstown, NY 12095

Mr. Jerome Siegel
PO Box 993
Gloversville, NY 12078

Board of Education
Wright Drive, Suite 100
Johnstown, NY 12095

Johnstown Cemetary Assoc.
W. Main Street
Johnstown, NY 12095

City of Johnstown
E. Fulton Street
Johnstown, NY 12095

Mr. Vincent Johansen, Sr.
82-61 170th Street
Jamaica Falls, NY 11432

Mr. Michael Clukey
128 N. Perry Street
Johnstown, NY 12095

Mr. Anthony Valovic
19 Briggs Street
Johnstown, NY 12095

Adjacent Property Owners (cont'd)

Joan Coon & K. Wallace
8 E. Canal Street
Johnstown, NY 12095

Ms. Sandra Scott
6 Canal Street
Johnstown, NY 12095

J. Buhrmaster Co., Inc.
Box 2120
Scotia, NY 12302

Mr. Jeffrey Lehner
Johnstown Auto Parts
Johnstown, NY 12095

Mr. Roy Nellis
214 N. Perry Street
Johnstown, NY 12095

Mr. Charles Noxon
216 N. Perry Street
Johnstown, NY 12095

Mr. Alan Mikucki
RD 1 Box 465G Kunkle Pt. Rd.
Mayfield, NY 12117

Ms. Susan Whitman
2-4 Crescendoe Road
Johnstown, NY 12095

Mr. Donald Sparks
121 N. Perry Street
Johnstown, NY 12095

Mr. Donald Sparks
119-1/2 N. Perry Street
Johnstown, NY 12095

Mr. Brian Beaupre
Accredited Prop. Mgt.
454 Hanover Street
Manchester, NH 03104

Mr. Joseph Ludwin
1411 State Hwy. 29
Gloversville, NY 12078

Reith's Moving & Storage
349 N. Main Street
Gloversville, NY 12078

Ms. Judith Feuer
115 N. Perry Street
Johnstown, NY 12095

Mr. Francis Dwyer
5 Dove Street
Johnstown, NY 12095

NEWSPAPERS

Ken Fonda, Managing Editor
The Leader-Herald
8 East Fulton Street
Gloversville, NY 12078
(518) 725-8616

David Turner, Managing Editor
Amsterdam Recorder
1 Venner Road
P.O. Box 640
Amsterdam, NY 12010

Paul Zielbauer, Environmental Writer
Jim Michaels, News Editor
The Times Union
645 Albany Shaker Road
Albany, NY 12212
(518) 454-5420

NEWSPAPERS (cont'd)

George Walsh, News Editor
Daily Gazette
P.O. Box 1090
Schenectady, NY 12301
(518) 374-4141

RADIO STATIONS

Joseph Caruso, News Director
WIZR 930 AM & WSRD 105 FM
178 East State Street
Johnstown, NY 12095
(518) 762-4631

Tom Roehl, News Director
WENT Radio
Harrison Street Extension
P.O. Box 831
Gloversville, NY 12078
(518) 725-7175

Susan Arbetter, News Director
WAMC Radio
318 Central Avenue
Albany, NY 12206-2522
(518) 465-5233

TELEVISION STATIONS

Rob Lillpopp, Assignment Editor
WTEN-TV (Channel 10, ABC)
341 Northern Blvd.
Albany, NY 12204
(518) 436-4822

Michael Carrese, Producer
WMHT/WMHQ (Channels 17 & 45)
P.O. Box 17
Schenectady, NY 12301
(518) 357-1700

Steve Janack, Assignment Editor
WXXA-TV (Channel 23, FOX)
28 Corporate Circle
Albany, NY 12203
(518) 862-2323

Vicki Moorehead, Assignment Editor
WNYT-TV (Channel 13, NBC)
15 North Pearl Street
Menands, NY 12204
(518) 436-4791

Larry Schwartz, Assignment Editor
WRGB-TV (Channel 6, CBS)
1400 Balltown Road
Schenectady, NY 12309
(518) 346-6666

ELECTED OFFICIALS

U.S. Senate

Senator Charles E. Schumer (D)
313 Hart Office Building
Washington, DC 20510
(202) 224-6542

also:
Leo O'Brien Office Building
Room 420
Albany, NY 12207
(518) 472-4343

Senator Daniel Patrick
Moynihan (D)
464 Russell Senate Office Building
Washington, DC 20510
(202) 224-4451

also:
Guarantee Building #203
28 Church Street
Buffalo, NY 14202
(716) 551-4097

U.S. House of Representatives

Representative John M. McHugh (R)
Rayburn Office Building
Room 2441
Washington, DC 20515
(202) 225-4611

also:
Fulton County Office Building
223 West Main Street
Johnstown, NY 12905
(518) 762-0379

State of New York

Governor George E. Pataki (R-C)
Office of the Governor
Executive Chamber, State Capitol
Albany, NY 12224
(518) 474-8390

Lieutenant Governor Mary
Donohue (R)
Office of the Lieutenant Governor
State Capitol, Room 326
Albany, NY 12224
(518) 474-4623

Senator Hugh T. Farley (R-C)
Legislative Office Building
Room 412
Albany, NY 12247
(518) 455-2181

Assemblyman Marc Bulter (R-C)
Legislative Office Building
Room 628
Albany, NY 12248
(518) 455-5393

Senator Carl Marcellino, Chairman
Environmental Conservation Committee
Legislative Office Building
Room 812
Albany, NY 12247
(518) 455-2390

Senator Kemp Hannon, Chairman
Health Committee
Legislative Office Building
Room 707
Albany, NY 12247
(518) 455-2200

State of New York (Continued)

Assemblyman Richard L. Brodsky,
Chairman
Environmental Conservation Committee
Legislative Office Building
Room 625
Albany, NY 12248
(518) 455-5753

Assemblyman Richard N. Gottfried,
Chairman
Health Committee
Legislative Office Building
Room 822
Albany, NY 12248
(518) 455-4941

Fulton County

Claude J. Favill, Chairperson
Fulton County Board of Supervisors
Fulton County Office Building
Johnstown, NY 12095

Jon Stead, Clerk
Fulton County Board of Supervisors
Fulton County Office Building
Johnstown, NY 12095

Jeff Bouchard, Director
Fulton County Dept. of Solid Waste
P.O. Box 28
Johnstown, NY 12095

City of Johnstown

Johnstown City Hall
33-41 East Main Street
Johnstown, NY 12095
(518) 736-4011

Mayor: William M. Pollak

Aldermen:	Russell Barter
	Laurence Yerdon
	Lisa Brunetto-Miller
	Thomas G. Clark
	Kaye B. Cole

APPENDIX A

Contact List

APPENDIX B

Location for Document Repository

APPENDIX B

LOCATION FOR DOCUMENT REPOSITORY

Johnstown Public Library
38 South Market Street
Johnstown, NY 12095
(518) 762-8317

Hours:	Monday	1:00 pm - 8:00 pm
	Tuesday and Wednesday	10:00 am - 8:00 pm
	Thursday	1:00 pm - 8:00 pm
	Friday	10:00 am - 5:00 pm
	Saturday	10:00 am - 1:00 pm
	Sunday	1:00 pm - 4:00 pm

APPENDIX C

Glossary for Commonly Used Citizen Participation Terms

APPENDIX C

GLOSSARY OF COMMONLY USED CITIZEN PARTICIPATION TERMS

Community Participation - A process to inform and involve the interested/affected public in the decision-making process during identification, assessment and remediation of inactive hazardous waste sites. This process helps to assure that the best decisions are made from environmental, human health, economic, social and political perspectives.

Community Involvement Plan - A document that describes the site-specific community participation activities that will take place to complement the "technical" (remedial) activities. It also provides site background and rationale for the selected community participation program at the site. A plan may be updated or altered as public interest or the technical aspects of the program change.

Consent Order - A legal and enforceable negotiated agreement between the NYSDEC and the potentially responsible party in which the potentially responsible party agrees to undertake investigation and remediation, if necessary, at the site. The Consent Order includes a description of the remedial actions to be taken and a schedule for implementation.

Contact List - Names, addresses and/or telephone numbers of individuals, groups, organizations and media interested and/or affected by an inactive hazardous waste site. The contact list is used to inform and involve the interested/affected public.

Document Repository - A location, typically a public building, near a particular site at which documents related to remedial and community participation activities at the site are available for public review. The document repository provides access to documents at times and a location convenient to the public.

Fact Sheet - A written discussion of the site's history, the status of the environmental study, or the remedial process. The fact sheet may be mailed to all or part of the contact list, distributed at meetings, or sent on an "as requested" basis.

Phase I Site Investigation - Initial step in a Site Investigation to characterize hazardous substances present at a site.

Phase II Site Investigation - A Phase II investigation is performed when additional information is needed to fully characterize the site after completion of the Phase I.

Potentially Responsible Party (PRP) - Individuals, companies (e.g. site owners, operators, transporters or generators of hazardous waste) who may be responsible for an inactive hazardous waste disposal site.

Proposed Remedial Action Plan (PRAP) - A pubic document prepared by the NYSDEC after the Remedial Alternatives Report which summarizes the remedial options for a site and proposes a specific remedial alternative for implementation.

Public - The universe of individuals, groups and organizations: a) affected (or potentially affected) by the site and/or its remedial program; b) interested in the site and/or its remediation; c) having information about the site and its history.

Public Consultation/Community Meeting - A scheduled gathering which may present study findings, discuss alternatives, respond to questions and receive public comment.

Record of Decision (ROD) - A public document prepared by the NYSDEC following the selection of a remedy for a site. The ROD presents the rationale for the selected remedy and is prepared after a public comment period on the PRAP.

Registry - The NYSDEC Registry of Inactive Hazardous Waste Disposal Sites in New York State.

Remedial Alternatives Report (RAR) - A process for developing, evaluating and selecting remedial actions, using data gathered during the SI to: define objectives of the remedial program for the site and broadly develop remedial action alternatives; perform an initial screening of these alternatives; and perform a detailed analysis of a limited number of alternatives which remain after the initial screening stage.

Remedial Design - Once a remedial action has been selected, technical plans and specifications for remedial construction at a site are developed, as specified in the ROD. Design documents are used to bid and construct the selected remedial action.

Responsiveness Summary - A summary and response to public questions and comments.

Site Investigation (SI) - A process to determine the nature and extent of contamination by collecting data and analyzing the site. It includes sampling and monitoring, as necessary, and includes the gathering of sufficient information to determine the necessity for, and proposed extent of, a remedial program for the site.

APPENDIX D

Points of Contact List

APPENDIX D

POINTS OF CONTACT LIST

USEPA

Mr. Larry D'Andrea
Brownfields Coordinator
USEPA Region 2
290 Broadway
18th Floor
New York, NY 10007

Ms. Lya Theodoratos
USEPA Region 2
290 Broadway
18th Floor
New York, NY 10007

<<EPA - OSC to be named>>

New York State

Mr. Gary Sheffer
Public Information Office
New York Department of
Environmental Conservation
50 Wolf Road
Albany, NY 12233
(518) 457-5400

Mr. Dan Steenberge
New York State Department of
Environmental Conservation
Region V
Route 86, P.O. Box 296
Ray Brook, NY 12977
(518) 897-1200

Ms. Betsy Lowe
Regional Citizen Participation Specialist
New York State Department of
Environmental Conservation
Region V
Route 86, P.O. Box 296
Ray Brook, NY 12977
(518) 897-1200

Ms. Antonia C. Novello, M.D., M.P.H
Commissioner
New York State Department of Health
Corning Tower
Empire State Plaza
Albany, NY 12237
(518) 474-2011

Mr. Ronald Tromontano, Director
Center for Environmental Health
New York State Department of Health
2 University Place
Albany, NY 12203
(518) 458-6440

Ms. Allison Wakeman, Director
Division of Environmental Protection
New York State Department of Health
2 University Place
Albany, NY 12203
(518) 458-6423

Ms. Nancy Kim, Director
Division of Environmental Health
Assessment
New York State Department of Health
2 University Place
Albany, NY 12203
(518) 458-6438

Fulton County

Regina Scrocco, Director
Fulton County Public Health Department
2714 State Highway 29
P.O. Box 415
Johnstown, NY 12095
(518) 736-5720

Robert Ambrosino
Soil and Water Conservation District
113 Hales Mills Road
Johnstown, NY 12095
(518) 762-0079

MALCOLM PIRNIE

SITE SPECIFIC SAFETY AND HEALTH PLAN

SECTION 1: GENERAL INFORMATION & DISCLAIMER

CLIENT NAME:	City of Johnstown	PROJECT NAME:	Former Karg Brothers Tannery
PROJECT MANAGER:	Bruce Nelson		
PROJECT LEADER:	Andrew Vitolins	REVISION DATE:	
SITE HEALTH & SAFETY OFFICER:	Matthew Bokus		
PREPARED BY:	Matthew Bokus	DATE:	Mrach 3, 2000

NOTE: This Site Specific Safety and Health Plan (SSSHP) has been prepared for use by Malcolm Pirnie, Inc. employees for work at this site. Malcolm Pirnie, Inc. is not responsible for its use by others. **The plan is written for the specific site conditions, purposes, tasks, dates and personnel specified and must be amended and reviewed by those named in Section 16 if these conditions change.**

Subcontractors shall be solely responsible for the health and safety of their employees and shall comply with all applicable laws and regulations. In accordance with 1910.120(b)(1)(iv) and (v), Malcolm Pirnie, Inc. will inform subcontractors of the site emergency response procedures, and any potential fire, explosion, health, safety or other hazards by making this Site Specific Safety and Health Plan and site information obtained by others available during regular business hours. All contractors and subcontractors are responsible for: (1) developing their own Health and Safety Plan including a written Hazard Communication Program and any other written hazard specific programs required by federal, state and local laws and regulations; (2) providing their own personal protective equipment; (3) providing documentation that their employees have been health and safety trained in accordance with applicable federal, state and local laws and regulations; (4) providing evidence of medical surveillance and medical approvals for their employees; and (5) designating their own site safety officer responsible for ensuring that their employees comply with their own Health and Safety plan and taking any other additional measures required by their site activities.

If an upgrade to Level "C" or above is anticipated, this Site Specific Safety and Health Plan must be reviewed/approved by Health and Safety, Corporate.

SECTION 2: PROJECT INFORMATION

(1) SITE INFORMATION

Site Name: Former Karg Brothers Tannery

Address: N. Perry St. and Crescendoe Road.

Site Project Client Contact: George Bevington

Phone No.: (518) 736-4014

Site Health & Safety Contact: N/A

Phone No.: N/A

(2) SITE CLASSIFICATION: (check and circle all that apply)

X Hazardous (RCRA)
Construction
Sanitary or C and D Landfill
First Entry
Hazardous (CERCLA/State Superfund)
UST/LUST
X Manufacturing
Previously Characterized
Active
X Inactive

Other

Explain:
USEPA Brownfields Pilot Project

(3) ENTRY OBJECTIVES AND DATES OF FIELD VISIT(S):

Conduct environmental sampling in support of USEPA Brownfields Pilot Demonstration Project at site. Sampling to be conducted in Spring, Summer, and Fall 2000.

(4) MALCOLM PIRNIE TASKS:

1. Observation of soil boring/monitoring well installation
2. Well development
3. Site survey
4. Water level measurements
5. Groundwater Sampling
6. Waste Material Evaluation
7. Surface water and sediment sampling

TASKS PERFORMED BY OTHERS:

1. Geoprobe
2. Well instalation

(5) PROJECT ORGANIZATION AND COORDINATION - The following Malcolm Pirnie personnel are designated to carry out the stated project job functions on site. (Note: One person may carry out more than one job function.)

	PROJECT MANAGER	Bruce Nelson
	SITE SAFETY OFFICER	Matthew Bokus
	ALTERNATE SITE SAFETY OFFICER	Jason Kappel
	PUBLIC INFORMATION OFFICER	Bruce Nelson
	SITE RECORDKEEPER	Andrew Vitolins
	ON-SITE PERSONNEL WITH CPR/FA	Andrew Vitolins
	FIELD TEAM LEADER	Andrew Vitolins
	FIELD TEAM MEMBERS	Matthew Bokus Jason Kappel Patrick Rabideau John Nead
VISITORS:	FEDERAL AGENCY REPS	USEPA
	STATE AGENCY REPS	NYSDEC
	LOCAL AGENCY REPS	
SUBCONTRACTORS:-	SUBCONTRACTOR(S) SITE SAFETY OFFICERS	Geoprobe Contractor

All personnel arriving or departing the site should log in and out with the Recordkeeper.

(6) ONSITE CONTROL

Matthew Bokus has been designated to coordinate access control and security for Malcolm Pirnie operations on site. A safe perimeter has been established at the perimeter of the Former Karg Brothers Tannery

No unauthorized person should be within this area.

The onsite Command Post and staging area have been established at site activities where field team members will be located.

The prevailing wind conditions are NW. A wind direction indicator is used to determine daily wind direction. The Command Post is located upwind from the Exclusion Zone or at a sufficient distance to prevent exposure should a release occur.

Control boundaries have been established and Exclusion Zone(s) (the contaminated area) have been identified. (Attach site map)

These boundaries are identified by: 20 foot radius around each site activity

SECTION 3: PHYSICAL HAZARDS INFORMATION

(1)IDENTIFY POTENTIAL PHYSICAL HAZARDS TO WORKERS:

	Confined Space	X	Steep/uneven terrain	X	Surface water
X	Heavy equipment	X	Heat stress		Drum handling
X	Moving parts		Extreme cold	X	Noise
	Heavy Lifting		Ionizing Radiation		Non-Ionizing Radiation
	Electrical		Traffic	X	Falls
	Overhead Hazards		Biological Hazards		

Describe other unsafe environments

(2)SAFETY EQUIPMENT REQUIRED FOR MALCOLM PIRNIE EMPLOYEES

	Explosimeter	X	Eye Wash		Snake Bite Kit
	Fall Protection Equipment		Emergency Shower	x	Floatation Device (USCG Type III)
			Barrier Tape	X	Emergency Air Horn
	Confined Space Equipment		Traffic Cones	x	Lights
			Stretcher		Lights - emergency
X	Ladder	X	A-B-C Fire Extinguisher	X	Communications - On Site
X	First Aid Kit		Tick Repellant	x	Communications - Off Site

Describe other

SECTION 4: CHEMICAL HAZARDS INFORMATION

(1) IDENTIFIED CONTAMINANTS

Known or suspected hazardous/toxic materials (attach historical information, physical description, map of contamination and tabulated data, if available)

Media	Substances Involved	Characteristics	Estimated Concentrations	PEL
GW	VOCs, metals, acids	CA, CC, TO	Unknown	
SL	VOCs, metals, acids	CA, CC, TO	Unknown	
WS	toxic metals	CA, CC, TO	Unknown	
WW	toxic metals	CA, CC, TO	Unknown	
WL	acids, metals	CA, CC, TO	Unknown	

Media types: GW (ground water), SW (surface water), WW (wastewater), AIR (air), SL (soil), SD (sediment), WL (waste, liquid), WS (waste, solid), WD (waste, sludge), WG (waste, gas), OT (other).

Characteristics: CA (corrosive, acid), CC (corrosive, caustic), IG (ignitable), RA (radioactive), VO (volatile), TO (toxic), RE (reactive), BIO (infectious), UN (unknown), OT (other, describe)

(2) DESCRIBE POTENTIAL FOR CONTACT WITH EACH MEDIA TYPE FOR EACH OF THE MPI TASKS LISTED IN SECTION 2.4:

MPI Task #	Route of Exposure	Potential for Contact	Method of Control
M.W. Installation	skin/inhalation	low	PPE
Site survey	skin/inhalation	low	PPE
G.W. Sampling	skin/inhalation	low	PPE
Soil Sampling	skin/inhalation	low	PPE
Waste sampling	skin/inhalation	low	PPE

The Site Safety Officer will brief the MPI field team on symptoms and signs of overexposure to chemical hazards.

SECTION 5: HAZARD COMMUNICATION PROGRAM

If chemicals are introduced to the site by Malcolm Pirnie, Inc. (e.g., decontamination liquids, preservatives, etc.), bring a copy of the Malcolm Pirnie, Inc. Hazard Communication Program and Material Safety Data Sheets (MSDSs) to the site. The Site Safety Officer will review this information with all field personnel prior to the start of the project. The Comprehensive List of Chemicals for this site is:

Alconox	See Appendix A for MSDS
Isopropanaol	Chemicals will only be used during decomtamination
10% Nitric acid solution	procedures.

SECTION 6: ENVIRONMENTAL MONITORING

(1) The following environmental monitoring instruments shall be used on site at the specified intervals.

EQUIPMENT		MONITORING PERIOD		PEL/REL/TLV	ACTION LEVEL
Combustible Gas Indicator	-	continuous/hourly/daily/other		25%	10%
O_2 Monitor	-	continuous/hourly/daily/other		19.5 - 25%	19.5
Colorimetric Tubes (type)	-	continuous/hourly/daily/other			
	-				
	-				
	-				
PID (Lamp 10.2 eV)	-	continuous/hourly/daily/other	As needed		
FID	-	continuous/hourly/daily/other			
Radiation Meter	-	continuous/hourly/daily/other			
Respirable Dust Monitor	-	continuous/hourly/daily/other	As needed		
Toxic Gas Indicator	-				
(Type)	-	continuous/hourly/daily/other			
Other	-	continuous/hourly/daily/other			
	-	continuous/hourly/daily/other			

(2) Monitoring equipment is to be calibrated according to manufacturers' instructions. Record calibration data and air concentrations in the Health and Safety on-site log book.

(3) Recommended Action Levels for Upgrade or Downgrade of Respiratory Protection or Site Shutdown and Evacuation. These are average values. Consideration should be given to the potential for release of highly toxic compounds from the waste or from reaction by-products. Levels are for persistent (> 10 min) breathing zone measurements.

	Uncharacterized Airborne Vapors or Gases	Characterized Gases, Vapors, Particulates*
Level D	Background*	Up to 50% of PEL, REL or TLV
Level C	Up to 5 ppm above background	Up to 25 times PEL, REL or TLV
Level B	5 ppm to 500 ppm above background	Up to 500 times PEL, REL or TLV
Level A	500 ppm to 1000 ppm above background	Up to 1000 times PEL, REL or TLV

*Off-site "clean" air measurement.

*Use mixture calculations (% allowed = $\sum C_n / PEL_n$) if more than one contaminant is present.

Oxygen Deficiency

Concentration	Action Taken
< 19.5% O_2	Leave Area. Reenter only with supplied-air respirators.
19.5 % to 25% O_2	Work may continue. Investigate changes from 21%.
> 25% O_2	Work must stop. Ventilate area before returning.

Flammability

Concentration	Action Taken
< 10% of LEL	Work may continue. Consider toxicity potential.
10% to 25% LEL	Work may continue. Increase monitoring frequency.
> 25% LEL	Work must stop. Ventilate area before returning.

Radiation

Intensity	Action Taken
< .5 mR/hr	Work may continue.
< 1 mR/hr	Work may continue. Continue to monitor. Notify Corporate Health and Safety and Corporate Health Physicist.
5 mR/hr	Radiation work zone. Work must stop.

SECTION 7: HEALTH AND SAFETY TRAINING AND MEDICAL MONITORING PROGRAM

The project staff is included in the Malcolm Pirnie Health and Safety training and medical monitoring programs. (See the Health and Safety Procedures Manual, Sections 3, 4 and 5.)

NAME	MEDICAL (Date)	HAZWOPER TRAINING INITIAL (Hrs/Date)	REFESHER (Date)	MGR/SUPV (Date)	CPR / FA / BBP (Dates)	FIT TEST (Make/Size/Type/Date)
Andrew Vitolins	6/99	40 | 10/95	3/99		8/98 | N/A | 8/98	MSA / S / FF / 10/95
Jason C. Kappel	6/99	40 | 10/95	3/99		8/98 | N/A | 8/98	MSA / L / FF / 10/95
Matthew Bokus	4/99	40 | 08/98	N/A		| |	MSA / L / FF / 08/98
John Nead	08/99	40 | 05/88	03/99		03/97| 03/97 | 08/98	MSA / M / FF / 08/98
Patrick Rabideau	08/99	40 | 01/98	03/99		03/99| 03/99 |	MSA / M / FF / 03/98

SECTION 8: PERSONAL MONITORING

The following personal monitoring will be in effect on site:

Personal exposure sampling:

Not applicable at this site.

Medical monitoring: The expected air temperature will be 75 F. If it is determined that heat stress monitoring is required (mandatory for heavy exertion in PPE at temperatures over 70°F) the following procedures shall be followed (describe procedures in effect, i.e., monitoring body temperature, body weight, pulse rate):

SEE ATTACHMENT C

A copy of personal monitoring results is to be sent to Corporate Health and Safety for inclusion in the Employee's Confidential Exposure Record File.

SECTION 9: CONFINED SPACE ENTRY

(1) WILL CONFINED SPACE ENTRY TAKE PLACE? Yes ____ No X

If yes, attach **Confined Space Entry Program** available from your Branch Health and Safety Coordinator and complete the **Pre-Entry Inspection Checklist** and **Confined Space Entry Permit** prior to entering each confined space, each work shift. The Confined Space Permit must be posted outside the confined space.

Permits will be saved and logged with project documentation.

SECTION 10: COMMUNICATIONS PROCEDURES

The following standard hand signals will be used in case of failure of radio communications:

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

If applicable, telephone communication to the Command Post should be established as soon as practicable. The stationary and/or mobile phone number(s) are N/A and N/A.

SECTION 11: DECONTAMINATION PROCEDURES

Personnel and equipment leaving the Exclusion Zone shall be thoroughly decontaminated. The Site Safety Officer is responsible for monitoring adherence with this decontamination plan. The standard level D decontamination protocol shall be used with the following decontamination stations*:

(1) Level "D" protection will be provided for all of the professionals working on this project. It will consist of work clothes,

(2) gloves, eye protection devices, and steel-toe shoes for the professionals working at or visiting the site. Upon exiting the

(3) work zone, obviously contaminated boots and gloves will be removed.

(4) Thoroughly wash outer boot covers with detergent-water solution and rinse with copious amounts of water.

(5)

(6)

(7)

(8)

(9)

(10)

Other

*See the Malcolm Pirnie Health and Safety Procedures Manual, Section 8, Personal Protective Equipment, for sample decontamination station descriptions.

The following decontamination equipment is required:

Detergent (Alconox)/Water Solution will be used as the decontamination solution.

SECTION 12: EMERGENCY PROCEDURES

The following standard emergency procedures will be used by onsite personnel. The Site Safety Officer shall be notified of any onsite emergencies and be responsible for ensuring that the appropriate procedures are followed.

Personnel Injury in the Exclusion Zone: Upon notification of an injury in the Exclusion Zone, the designated emergency signal 3 short blasts shall be sounded. All site personnel shall assemble at the decontamination line. An outside rescue team summoned by the field team leader or SSO will enter the Exclusion Zone (if required) to remove the injured person to the hotline. The Site Safety Officer and Field Team Leader should evaluate the nature of the injury, and the affected person should be decontaminated to the extent possible prior to movement to the Support Zone. The onsite CPR/FA personnel shall initiate the appropriate first aid, and contact should be made for an ambulance and with the designated medical facility (if required). No persons shall reenter the Exclusion Zone until the cause of the injury or symptoms is determined.

Personal Protective Equipment Failure: If any site worker experiences a failure or alteration of protective equipment that affects the protection factor, that person and his/her buddy shall immediately leave the Exclusion Zone. Reentry shall not be permitted until the equipment has been repaired or replaced.

Fire/Explosion: Upon notification of a fire or explosion on site, the designated emergency signal 1 long blast shall be sounded and all site personnel assembled at the decontamination line. The fire department shall be alerted and all personnel moved to a safe distance from the involved area.

Other Equipment Failure: If any other equipment on site fails to operate properly, the Field Team Leader and Site Safety Officer shall be notified and then determine the effect of this failure on continuing operations on site. If the failure affects the safety of personnel or prevents completion of the Work Plan tasks, all personnel shall leave the Exclusion Zone until the situation is evaluated and appropriate actions taken.

The following emergency escape routes are designated for use in those situations where egress from the Exclusion Zone can not occur through the decontamination line (attach map if available):

The site personnel shall assemble at a designated holding area which will be determined prior to field activities.

In all situations, when an onsite emergency results in evacuation of the Exclusion Zone, personnel shall not reenter until:

1. The conditions resulting in the emergency have been corrected.
2. The hazards have been reassessed by the SSO.
3. The Site Safety Plan has been reviewed by the SSO and Corporate Health and Safety Manager.
4. Site personnel have been briefed on any changes in the Site Safety Plan by the SSO.

SECTION 13. EMERGENCY INFORMATION

TO BE POSTED IN SITE-TRAILER/OFFICE AND IN FIELD VEHICLES

(1) LOCAL RESOURCES

Ambulance (name):	Fulton County 911	Phone:	911
Hospital (name):	Fulton County 911	Phone:	911
Police (local or state):	Fulton County 911	Phone:	911
Fire Dept. (name):	Fulton County 911	Phone:	911
HAZ MAT Responder:	Fulton County 911	Phone:	911
Nearest phone:	Cellular phone		
On-Site CPR/FA(s):			

A "911" emergency system is active.

The hospital is 30 minutes from the site and the ambulance response time is 10 minutes. An employee of Nathan Littauer Hospital was contacted and briefed on the situation, the potential hazards, and the substances involved. When IDLH conditions exist, arrangements should be made for onsite standby of emergency services.

(2) DIRECTIONS TO NEAREST HOSPITAL - ATTACH MAP:

Exit the site, turn left onto Crescendoe Rd. Follow Crescendoe Rd. To N. Perry St. turn right. Follow N. Perry St. to Briggs St. turn, right. Follow Briggs St. to Route 30 N, turn left onto Route 30 N. Follow Route 30 N to the City of Gloversville. Follow Route 30 N to State St., take a left onto State St. Follow State St. the hospital will be on the right.

(3) CORPORATE RESOURCES

Mark A. McGowan, CIH, CSP Manager, Corporate Health & Safety	(914) 641-2484 work (800) 478-6870 answering service
Joseph Golden	(914) 641-2978 work
Nidal Azzam Corporate Health Physicist	(201) 529-0858 work
Christopher Gaule (Branch Health & Safety Coordinator)	(518) 766-4981 (H) (518) 786-7349 (w)
Elayne F. Theriault, M.D. Environmental Medicine Resources, Inc. (Corporate Medical Consultant)	(800) 229-3674 24 Hour Number
Occupational Medical Services (Branch Medical Consultant)	(518) 482-0666

(4) WHOM TO NOTIFY IN CASE OF ACCIDENT:
Christopher Gaule (518) 786-7349 (Work)

Also notify: Jennifer Kakic, MPI Benefits Administrator (914) 641-2551
MPI Legal Department (914) 694-2100

SECTION 14: PROTECTIVE EQUIPMENT LIST

TASK*	RESPIRATORS & CARTRIDGE*	USE	CLOTHING	GLOVES	BOOTS	OTHER
M.W. installation	D	UP	C	L/T	S	L/N/N
Well development	D	UP	C	L/T	S	L/H
G.W. Sampling	D	UP	C	L/T	S	L/H
Waste Sampling	D	UP	C	L/T	S	L/H
Survey	D	UP	C	L/T	S	L/H
SW Sampling	D	UP	C	L/T	S	L/H/P

*Same as in Section 4(2).

RESPIRATORS	APR CARTRIDGES	USE	CLOTHING	GLOVES	BOOTS	OTHER
B = SCBA	O = Organic vapor	Cont = Continuous	T = Tyvek	B = Butyl	F = Firemans	F = Face Shield
APR = APR	G = Organic vapor/acid gas	UP = Upgrade	P = PE Tyvek	L - Latex	L = Latex	G = Goggles
D = N/A	A = Asbestos (HEPA)		S = Saranex	N = Neoprene	N = Neoprene	L = Glasses
E = Escape	P = Particulate		C = Coveralls	T = Nitrile	S = Safety	H = Hardhat
AL = Airline	C = Combination organic vapor & particulate			V = Viton		N = Hearing Protection
	OTH = Other			CN = Cotton		P = Personal
				P = PVC		
				PA = Polyvinyl Alcohol		
				SS = Silvershield		

SECTION 15: SAFE WORK PRACTICES

THE FOLLOWING PRACTICES MUST BE FOLLOWED BY PERSONNEL ON SITE

1. Smoking, eating, chewing gum or tobacco, or drinking are forbidden except in clean or designated areas.
2. Ignition of flammable liquids within or through improvised heating devices (e.g., barrels) is forbidden.
3. Contact with samples, excavated materials, or other contaminated materials must be minimized.
4. Use of contact lenses is prohibited at all times.
5. Do not kneel on the ground when collecting samples.
6. If drilling equipment is involved, know where the 'kill switch' is.
7. All electrical equipment used in outside locations, wet areas or near water must be plugged into ground fault circuit interrupter (GFCI) protected outlets.
8. A "Buddy System" in which another worker is close enough to render immediate aid will be in effect.
9. Good housekeeping practices are to be maintained.
10. Where the eyes or body may be exposed to corrosive materials, suitable facilities for quick drenching or flushing shall be available for immediate use.
11. In the event of treacherous weather-related working conditions (i.e., thunderstorm, limited visibility, extreme cold or heat) field tasks will be suspended until conditions improve or appropriate protection from the elements is provided.

Site Specific Safe Work Practices:____

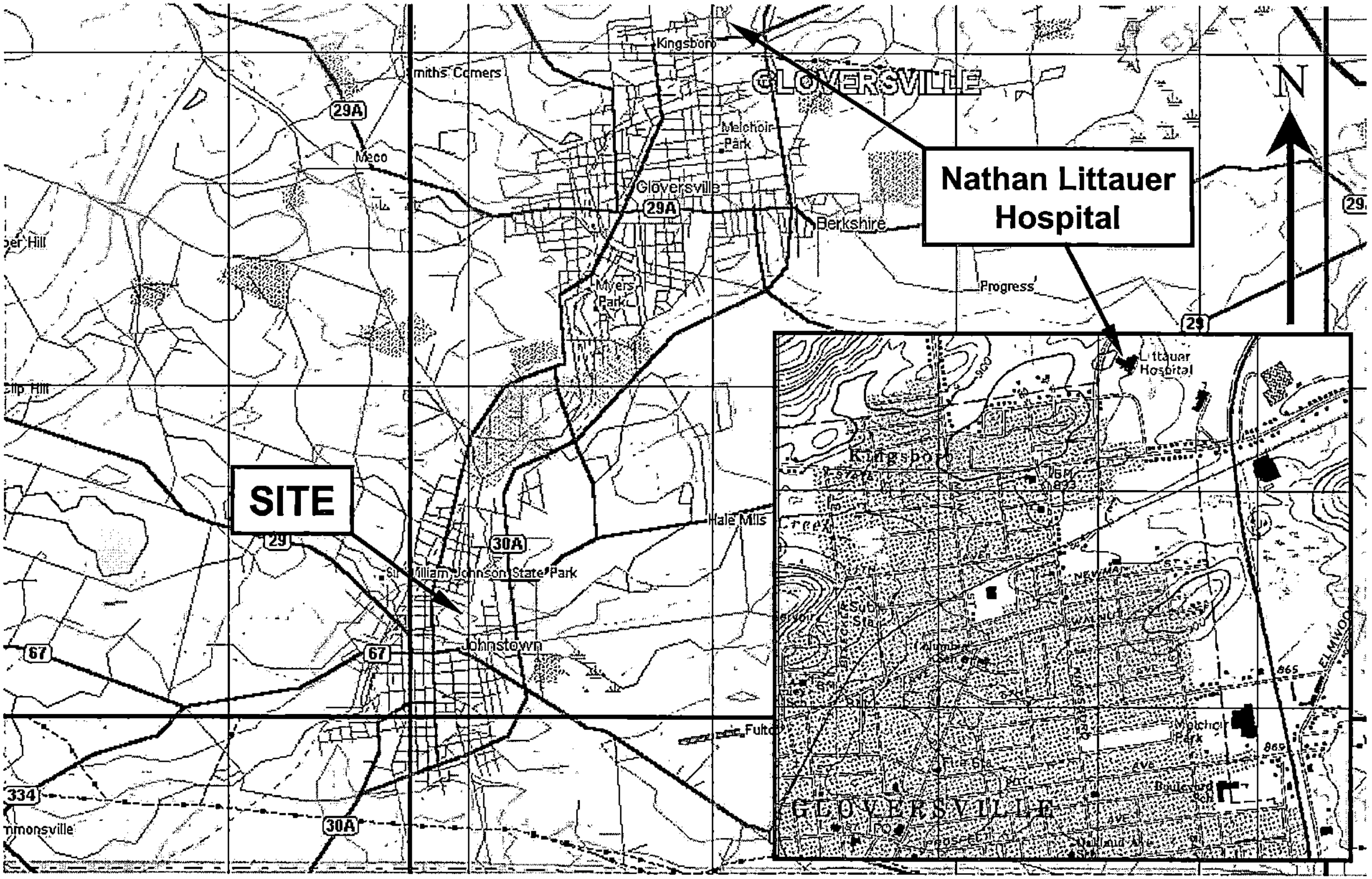
SECTION 16: EMPLOYEE ACKNOWLEDGEMENTS

PLAN REVIEWED BY:

		DATE
Corporate Health & Safety:		
Branch H&S Coordinator:		
Project Manager:		
Project Leader:		

I acknowledge that I have read the information on this Site Safety Plan Short Form and the attached Material Safety Data Sheets (MSDSs). I understand the site hazards as described and agreed to comply with the contents of this Plan.

EMPLOYEE (print name)	SIGNATURE	DATE



MALCOLM PIRNIE

FORMER KARG BROTHERS TANNERY
JOHNSTOWN, NEW YORK

Hospital Map

APPENDIX A

Material Safety Data Sheets

DATE: 09/14/90 ACCT: 652108-02
INDEX: 0490234096O CAT NO: A467-500 PO NBR: 082290

NITRIC ACID
NITRIC ACID
NITRIC ACID

MATERIAL SAFETY DATA SHEET

FISHER SCIENTIFIC
CHEMICAL DIVISION
1 REAGENT LANE
FAIR LAWN NJ 07410
(201) 796-7100

EMERGENCY CONTACTS:
GASTON L. PILLORI: (201) 796-7100
AFTER BUSINESS HOURS; HOLIDAYS:
(201) 796-7523
CHEMTREC ASSISTANCE: (800) 424-9300

THE INFORMATION BELOW IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. HOWEVER, WE MAKE NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO SUCH INFORMATION, AND WE ASSUME NO LIABILITY RESULTING FROM ITS USE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION FOR THEIR PARTICULAR PURPOSES.

SUBSTANCE IDENTIFICATION

CAS-NUMBER 7697-37-2

SUBSTANCE: **NITRIC ACID**

TRADE NAMES/SYNONYMS:
AQUA FORTIS; WFNA; RFNA; HYDROGEN NITRATE; AZOTIC ACID; NITRYL HYDROXIDE; NITAL; STCC 4918528; UN 2031; A-200; A-200-C; A-200-S; A-202; A-206-C; A-509; A-467; HNO3; /4; ACC16550

CHEMICAL FAMILY:
INORGANIC ACID

MOLECULAR FORMULA: H-N-O3

MOLECULAR WEIGHT: 63.01

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=0 REACTIVITY=1 PERSISTENCE=0
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

MPONENT: NITRIC ACID PERCENT: 70

MPONENT: WATER PERCENT: 30

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:
NITRIC ACID:
2 PPM (5 MG/M3) OSHA TWA; 4 PPM (10 MG/M3) OSHA STEL
2 PPM (5 MG/M3) ACGIH TWA; 4 PPM (10 MG/M3) ACGIH STEL
2 PPM NIOSH RECOMMENDED 10 HOUR TWA

1000 POUNDS SARA SECTION 302 THRESHOLD PLANNING QUANTITY
1000 POUNDS SARA SECTION 304 REPORTABLE QUANTITY
1000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

PHYSICAL DATA

DESCRIPTION: COLORLESS TO PALE YELLOW LIQUID WITH A SUFFOCATING ODOR.

BOILING POINT: 181 F (83 C) MELTING POINT: -44 F (-42 C)

SPECIFIC GRAVITY: 1.5027 @ 25 C VAPOR PRESSURE: 47.9 MMHG @ 20 C

EVAPORATION RATE: NOT AVAILABLE SOLUBILITY IN WATER: VERY SOLUBLE

VAPOR DENSITY: 3.2

SOLVENT SOLUBILITY: SOLUBLE IN ETHER.

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
NEGLIGIBLE FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

OXIDIZER: OXIDIZERS DECOMPOSE, ESPECIALLY WHEN HEATED, TO YIELD OXYGEN OR OTHER GASES WHICH WILL INCREASE THE BURNING RATE OF COMBUSTIBLE MATTER. CONTACT WITH EASILY OXIDIZABLE, ORGANIC, OR OTHER COMBUSTIBLE MATERIALS MAY RESULT IN IGNITION, VIOLENT COMBUSTION OR EXPLOSION.

REFIGHTING MEDIA:
WATER, DRY CHEMICAL OR SODA ASH

1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

OR LARGER FIRES, FLOOD AREA WITH WATER FROM A DISTANCE
1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL CONTAINERS EXPOSED TO FLAMES WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES; ELSE WITHDRAW FROM AREA AND LET FIRE BURN (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 44).

USE FLOODING AMOUNTS OF WATER AS FOG. COOL CONTAINERS WITH FLOODING AMOUNTS OF WATER, APPLY FROM AS FAR A DISTANCE AS POSSIBLE. AVOID BREATHING CORROSIVE VAPORS, KEEP UPWIND. CONSIDER EVACUATION OF DOWNWIND AREA IF MATERIAL IS LEAKING.

TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49 CFR 172.101:
OXIDIZER

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49 CFR 172.101 AND SUBPART E:
OXIDIZER AND CORROSIVE

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49 CFR 173.268
EXCEPTIONS: NONE

TOXICITY

NITRIC ACID:
TOXICITY DATA:
ANHYDROUS: 110 MG/KG UNREPORTED-MAN LDLO; 430 MG/KG ORAL-HUMAN LDLO; REPRODUCTIVE EFFECTS DATA (RTECS).
MONOHYDRATE: NO DATA AVAILABLE.
TRIHYDRATE: NO DATA AVAILABLE.
CARCINOGEN STATUS: NONE.
LOCAL EFFECTS: CORROSIVE- INHALATION, SKIN, EYES, INGESTION.
ACUTE TOXICITY LEVEL: INSUFFICIENT DATA.
TARGET EFFECTS: NO DATA AVAILABLE.
INCREASED RISK FROM EXPOSURE: PERSONS WITH IMPAIRED PULMONARY FUNCTION, PRE-EXISTING EYE AND SKIN DISORDERS.

HEALTH EFFECTS AND FIRST AID

INHALATION:
NITRIC ACID:
CORROSIVE. 100 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE- INHALATION OF ACIDIC SUBSTANCES MAY CAUSE SEVERE RESPIRATORY IRRITATION WITH COUGHING, CHOKING, AND POSSIBLY YELLOWISH BURNS OF THE MUCOUS MEMBRANES. OTHER INITIAL SYMPTOMS MAY INCLUDE DIZZINESS, HEADACHE, NAUSEA, AND WEAKNESS. PULMONARY EDEMA MAY BE IMMEDIATE IN THE MOST SEVERE EXPOSURES, BUT MORE LIKELY WILL OCCUR AFTER A LATENT PERIOD OF 5-72 HOURS. THE SYMPTOMS MAY INCLUDE TIGHTNESS IN THE CHEST, DYSPNEA, DIZZINESS, FROTHY SPUTUM, AND CYANOSIS. PHYSICAL FINDINGS MAY INCLUDE HYPOTENSION, WEAK, RAPID PULSE, MOIST RALES, AND HEMOCONCENTRATION. IN NON-FATAL CASES, COMPLETE RECOVERY MAY OCCUR WITHIN A FEW DAYS OR WEEKS OR, CONVALESCENCE MAY BE PROLONGED WITH FREQUENT RELAPSES AND CONTINUED DYSPNEA AND OTHER SIGNS AND SYMPTOMS OF PULMONARY INSUFFICIENCY. IN SEVERE EXPOSURES, DEATH DUE TO ANOXIA MAY OCCUR WITHIN A FEW HOURS AFTER ONSET OF THE SYMPTOMS OF PULMONARY EDEMA OR FOLLOWING A RELAPSE.
CHRONIC EXPOSURE- DEPENDING ON THE CONCENTRATION AND DURATION OF EXPOSURE, REPEATED OR PROLONGED EXPOSURE TO AN ACIDIC SUBSTANCE MAY CAUSE EROSION OF THE TEETH, INFLAMMATORY AND ULCERATIVE CHANGES IN THE MOUTH, AND POSSIBLY JAW NECROSIS. BRONCHIAL IRRITATION WITH COUGH AND FREQUENT ATTACKS OF BRONCHIAL PNEUMONIA MAY OCCUR. GASTROINTESTINAL DISTURBANCES ARE ALSO POSSIBLE.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND BLOOD PRESSURE AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. ADMINISTRATION OF OXYGEN SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
NITRIC ACID:
CORROSIVE.
ACUTE EXPOSURE- DIRECT CONTACT WITH LIQUID OR VAPOR MAY CAUSE SEVERE PAIN, BURNS AND POSSIBLY YELLOWISH STAINS. BURNS MAY BE DEEP WITH SHARP EDGES AND HEAL SLOWLY WITH SCAR TISSUE FORMATION. DILUTE SOLUTIONS OF NITRIC ACID MAY PRODUCE MILD IRRITATION AND HARDEN THE EPIDERMIS WITHOUT DESTROYING IT.
CHRONIC EXPOSURE- EFFECTS DEPEND ON THE CONCENTRATION AND DURATION OF EXPOSURE. REPEATED OR PROLONGED CONTACT WITH ACIDIC SUBSTANCES MAY RESULT

IN DERMATITIS OR EFFECTS SIMILAR TO ACUTE EXPOSURE.

RST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). IN CASE OF CHEMICAL BURNS, COVER AREA WITH STERILE, DRY DRESSING. BANDAGE SECURELY, BUT NOT TOO TIGHTLY. GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
NITRIC ACID:
CORROSIVE.

ACUTE EXPOSURE- DIRECT CONTACT WITH ACIDIC SUBSTANCES MAY CAUSE PAIN AND LACRIMATION, PHOTOPHOBIA, AND BURNS, POSSIBLY SEVERE. THE DEGREE OF INJURY DEPENDS ON THE CONCENTRATION AND DURATION OF CONTACT. IN MILD BURNS, THE EPITHELIUM REGENERATES RAPIDLY AND THE EYE RECOVERS COMPLETELY. IN SEVERE CASES, THE EXTENT OF INJURY MAY NOT BE FULLY APPARENT FOR SEVERAL WEEKS. ULTIMATELY, THE WHOLE CORNEA MAY BECOME DEEPLY VASCULARIZED AND OPAQUE RESULTING IN BLINDNESS. IN THE WORST CASES, THE EYE MAY BE TOTALLY DESTROYED. CONCENTRATED NITRIC ACID MAY IMPART A YELLOW COLOR TO THE EYE UPON CONTACT.

CHRONIC EXPOSURE- EFFECTS DEPEND ON THE CONCENTRATION AND DURATION OF EXPOSURE. REPEATED OR PROLONGED EXPOSURE TO ACIDIC SUBSTANCES MAY CAUSE CONJUNCTIVITIS OR EFFECTS AS IN ACUTE EXPOSURE.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). CONTINUE IRRIGATING WITH NORMAL SALINE UNTIL THE PH HAS RETURNED TO NORMAL (30-60 MINUTES). COVER WITH STERILE BANDAGES. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
NITRIC ACID:
CORROSIVE.

ACUTE EXPOSURE- ACIDIC SUBSTANCES MAY CAUSE CIRCUMORAL BURNS WITH YELLOW DISCOLORATION AND CORROSION OF THE MUCOUS MEMBRANES OF THE MOUTH, THROAT AND ESOPHAGUS. THERE MAY BE IMMEDIATE PAIN AND DIFFICULTY OR INABILITY TO SWALLOW OR SPEAK. EPIGLOTTAL EDEMA MAY RESULT IN RESPIRATORY DISTRESS AND POSSIBLY ASPHYXIA. MARKED THIRST, EPIGASTRIC PAIN, NAUSEA, VOMITING AND DIARRHEA MAY OCCUR. DEPENDING ON THE DEGREE OF ESPOHAGEAL AND GASTRIC CORROSION, THE VOMITUS MAY CONTAIN FRESH OR DARK PRECIPITATED BLOOD AND LARGE SHREDS OF MUCOSA. SHOCK WITH MARKED HYPOTENSION, WEAK, RAPID PULSE, SHALLOW RESPIRATION, AND CLAMMY SKIN MAY OCCUR. CIRCULATORY COLLAPSE MAY ENSUE AND IF UNCORRECTED, LEAD TO RENAL FAILURE. IN SEVERE CASES, GASTRIC, AND TO A LESSER DEGREE, ESOPHAGEAL PERFORATION AND SUBSEQUENT PERITONITIS MAY OCCUR AND BE ACCOMPANIED BY FEVER AND ABDOMINAL RIGIDITY. ESOPHAGEAL, GASTRIC ANC PYLORIC STRICTURE MAY OCCUR WITHIN A FEW WEEKS, BUT MAY BE DELAYED FOR MONTHS OR EVEN YEARS. DEATH MAY RESULT WITHIN A SHORT TIME FROM ASPHYXIA, CIRCULATORY COLLAPSE OR ASPIRATION OF EVEN MINUTE AMOUNTS. LATER DEATH MAY BE DUE TO PERITONITIS, SEVERE NEPHRITIS OR PNEUMONIA. COMA AND CONVULSIONS SOMETIMES OCCUR TERMINALLY.

CHRONIC EXPOSURE- DEPENDING ON THE CONCENTRATION, REPEATED INGESTION OF ACIDIC SUBSTANCES MAY RESULT IN INFLAMMATORY AND ULCERATIVE CHANGES IN THE MUCOUS MEMBRANES OF THE MOUTH AND OTHER EFFECTS AS IN ACUTE INGESTION. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

FIRST AID- DO NOT USE GASTRIC LAVAGE OR EMESIS. DILUTE THE ACID IMMEDIATELY BY DRINKING LARGE QUANTITIES OF WATER OR MILK. IF VOMITING PERSISTS, ADMINISTER FLUIDS REPEATEDLY. INGESTED ACID MUST BE DILUTED APPROXIMATELY 100 FOLD TO RENDER IT HARMLESS TO TISSUES. MAINTAIN AIRWAY AND TREAT SHOCK (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). GET MEDICAL ATTENTION IMMEDIATELY. IF VOMITING OCCURS, KEEP HEAD BELOW HIPS TO HELP PREVENT ASPIRATION.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY

REACTIVITY:
REACTS EXOTHERMICALLY WITH WATER.

INCOMPATIBILITIES:
NITRIC ACID:
ACETIC ACID: MAY REACT EXPLOSIVELY.
ACETIC ANHYDRIDE: EXPLOSIVE REACTION BY FRICTION OR IMPACT.
ACETONE: MAY REACT EXPLOSIVELY.
ACETONITRILE: EXPLOSIVE MIXTURE.
4-ACETOXY-3-METHOXYBENZALDEHYDE: EXOTHERMIC REACTION.
ACROLEIN: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
ACRYLONITRILE: EXPLOSIVE REACTION AT 90 C.
ACRYLONITRILE-METHACRYLATE COPOLYMER: INCOMPATIBLE.
ALCOHOLS: POSSIBLE VIOLENT REACTION OR EXPLOSION; FORMATION OF EXPLOSIVE COMPOUND IN THE PRESENCE OF HEAVY METALS.
ALKANETHIOLS: EXOTHERMIC REACTION WITH POSSIBLE IGNITION.
-ALKOXY-1,3-DITHIA-2-PHOSPHOLANE: IGNITION REACTION.
LLYL ALCOHOL: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
LLYL CHLORIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
AMINES (ALIPHATIC OR AROMATIC): POSSIBLE IGNITION REACTION.
2-AMINOETHANOL: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.

2-AMINOTHIAZOLE: EXPLOSIVE REACTION.
AMMONIA (GAS): BURNS IN AN ATMOSPHERE OF NITRIC ACID VAPOR.
AMMONIUM HYDROXIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
AMMONIUM NITRATE: FORMS EXPLOSIVE MIXTURE.
ANILINE: IGNITES ON CONTACT.
ANILINIUM NITRATE: FORMS EXPLOSIVE SOLUTION.
ANION EXCHANGE RESINS: POSSIBLE VIOLENT EXOTHERMIC REACTION.
ANTIMONY: VIOLENT REACTION.
ARSINE: EXPLOSIVE REACTION.
ARSINE-BORON TRIBROMIDE: VIOLENT OXIDATION.
BASES: REACTS.
BENZENE: EXPLOSIVE REACTION.
BENZIDINE: SPONTANEOUS IGNITION.
BENZONITRILE: POSSIBLE EXPLOSION.
BENZOTHIOPHENE DERIVATIVES: FORMATION OF POSSIBLY EXPLOSIVE COMPOUNDS.
N-BENZYL-N-ETHYLANILINE: VIGOROUS DECOMPOSITION.
1,4-BIS(METHOXYMETHYL)2,3,5,6-TETRAMETHYLBENZENE: GAS EVOLUTION.
BISMUTH: INTENSE EXOTHERMIC REACTION OR EXPLOSION.
1,3-BIS(TRIFLUOROMETHYL)BENZENE: POSSIBLE EXPLOSION.
BORON: VIOLENT REACTION WITH INCANDESCENCE.
BORON DECAHYDRIDE: EXPLOSIVE REACTION.
BORON PHOSPHIDE: IGNITION REACTION.
BROMINE PENTAFLUORIDE: IGNITION REACTION.
N-BUTYL MERCAPTAN: IGNITION REACTION.
N-BUTYRALDEHYDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
CADMIUM PHOSPHIDE: EXPLOSIVE REACTION.
CALCIUM HYPOPHOSPHITE: IGNITION REACTION.
CARBON (PULVERIZED): VIOLENT REACTION.
CELLULOSE: FORMS EASILY COMBUSTIBLE ESTER.
CHLORATES: REACTS.
CHLORINE: INCOMPATIBLE.
CHLORINE TRIFLUORIDE: VIOLENT REACTION.
CHLOROBENZENE: POSSIBLE EXPLOSION.
4-CHLORO-2-NITROANILINE: FORMS EXPLOSIVE COMPOUND.
CHLOROSULFONIC ACID: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
COAL: EXPLOSIVE MIXTURE.
COATINGS: MAY BE ATTACKED.
CRESOL: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
CROTONALDEHYDE: VIOLENT DECOMPOSITION WITH IGNITION.
CUMENE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
CUPRIC NITRIDE: EXPLOSIVE REACTION.
CUPROUS NITRIDE: VIOLENT REACTION.
CYANATES: POSSIBLE EXPLOSIVE REACTION.
CYCLOHEXANONE: VIOLENT REACTION.
CYCLOHEXYLAMINE: FORMS EXPLOSIVE COMPOUND.
CYCLOPENTADIENE: EXPLOSIVE REACTION.
1,2-DIAMINOETHANEBIS(TRIMETHYLGOLD): EXPLOSIVE REACTION.
DIBORANE: SPONTANEOUS IGNITION.
DI-2-BUTOXYETHYL ETHER: VIOLENT DECOMPOSITION REACTION.
2,6-DI-T-BUTYL PHENOL: FORMATION OF EXPLOSIVE COMPOUND.
DICHLOROETHANE: FORMS SHOCK AND HEAT SENSITIVE MIXTURE.
DICHLOROETHYLENE: FORMS EXPLOSIVE COMPOUND.
DICHLOROMETHANE: FORMS EXPLOSIVE SOLUTION.
DICYCLOPENTADIENE: SPONTANEOUS IGNITION.
DIENES: IGNITION REACTION.
DIETHYLAMINO ETHANOL: POSSIBLE EXPLOSION.
DIETHYL ETHER: POSSIBLE EXPLOSION.
3,6-DIHYDRO-1,2,2H-OXAZINE: EXPLOSIVE INTERACTION.
DIISOPROPYL ETHER: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
DIMETHYLAMINOMETHYLFERROCENE: VIOLENT DECOMPOSITION IF HEATED.
DIMETHYL ETHER: FORMS EXPLOSIVE COMPOUND.
DIMETHYL HYDRAZINE: IGNITES ON CONTACT.
DIMETHYL SULFOXIDE + 1,4-DIOXANE: EXPLOSION.
DIMETHYL SULFOXIDE + <14% WATER: EXPLOSIVE REACTION.
DINITROBENZENE: EXPLOSION HAZARD.
DINITROTOLUENE: EXPLOSIVE REACTION.
DIOXANE + PERCHLORIC ACID: POSSIBLE EXPLOSION.
DIPHENYL DISTIBENE: EXPLOSIVE OXIDATION.
DIPHENYL MERCURY + CARBON DISULFIDE: VIOLENT REACTION.
DIPHENYL TIN: IGNITION REACTION.
DISODIUM PHENYL ORTHOPHOSPHATE: VIOLENT EXPLOSION.
DIVINYL ETHER: POSSIBLE IGNITION REACTION.
EPICHLOROHYDRIN: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
ETHANESULFONAMIDE: EXPLOSIVE REACTION.
ETHOXY-ETHYLENE DITHIOPHOSPHATE: IGNITION ON CONTACT.
M-ETHYL ANILINE: IGNITION REACTION.
ETHYLENE DIAMINE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
ETHYLENE GLYCOL: FORMS SHOCK AND HEAT SENSITIVE MIXTURE.
ETHYLENEIMINE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
5-ETHYL-2-METHYL PYRIDINE: EXPLOSIVE REACTION.
ETHYL PHOSPHINE: IGNITION REACTION.
5-ETHYL-2-PICOLINE: FORMS EXPLOSIVE COMPOUNDS.
FERROUS OXIDE (POWDERED): INTENSE EXOTHERMIC REACTION.
FLUORINE: POSSIBLE EXPLOSIVE REACTION.
FORMIC ACID: EXOTHERMIC REACTION WITH RELEASE OF TOXIC GASES.
FORMYLAMINO-1-PHENYL-1,3-PROPANEDIOL: POSSIBLE EXPLOSION.
UEL OIL (BURNING): EXPLOSION.
ULMINATES: REACTS.
FURFURYLIDENE KETONES: IGNITES ON CONTACT.
GERMANIUM: VIOLENT REACTION.

GLYCEROL: POSSIBLE EXPLOSION.
GLYOXAL: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
HEXALITHIUM DISILICIDE: EXPLOSIVE REACTION.
HEXAMETHYLBENZENE: POSSIBLE EXPLOSION.
2,2,4,4,6,6-HEXAMETHYLTRITHIANE: EXPLOSIVE OXIDATION.
HEXENAL: EXPLODES ON HEATING.
HYDRAZINE: VIOLENT REACTION.
HYDRAZOIC ACID: ENERGETIC REACTION.
HYDROGEN IODIDE: IGNITION REACTION.
HYDROGEN PEROXIDE: FORMS UNSTABLE MIXTURE.
HYDROGEN PEROXIDE AND KETONES: FORMS EXPLOSIVE PRODUCTS.
HYDROGEN PEROXIDE AND MERCURIC OXIDE: FORMS EXPLOSIVE COMPOUNDS.
HYDROGEN PEROXIDE AND THIOUREA: FORMS EXPLOSIVE COMPOUNDS.
HYDROGEN SELENIDE: IGNITION REACTION.
HYDROGEN SULFIDE: INCANDESCENT REACTION.
HYDROGEN TELLURIDE: IGNITION AND POSSIBLE EXPLOSIVE REACTION.
INDANE AND SULFURIC ACID: EXPLOSIVE REACTION.
ISOPRENE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
KETONES (CYCLIC): VIOLENT REACTION.
LACTIC ACID + HYDROFLUORIC ACID: EXPLOSIVE REACTION.
LITHIUM: IGNITION REACTION.
LITHIUM SILICIDE: INCANDESCENT REACTION.
MAGNESIUM: EXPLOSIVE REACTION.
MAGNESIUM + 2-NITROANILINE: MAY IGNITE ON CONTACT.
MAGNESIUM PHOSPHIDE: INCANDESCENT REACTION.
MAGNESIUM SILICIDE: VIOLENT REACTION.
MAGNESIUM-TITANIUM ALLOY: FORMS SHOCK AND HEAT SENSITIVE MIXTURE.
MANGANESE (POWDERED): INCANDESCENCE AND POSSIBLE EXPLOSION.
MESITYL OXIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
MESITYLENE: POSSIBLE EXPLOSIVE REACTION.
METALS: VIOLENT REACTION WITH EXPLOSION OR IGNITION.
METAL ACETYLIDES: VIOLENT OR EXPLOSIVE REACTION.
METAL CARBIDES: VIOLENT OR EXPLOSIVE REACTION.
METAL CYANIDES: EXPLOSIVE REACTIONS.
METAL FERRICYANIDE OR FERROCYANIDE: VIOLENT REACTION.
METAL SALICYLATES: FORMS EXPLOSIVE COMPOUNDS.
METAL THIOCYANATES: POSSIBLE EXPLOSION.
2-METHYLBENZIMIDAZOLE + SULFURIC ACID: POSSIBLE EXPLOSIVE REACTION.
4-METHYLCYCLOHEXANONE: EXPLOSIVE REACTION.
2-METHYL-5-ETHYLPYRIDINE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
METHYL THIOPHENE: IGNITION REACTION.
NEODYMIUM PHOSPHIDE: VIOLENT REACTION.
NICKEL TETRAPHOSPHIDE: IGNITION REACTION.
NITRO AROMATIC HYDROCARBONS: FORMS HIGHLY EXPLOSIVE PRODUCTS.
NITROBENZENE: EXPLOSIVE REACTION, ESPECIALLY IN THE PRESENCE OF WATER.
NITROMETHANE: EXPLOSIVE REACTION.
NITRONAPHTHALENE: EXPLOSION HAZARD.
NON-METAL OXIDES : EXPLOSIVE REACTION.
OLEUM: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
ORGANIC MATERIALS: FIRE AND EXPLOSION HAZARD.
ORGANIC SUBSTANCES AND PERCHLORATES: POSSIBLE EXPLOSION.
ORGANIC SUBSTANCES AND SULFURIC ACID: POSSIBLE EXPLOSION.
PHENYL ACETYLENE + 1,1-DIMETHYLHYDRAZINE: VIOLENT REACTION.
PHENYL ORTHOPHOSPHORIC ACID DISODIUM SALT: FORMS EXPLOSIVE PRODUCTS.
PHOSPHINE + OXYGEN: SPONTANEOUS IGNITION.
PHOSPHONIUM IODIDE: IGNITION REACTION.
PHOSPHORUS (VAPOR): IGNITES WHEN HEATED.
PHOSPHOROUS HALIDES: IGNITION REACTION.
PHOSPHORUS TETRAIODIDE: VIGOROUS REACTION.
PHOSPHORUS TRICHLORIDE: EXPLOSIVE REACTION.
PHTHALIC ACID AND SULFURIC ACID: POSSIBLE EXPLOSIVE REACTION.
PHTHALIC ANHYDRIDE: EXOTHERMIC REACTION AND FORMS EXPLOSIVE PRODUCTS.
PICRATES: REACTS.
PLASTICS: MAY BE ATTACKED.
POLYALKENES: INTENSE REACTION. .
POLYDIBROMOSILANES: EXPLOSIVE REACTION.
POLY(ETHYLENE OXIDE) DERIVATIVES: POSSIBLE EXPLOSION.
POLYPROPYLENE: TEMPERATURE AND PRESSURE INCREASE IN A CLOSED CONTAINER.
POLY(SILYLENE): IGNITION.
POLYURETHANE (FOAM): VIGOROUS REACTION.
POTASSIUM HYPOPHOSPHITE: EXPLOSIVE REACTION.
POTASSIUM PHOSPHINATE: EXPLODES ON EVAPORATION.
B-PROPIOLACTONE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
PROPIOPHENONE + SULFURIC ACID: EXOTHERMIC REACTION ABOVE -5 C.
PROPYLENE GLYCOL + HYDROFLUORIC ACID + SILVER NITRATE: EXPLOSIVE MIXTURE.
PROPYLENE OXIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
PYRIDINE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
PYROCATECHOL: IGNITES ON CONTACT.
REDUCING AGENTS: POSSIBLE EXPLOSIVE OR IGNITION REACTION.
RESORCINOL: POSSIBLE EXPLOSION.
RUBBER: VIGOROUS REACTION, POSSIBLE EXPLOSION.
SELENIUM: VIGOROUS REACTION.
SELENIUM HYDRIDE: IGNITION OR INCANDESCENT REACTION.
SELENIUM IODOPHOSPHIDE: EXPLOSIVE REACTION.
SILICON: VIOLENT REACTION.
SILICONE OIL: POSSIBLE EXPLOSION.
SILVER BUTEN-3-YNIDE: EXPLOSION.
SODIUM: SPONTANEOUS IGNITION.
SODIUM AZIDE: EXOTHERMIC REACTION.

SODIUM HYDROXIDE: TEMPERATURE AND PRESSURE INCREASE IN A CLOSED CONTAINER.
STIBINE: EXPLOSIVE REACTION.
SUCROSE (SOLID): VIGOROUS REACTION.
SULFAMIC ACID: VIOLENT REACTION WITH EVOLUTION OF TOXIC NITROUS OXIDE.
SULFIDES: REACTS.
SULFUR DIOXIDE: EXPLOSIVE REACTION.
SULFUR HALIDES: VIOLENT REACTION.
SULFURIC ACID + GLYCERIDES: EXPLOSIVE REACTION.
SULFURIC ACID + TEREPHTHALIC ACID: VIOLENT REACTION.
SURFACTANTS + PHOSPHORIC ACID: EXPLOSION HAZARD.
TERPENES: SPONTANEOUS IGNITION.
TETRABORANE: EXPLOSIVE REACTION.
TETRABORANE DECAHYDRIDE: EXPLOSIVE REACTION.
TETRAPHOSPHOROUS DIIODOTRISELENIDE: EXPLOSIVE REACTION.
TETRAPHOSPHOROUS IODIDE: IGNITES ON CONTACT.
TETRAPHOSPHOROUS TETRAOXIDE TRISULFIDE: VIOLENT REACTION.
THIOALDEHYDES: VIOLENT REACTION.
THIOKETONES: VIOLENT REACTION.
THIOPHENES: EXPLOSIVE REACTION.
TITANIUM: FORMS SHOCK-SENSITIVE COMPOUND.
TITANIUM ALLOYS: POSSIBLE EXPLOSIVE REACTION.
TITANIUM-MAGNESIUM ALLOY: POSSIBLE EXPLOSION ON IMPACT.
TOLUENE: VIOLENT REACTION.
TOLUIDENE: IGNITION REACTION.
1,3,5-TRIACETYLHEXAHYDRO-1,3,5-TRIAZINE + TRIFLUOROACETIC ANHYDRIDE:
  EXPLOSIVE REACTION.
TRIAZINE: VIOLENTLY EXPLOSIVE REACTION.
TRICADMIUM DIPHOSPHIDE: EXPLOSIVE REACTION.
TRIETHYLGALLIUM MONOETHYL ETHER COMPLEX: IGNITION REACTION.
TRIMETHYLTRIOXANE: INTENSE REACTION.
TRIS(IODOMERCURI)PHOSPHINE: VIOLENT DECOMPOSITION.
TRITHIOACETONE: EXPLOSIVE REACTION.
TURPENTINE: EXPLOSIVE MIXTURE.
UNSYMMETRICAL DIMETHYL HYDRAZINE: SPONTANEOUS IGNITION.
URANIUM: EXPLOSIVE REACTION.
URANIUM ALLOY: VIOLENT REACTION.
URANIUM DISULFIDE: VIOLENT REACTION.
URANIUM-NEODYMIUM ALLOYS: EXPLOSIVE REACTION.
VINYL ACETATE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
VINYLIDENE CHLORIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
WOOD: POSSIBLE IGNITION.
P-XYLENE: INTENSE REACTION IN PRESENCE OF SULFURIC ACID.
ZINC: INCANDESCENT REACTION.
ZINC ETHOXIDE: POSSIBLE EXPLOSION.
ZIRCONIUM-URANIUM ALLOYS: EXPLOSIVE REACTION.

DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF NITROGEN.

POLYMERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE AND DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

PROTECT AGAINST PHYSICAL DAMAGE. SEPARATE FROM METALLIC POWDERS, CARBIDES, HYDROGEN SULFIDE, TURPENTINE, ORGANIC ACIDS, AND ALL COMBUSTIBLE, ORGANIC OR OTHER READILY OXIDIZABLE MATERIALS. PROVIDE GOOD VENTILATION AND AVOID DIRECT SUNLIGHT (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

THRESHOLD PLANNING QUANTITY (TPQ):
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 302 REQUIRES THAT EACH FACILITY WHERE ANY EXTREMELY HAZARDOUS SUBSTANCE IS PRESENT IN A QUANTITY EQUAL TO OR GREATER THAN THE TPQ ESTABLISHED FOR THAT SUBSTANCE NOTIFY THE STATE EMERGENCY RESPONSE COMMISSION FOR THE STATE IN WHICH IT IS LOCATED. SECTION 303 OF SARA REQUIRES THESE FACILITIES TO PARTICIPATE IN LOCAL EMERGENCY RESPONSE PLANNING (40 CFR 355.30).

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40 CFR 262. EPA HAZARDOUS WASTE NUMBER D002.
100 POUND CERCLA SECTION 103 REPORTABLE QUANTITY.

CONDITIONS TO AVOID

MAY IGNITE OTHER COMBUSTIBLE MATERIALS (WOOD, PAPER, OIL, ETC.). REACTS VIOLENTLY WITH WATER AND FUELS. FLAMMABLE, POISONOUS GASES MAY ACCUMULATE IN

NKS AND HOPPER CARS. RUNOFF TO SEWER MAY CREATE FIRE OR EXPLOSION HAZARD.

NSULT NFPA PUBLICATION 43A, STORAGE OF LIQUID AND SOLID OXIDIZING MATERIALS, FOR STORAGE REQUIREMENTS.

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SPILL AND LEAK PROCEDURES

SOIL SPILL:
DIG A HOLDING AREA SUCH AS A PIT, POND OR LAGOON TO CONTAIN SPILL AND DIKE SURFACE FLOW USING BARRIER OF SOIL, SANDBAGS, FOAMED POLYURETHANE OR FOAMED CONCRETE. ABSORB LIQUID MASS WITH FLY ASH OR CEMENT POWDER.

NEUTRALIZE SPILL WITH SLAKED LIME, SODIUM BICARBONATE OR CRUSHED LIMESTONE.

AIR SPILL:
APPLY WATER SPRAY TO KNOCK DOWN AND REDUCE VAPORS. KNOCK-DOWN WATER IS CORROSIVE AND TOXIC AND SHOULD BE DIKED FOR CONTAINMENT AND LATER DISPOSAL.

WATER SPILL:
ADD SUITABLE AGENT TO NEUTRALIZE SPILLED MATERIAL TO PH-7.

OCCUPATIONAL SPILL:
KEEP COMBUSTIBLES (WOOD, PAPER, OIL, ETC.) AWAY FROM SPILLED MATERIAL. DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. DO NOT GET WATER INSIDE CONTAINER. FOR SMALL SPILLS, FLUSH AREA WITH FLOODING AMOUNTS OF WATER. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY. VENTILATE CLOSED SPACES BEFORE ENTERING.

REPORTABLE QUANTITY (RQ): 1000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT

TILATION:
OVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED POSURE LIMITS.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29 CFR 1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

NITRIC ACID:

125 MG/M3- ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS-FLOW MODE.

250 MG/M3- ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.
ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER PROVIDING PROTECTION AGAINST NITRIC ACID.
ANY CHEMICAL CARTRIDGE RESPIRATOR WITH A FULL FACEPIECE AND CARTRIDGE(S) PROVIDING PROTECTION AGAINST NITRIC ACID.

ESCAPE- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT-OR BACK-MOUNTED CANISTER PROVIDING PROTECTION AGAINST NITRIC ACID.
ANY APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.

NOTE: ONLY NON-OXIDIZABLE SORBENTS ARE ALLOWED (NOT CHARCOAL).

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

THING:
LOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT ANY POSSIBILITY OF SKIN CONTACT WITH THIS SUBSTANCE.

OVES:
PLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS BSTANCE.

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES AND A FACESHIELD TO PREVENT CONTACT WITH THIS SUBSTANCE.

EMERGENCY WASH FACILITIES:
WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES AND/OR SKIN MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN AND QUICK DRENCH SHOWER WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

AUTHORIZED - FISHER SCIENTIFIC GROUP, INC.
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-ADDITIONAL INFORMATION-

MSDS1011

laterial Safety Data Sheet

ay be used to comply with
SHA's Hazard Communication Standard,
29 CFR 1910.1200. Standard must be
consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY *(As Used on Label and List)* ALCONOX

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name ALCONOX, INC.	Emergency Telephone Number (212) 473-1300
Address *(Number, Street, City, State, and ZIP Code)* 215 PARK AVENUE SOUTH	Telephone Number for Information (212) 473-1300
NEW YORK, N.Y. 10003	Date Prepared JANUARY 1, 1991
	Signature of Preparer *(optional)*

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% *(optional)*
THERE ARE NO INGREDIENTS IN ALCONOX WHICH APPEARED ON THE OSHA STANDARD 29 CFR 1910 SUBPART Z.				

Section III — Physical/Chemical Characteristics

Boiling Point	N.A.	Specific Gravity (H_2O = 1)	N.A.
Vapor Pressure (mm Hg.)	N.A.	Melting Point	N.A.
Vapor Density (AIR = 1)	N.A.	Evaporation Rate (Butyl Acetate = 1)	N.A.

Solubility in Water APPRECIABLE (GREATER THAN 10 PER CENT)

Appearance and Odor WHITE POWDER INTERSPERED WITH CREAM COLORED FLAKES - ODORLESS

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used) NONE	Flammable Limits	LEL N.A.	UEL N.A.

Extinguishing Media WATER, CO_2, DRY CHEMICAL, FOAM, SAND/EARTH

ecial Fire Fighting Procedures FOR FIRES INVOLVING THIS MATERIAL DO NOT ENTER WITHOUT PROTECTIVE EQUIPMENT AND SELF CONTAINED BREATHING APPARATUS.

Unusual Fire and Explosion Hazards NONE

Section V — Reactivity Data

	Unstable		Conditions to Avoid NONE
	Stable	XX	

Incompatibility (*Materials to Avoid*) AVOID STRONG ACIDS

Hazardous Decomposition or Byproducts MAY RELEASE CO_2 GAS ON BURNING

Hazardous Polymerization	May Occur		Conditions to Avoid NONE
	Will Not Occur	XX	

Section VI — Health Hazard Data

Route(s) of Entry: Inhalation? YES Skin? NO Ingestion? YES

Health Hazards (*Acute and Chronic*) INHALATION OF POWDER MAY PROVE LOCALLY IRRITATING TO MUCOUS MEMBRANES. INGESTION MAY CAUSE DISCOMFORT AND/OR DIARRHEA.

Carcinogenicity: NTP? NO IARC Monographs? NO OSHA Regulated? NO

Signs and Symptoms of Exposure EXPOSURE MAY IRRITATE MUCOUS MEMBRANES. MAY CAUSE SNEEZING.

Medical Conditions Generally Aggravated by Exposure RESPIRATORY CONDITIONS MAY BE AGGRAVATED BY POWDER.

ergency and First Aid Procedures
YES-FLUSH WITH PLENTY OF WATER FOR 15 MINUTES SKIN-FLUSH WITH PLENTY OF WATER
INGESTION-DRINK LARGE QUANTITIES OF WATER.GET MEDICAL ATTENTION FOR DISCOMFORT

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled MATERIAL FOAMS PROFUSELY. SHOVEL AND RECOVER AS MUCH AS POSSIBLE. RINSE REMAINDER TO SEWER. MATERIAL IS COMPLETELY BIODEGRADABLE.

Waste Disposal Method
SMALL QUANTITIES MAY BE DISPOSED OF IN SEWER. LARGE QUANTITIES SHOULD BE DISPOSED OF ACCORDING TO LOCAL REQUIREMENTS FOR NON-HAZARDOUS DETERGENT.

Precautions to Be Taken in Handling and Storing STORE IN A DRY AREA TO PREVENT CAKING.

Other Precautions
NO SPECIAL REQUIREMENTS OTHER THAN THE GOOD INDUSTRIAL HYGIENE AND SAFETY PRACTICES EMPLOYED WITH ANY INDUSTRIAL CHEMICAL.

Section VIII — Control Measures

Respiratory Protection (*Specify Type*) DUST MASK

Ventilation	Local Exhaust NORMAL	Special N.A.
	Mechanical (*General*) N.A.	Other N.A.

ive Gloves USEFUL-NOT REQUIRED

Eye Protection USEFUL-NOT REQUIRED

Other Protective Clothing or Equipment NOT REQUIRED

Work/Hygienic Practices NO SPECIAL PRACTICES REQUIRED

ISOPROPYL ALCOHOL

Material Safety Data Sheet

Mallinckrodt Chemical, Inc.
P.O. Box 800
Paris, Ky 40362
Effective Date: 02-17-95

Emergency Phone # 314-539-1600
Supersedes 04-06-89

PRODUCT IDENTIFICATION:

Synonyms: 2-propanol; sec-propyl alcohol; isopropanol
Formula CAS No.: 67-63-0
Molecular Weight: 60.10
Hazardous Ingredients: Isopropyl alcohol
Chemical Formula: $(CH_3)_2\ CHOH$

PRECAUTIONARY MEASURES

WARNING! FLAMMABLE LIQUID. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM. Keep away from heat, sparks and flame. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling. Avoid breathing vapor. Avoid contact with eyes, skin and clothing.

EMERGENCY FIRST AID

If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. In all cases call a physician. SEE SECTION 5.

D[illegible] Hazard Class: PSN: Isopropanol Class: 3.2 ID#: UN1219 PG II

Physical Data

SECTION 1

Appearance: Clear, colorless liquid.
Odor: Rubbing alcohol.
Solubility: Infinite in water.
Boiling Point: 82 C (180 F).
Vapor Density (Air=1):2.1
Melting Point: -89 C (-128 F).
Vapor Pressure (mm Hg):33 @ 20 C (68 F)

Specific gravity: 0.79
Evaporation Rate:(n-BUAC = 1) 2.83
NFPA Ratings: Health: 1 Flammability: 3 Reactivity: 0

Fire and Explosion Information SECTION 2

Fire: Flammable Liquid Flashpoint: 12C (53F). (closed cup). Autoignition temperature: 399C (750F). Flammable limits in air, % by volume: lel: 2.0; uel: 12.0.

Explosion: Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire or explosion.

Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide. Water spray may be used to keep fire exposed containers cool.

Special Information: In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures. Vapors can flow along surfaces to distant ignition source and flash back.

Reactivity Data SECTION 3

Stability: Stable under ordinary conditions of use and storage. Heat and sunlight can contribute to instability.

Hazardous Decomposition Products: Toxic gases and vapors such as carbon monoxide may be released in a fire involving isopropyl alcohol.

Hazardous Polymerization: Will not occur.

Incompatibilities: Heat, flame, strong oxidizers, acetadehyde, acides, chlorine,

ethylene oxide, hydrogen-palladium combination, hydrogen peroxide-sulfuric acid combination, potassium tert-butoxide, hypochlorous acid, isocyanates, nitroform, phosgene, oleum and perchloric acid.

Leak/Spill Disposal Information SECTION 4

Ventilate area of leak or spill. Remove all sources of ignition. Clean-up personnel require protective clothing and respiratory protection from vapors. Contain and recover liquid when possible. Collect as hazardous waste and atomize in a suitable RCRA approved combustion chamber, or absorb with vermiculite, dry sand, earth or similar material for disposal as hazardous waste in a RCRA approved facility. Do not flush to sewer!
Ensure compliance with local, state and federal regulations.

Health Hazard Information SECTION 5

A. Exposure/Health Effects

Inhalation: Inhalation of vapors irritates the respiratory tract. Exposure to high concentrations has a narcotic effect, producing symptoms of dizziness, drowsiness, headache, staggering, unconsciousness and possibly death.

Ingestion: May cause drowsiness, unconsciousness, and death. Gastrointestinal pain, cramps, nausea, vomiting, and diarrhea may also result. The single lethal dose for a human adult = about 250 mls.

cause irritation with a stinging effect and burning sensation.

Eye Contact: Vapors may irritate the eyes. Splashes may cause severe irritation, possible corneal burns and eye damage.

onic Exposure: Prolonged contact with skin may cause mild irritation, drying, cracking, or contact dermatitis may develop.

Aggravation of Pre-existing Conditions: Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

B. FIRST AID

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion: Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconcious person.

Skin Exposure: Remove any contaminated clothing. Wash skin with soap or mild detergent and water for at least 15 minutes. Get medical attention if irritation develops or persists.

Eye Exposure: Wash eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

C. TOXICITY (RTECS, 1994)

rat LD50: 5045 mg/kg; skin rabbit LD50: 12.8 gm/kg; investigated as a tumorigen, mutagen, reproductive effector.

Occupational Control Measures SECTION 6

Airborne Exposure Limits: -OSHA Permissible Exposure Limit (PEL): 400 ppm (TWA), 500 ppm (STEL) -ACGIH Threshold Limit Value (TLV): 400 ppm (TWA), 500 ppm (STEL)

Ventilation System: A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators: If the TLV is exceeded a full facepiece chemical cartridge (NIOSH Approved) respirator may be worn, in general, up to the maximum use concentration specified by the respirator supplier. Alternatively, a supplied air full facepiece respirator or airlined hood may be worn.

S Protection: Wear impervious protective clothing, including boots, gloves, ab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection: Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with this material. Maintain eye wash fountain and quick-drench facilities in work area.

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from oxidizing materials. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment.

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Addendum to Material Safety Data Sheet
REGULATORY STATUS

This Addendum Must Not Be Detached from the MSDS
entifies SARA 313 substance(s)

Any copying or redistribution of the MSDS must include a copy of this addendum

Hazard Categories for SARA Section 311/312 Reporting

Acute	Chronic	Fire	Pressure	Reactive
X	X	X		

Product or Components of Product:	SARA EHS Sec. 302 RQ	SARA EHS Sec. 302 TPQ	SARA Sec. 313 Chemicals Name List	SARA Sec. 313 Chemicals Chemical Category	CERCLA Sec.103 RQ lbs	RCRA Sec. 261.33
ISOPROPYL ALCOHOL (67-63-0)	No	No	Yes	No	No	No

SARA Section 302 EHS RQ:
Reportable Quantity of Extremely Hazardous Substance, listed at 40 CFR 355.

SARA Section 302 EHS TPQ: Threshold Planning Quantity of Extremely Hazardous substance. An asterisk (*) following a Threshold Planning Quantity signifies that if the material is a solid and has a particle size equal to or larger than 100 micrometers, the Threshold Planning Quantity = 10,000 LBS.

SARA Section 313 Chemicals: Toxic Substances subject to annual release reporting requirements listed at 40 CFR 372.65.

CERCLA Sec. 103: Comprehensive Environmental Response, Compensation and Liability Act (Superfund). Releases to air, land or water of these hazardous substances which exceed the Reportable Quantity (RQ) must be reported to the National Response Center, (800-424-8802); Listed at 40 CFR 302.4

RCRA: Resource Conservation and Recovery Act. Commercial chemical product wastes designated as acute hazards or toxic under 40 CFR 261.33