APPENDICES

Appendix A

DPE Well Decommissioning Plan

APPENDIX A

Dual Phase Extraction (DPE) System Decommissioning Plan

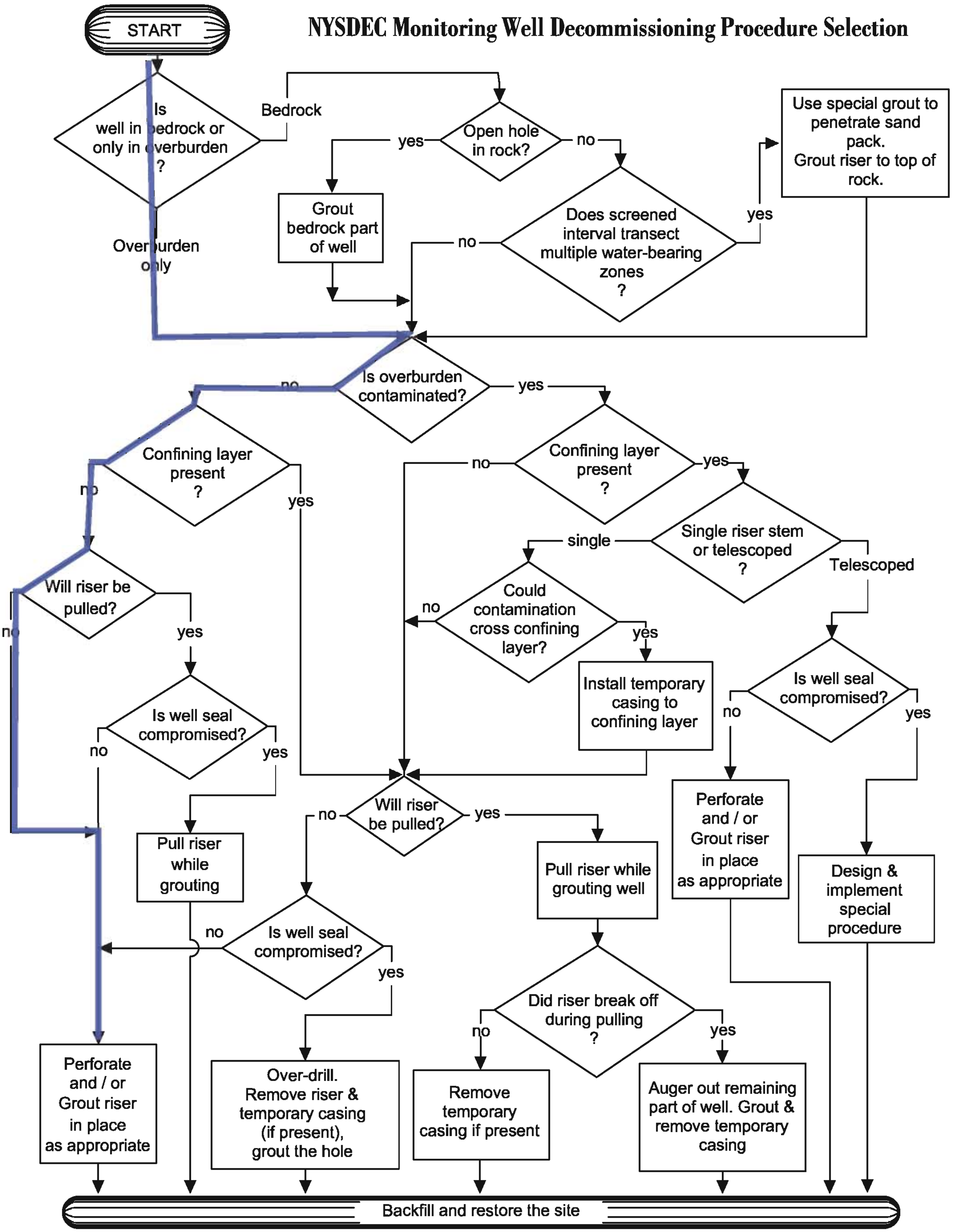
A total of 22 dual phase extraction wells (DPE-1 through DPE-22) will be decommissioned according to the procedures in *CP-43: Groundwater Monitoring Well Decommissioning Policy*. Each of the 22 DPE wells will be decommissioned by grouting the well to ground surface as shown on Figure 2 of the policy. This procedure will minimize investigation derived waste.

Well decommissioning procedures are as follows:

- Remove the steel manhole or protective casing. Remove any equipment or debris and the drop tube and well seal.
- Measure total depth of the well to ensure the well depth is consistent with the recorded construction depth.
- The bottom of the casing shall be punctured using suitable equipment (i.e., drill rig or direct push rod system).
- The well shall be tremie- or pressure-grouted with a cement bentonite grout.
- The surface will be patched to match the surrounding surface type (i.e., concrete, asphalt, or seed) as appropriate.

The NYSDEC will be notified prior to decommissioning of monitoring wells and the decommissioning process will be documented in a brief summary letter report.

NYSDEC Monitoring Well Decommissioning Procedure Selection



Attachment 1

Appendix B

Remediation System As-Built Report and O&M Plan
(Alliance 2002)

ENVIRONMENTAL ALLIANCE

December 19, 2002

• *Engineering*
• *Remediation*
• *Consulting*

Mr. Ramanand Pergadia, P.E.
New York State Department of Environmental Conversation (NYSDEC)
Division of Hazardous Waste Remediation, Region 3
21 South Putt Corners Road
New Palta, NY 12561-1696

Re: As-Built and Operations and Maintenance Report
Former Chromalloy Facility in West Nyack, New York – No. 344039

Dear Mr. Pergadia:

On behalf of Sequa Corporation, and respondent, Chromalloy Gas Turbine Corporation, Environmental Alliance, Inc. (Alliance) is submitting four copies of the remediation system As-Built and Operations and Maintenance (O&M) Report. Distribution of copies of this report is in accordance with the Order on Consent for the project. This As-built and O&M report is prepared for the Former Chromalloy Facility (Facility) in West Nyack, New York.

Please do not hesitate to contact us if you have any questions, comments, or require additional information, feel free to contact me at (302) 995-7544.

Sincerely,
ENVIRONMENTAL ALLIANCE, INC.

William Smith, P.G.
Principal Hydrogeologist

c: Robert L. Iuliucci – Sequa Corporation
Mark Crawford, Sequa Corporation
Leonard Pasculli, Esq., Sequa Corporation
Mark Pennington, Esq., Morgan, Lewis, & Bockius, LLP
Rosalie Rusinko, Esq., NYSDEC
Angus Eaton, NYSDEC
Gary Litwin, NYSDOH (2 copies)
Catherine Quinn / Daniel Miller, Rockland County Health Department

\\envallde\eai\EAI\1166\correspondence\2002 Letters and Memo's\As-built report cover transmittal.doc

1812 Newport Gap Pike Wilmington, DE 19808
302-995-7544 302-995-0941 Fax www.EnvAlliance.com

REMEDIATION SYSTEM AS-BUILT REPORT AND OPERATIONS AND MAINTENANCE PLAN FOR FORMER CHROMALLOY FACILITY WEST NYACK, NEW YORK FACILITY ID NO. 344039

December 19, 2002

PREPARED FOR:
SEQUA CORPORATION

PREPARED BY:
ENVIRONMENTAL ALLIANCE, INC.
1812 NEWPORT GAP PIKE
WILMINGTON, DE 19808
(302) 995-7544

William Smith, P.G.
Principal Hydrogeologist

Paul Miller, P.E.
Environmental Alliance Engineering, PLLC
NY #078181

J:\EAI\1166\Reports\as-built reportfinal.doc

ENVIRONMENTAL ALLIANCE

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

APPENDICES

1.0 INTRODUCTION

Environmental Alliance, Inc. (Alliance) has prepared this document to present the As-Built Construction Details and Operations and Maintenance (O&M) Plan for the New York State Department of Environmental Conservation (NYSDEC) approved remedial system at the Former Chromalloy Facility (Facility) in West Nyack, New York. Refer to Figure 1-1 for the site location map and Figure 1-2 for site base map. This report was prepared pursuant to the NYSDEC issued Record of Decision (ROD) for the Facility dated March 31, 1999 and complies with the Order on Consent (Consent Order), effective date of March 31, 2001, issued by the NYSDEC and signed by Chromalloy Gas Turbine Corporation (respondent in this matter).

The information presented provides details of the activities conducted at the Facility beginning with remediation point installation in September 2002 through start-up and operation tests of the remedial treatment systems completed October 10, 2002. The activities conducted include the construction of the remedial treatment building, construction of the treated effluent line from treatment building to the Hackensack River, installation of a bedrock groundwater recovery well, installation of overburden remediation points, and the installation/testing of the Pump and Treat (P&T) and Dual Phase Extraction (DPE) remedial systems. The P&T and DPE remedial systems and treatment building housing those systems were constructed consistent with the specifications in the DPE Remedial Design Report (DPE-RD) dated May 4, 2001 and the P&T Remedial Design Report (P&T-RD) dated June 1, 2001. Modifications made in regards to the treatment building location and construction were implemented to address the property owner's requests and requirements. Subsequently, modifications were made in the design of the P&T and DPE systems were made to address the change in location and construction. Modifications made in the location and construction of the treatment building and the P&T and DPE remedial systems and the O&M Plan for the remedial systems are presented in this As-Built Construction Details and O&M Plan Report (As-Built and O&M Report).

The purpose of the P&T remedial system is to address the residual Volatile Organic Compounds (VOCs), mainly trichloroethene (TCE), in the lower groundwater at both onsite and offsite areas. The purpose of the DPE remedial system is to addresses residual VOC-impacted (mainly TCE) soil and upper groundwater at the southwestern corner of the Facility building. The combined remedial systems comprise the remediation system designated as Operable Unit-I (OU-I) required in the ROD and agreed to in the Consent Order for the Facility.

1.1 Construction Overview

Initiation of remedial system construction activities began with the installation of DPE points (DP-3, DP-21 and DP-22) in late September 2001 at the Facility. Following the completion of these points, construction of the treatment system effluent line from the northwestern corner of the Facility building to the Hackensack River was begun while awaiting approval of the treatment building design plans by the Town of Clarkstown (Clarkstown). Alliance completed the treatment system effluent line construction noted by mid-October 2001. Clarkstown approved the treatment building design plans in December 2001.

In January and February 2002, numerous construction activities were completed for the treatment building. These activities include installation of the submersible well pump for the P&T remedial system at existing bedrock well MW-15B (now to be designated RW-1); trenching and installation of effluent treatment line from the northwest corner of the Facility building to the treatment building; electric conduit trenching from pole to transformer to treatment building; groundwater effluent from the submersible pump to the treatment building; installation of DPE points (DP-4, DP-18, DP-19 and DP-20), trenching/connection of all existing DPE points (nine total) from individual points to the treatment building including stub-outs for 13 additional DPE points proposed for installation, and block work for all four building walls.

The thirteen additional DPE points that are proposed as part of the DPE remedial system have yet to be installed at the Facility. These DPE points are proposed for installation in an area that is anticipated to be re-graded by Bradley Corporate Park (BCP) to an elevation approximately ten feet below the existing elevation pending building permit approvals by Clarkstown and others. Since installation of these remedial points is not feasible at this time without the potential future re-grading activities destroying the points and lateral connections to the treatment building, Alliance will wait until the re-grading issue is addressed. Additionally, these proposed remedial points are on the up gradient peripheral portion of the plume and are not required nor intended to be operated until such time that the core of the treatment area has been significantly remediated. Until this re-grading issue is resolved, Alliance will operate the existing DPE points installed and connected to the treatment system to address the primary area of residual VOCs in soil at the southwest corner of the Facility building.

The remedial system installation and construction activities were originally scheduled to be completed by the end of February 2002; however, the property owner (Mr. John Magee of BCP) required changes in the design of the treatment building after treatment building connections and block-work construction activities were completed. After many debates and negotiations regarding BCPs requirements, an agreement was reached between Sequa, Alliance and BCP, and plans to redesign the building were prepared. Once the redesign plans were completed, BCP was provided a copy of the modified design plans for their approval. After approval by BCP on April 10, 2002, Alliance submitted these plans to the Clarkstown for their approval on the same day.

Upon Clarkstown's approval of the design plans in May 2002, Alliance began scheduling of subcontractors and authorized ordering materials for the project. Unfortunately, due to the delays incurred to this point of the treatment building construction process, subcontractors and their vendors were all involved in servicing other job contracts during the busy construction season. This situation created further delays as the construction activities conducted from this point were completed by the subcontractors and vendors on an as available schedule instead of a continuous flow of work.

In May and June 2002, installation of steel columns and roof support structure required to raise the height of the building and reconstruction of the block walls was completed. In July and August 2002, the roof, roof drains, doors, building vents, and remedial equipment were installed. Subsequently, electrical wiring (main and low voltage), fire sprinkler system, plumbing (remedial system and water supply), lighting, building façade, building painting, etc. were completed during August and September 2002.

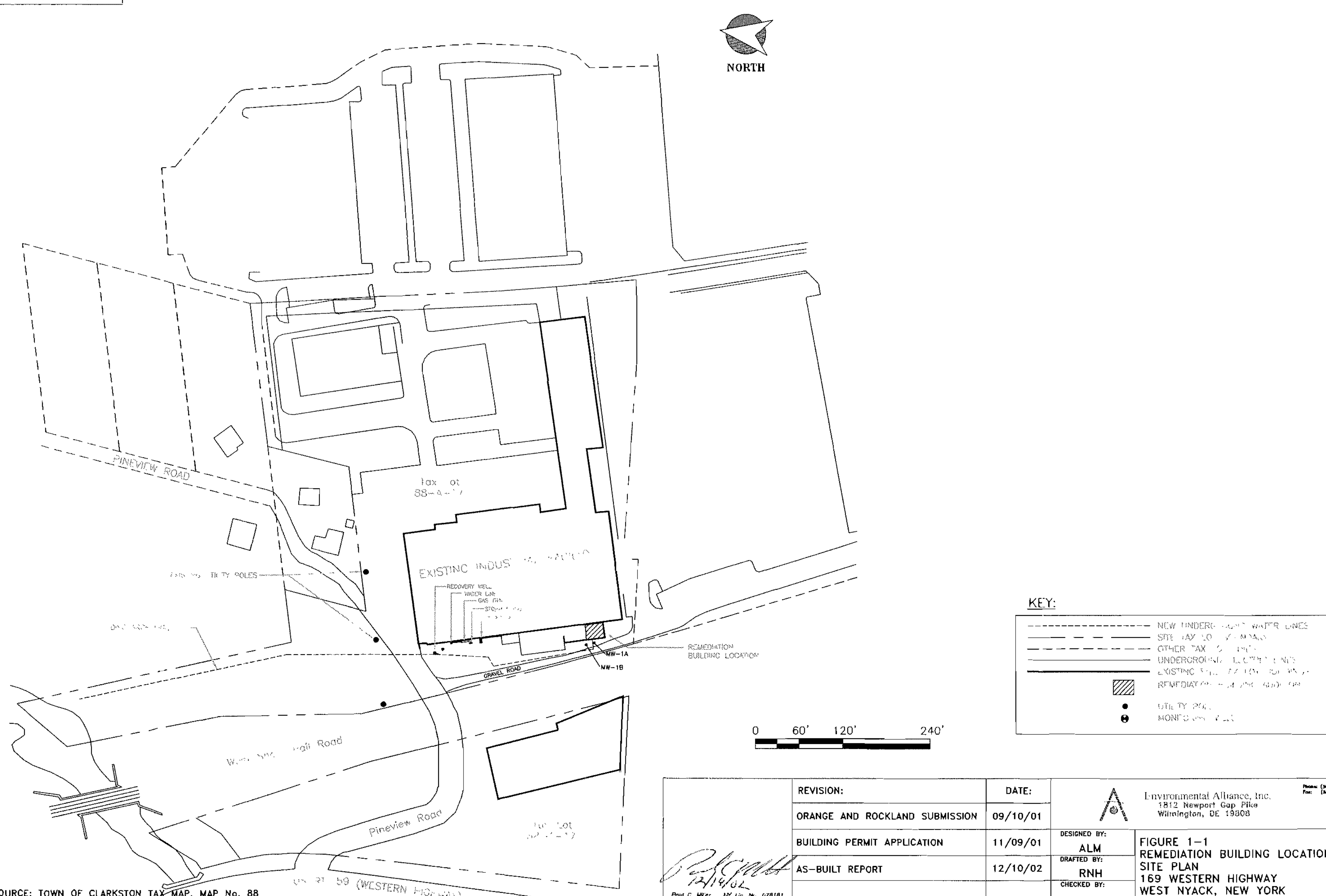
After the remedial equipment was installed and the initial building permit and code inspections were completed for the treatment building, P&T and DPE remedial system tests were performed. A 5-hour test of the P&T System was performed on October 9, 2002 to verify the system operations at a groundwater removal rate of 80 gallons per minute (gpm) and to test the discharge out fall structure as stipulated by the NYSDEC in a letter dated October 29, 2001. A 3-hour DPE System test was performed October 10, 2002 to verify system operations and to obtain baseline concentrations of contaminants removed by the remedial system.

Despite the time consuming delays associated with the redesign of the nearly complete treatment building during the construction process, finishing touches were implemented during October 2002 to prepare the building for final inspection and approval for a Certificate of Occupancy (CO) by Clarkstown (received October 23, 2002).

1.2 Report Organization

This As-Built and O&M Report is organized as follows: Section 1.0 contains the introduction, including remedial construction overview and report organization. Section 2.0 summarizes the remedial system construction details. Section 3.0 describes the remedial system start-up testing activities. Section 4.0 presents the results of the remedial system start-up testing activities. Section 5.0 presents the O&M Plan and monitoring program for the DPE and P&T remedial systems operation.

\EAI\1166\REMEDIAL DESIGN\AS-BUILT\Figure 1-1



BASE MAP SOURCE: TOWN OF CLARKSTON TAX MAP, MAP No. 88

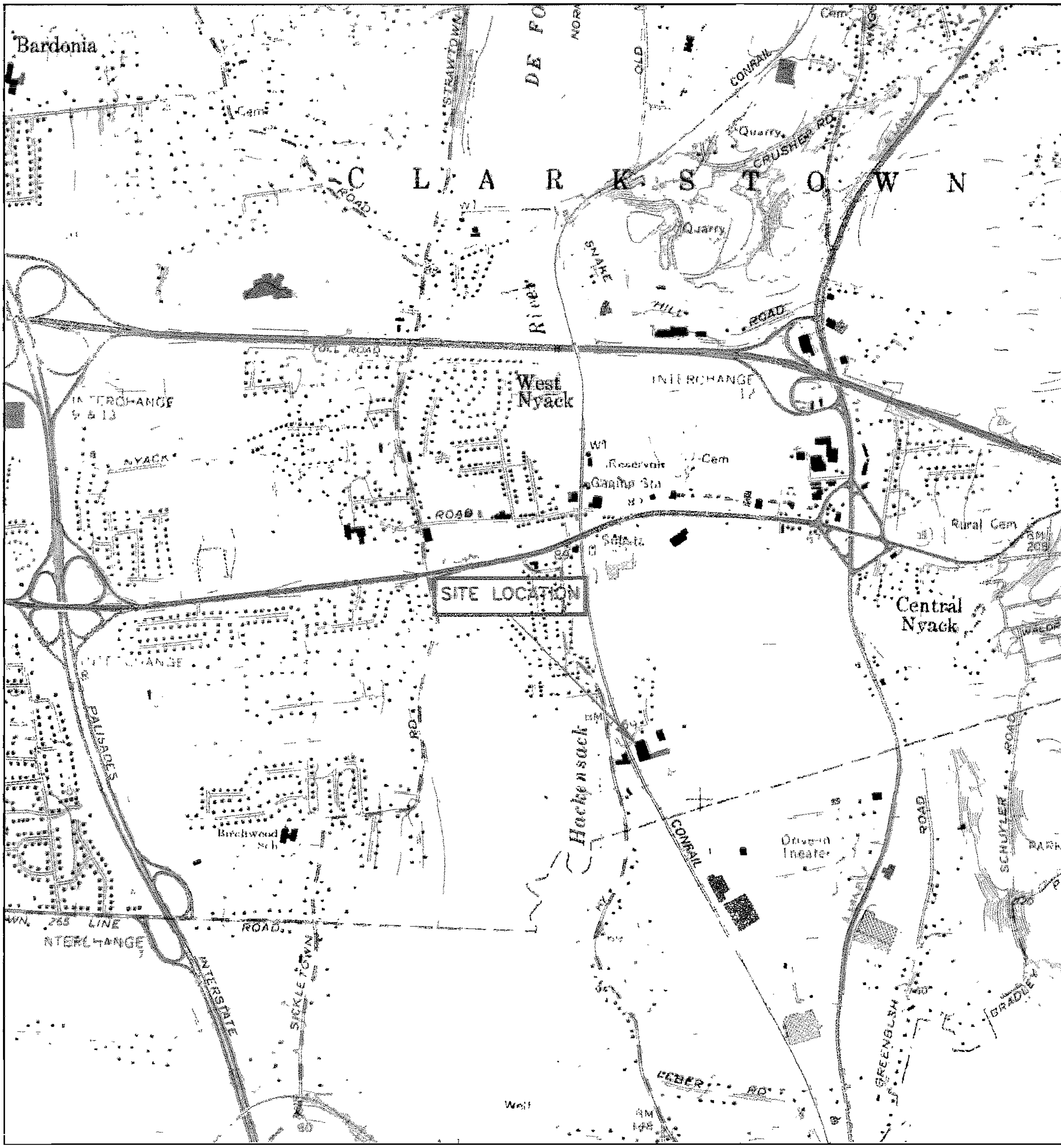
REVISION:	DATE:
ORANGE AND ROCKLAND SUBMISSION	09/10/01
BUILDING PERMIT APPLICATION	11/09/01
AS-BUILT REPORT	12/10/02

12/14/02
Paul C Miller NY Lic. No. 078181

Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808
Phone: (302) 995-7544
Fax: (302) 995-0941

DESIGNED BY: ALM
DRAFTED BY: RNH
CHECKED BY:

FIGURE 1-1
REMEDIATION BUILDING LOCATION
SITE PLAN
169 WESTERN HIGHWAY
WEST NYACK, NEW YORK



0 2200'

APPROXIMATE SCALE

Source: USGS Nyack, New York Quadrangle

REVISION DATE: 12/2/02	
DESIGNED BY: AA	
DRAFTED BY: RNH	FIGURE 1-2 SITE LOCATION MAP REMEDIAL DESIGN FORMER CHROMALLOY FACILITY WEST NYACK, NEW YORK
CHECKED BY:	

2.0 REMEDIAL SYSTEM CONSTRUCTION DETAILS

The remedial system construction project followed the site-specific Health and Safety Plan (HASP) originally prepared under the RI/FS Modification 7 and amended as of October 15, 2001 to include addressing excavation, trenching and drilling activities by following a Community Action Monitoring Plan (CAMP) as requested by the New York State Department of Health (NYSDOH). Compliance with the CAMP was achieved using two TSI Dust Tracker Aerosol Monitor and two Photo-ionization Detectors (PIDs) to evaluate the air for dust and VOC emissions during remedial construction activities. Additionally, Alliance implemented the use of a multi-meter to measure lower explosive limit (LEL), oxygen percent (O_2), methane (CH_4), hydrogen sulfide (H_2S), and carbon monoxide (CO) to supplement the dust and VOC monitoring activities.

Prior to implementation of any intrusive subsurface activities (e.g. installation of any remediation points, piping trenches, excavation work, etc.) the New York State Utility Mark-Out service was contacted to locate subsurface utilities in work areas before conducting any tasks. A total of six utility mark-outs were performed for this project. As backup documentation for the mark-outs, Alliance photographed the painted ground surfaces for future reference after the paint washed out. Paint, caution tape, safety cones, and signs were used to mark the identified utility lines. Caution tape, equipment, soil stockpiles and/or temporary fencing were used to mark out and limit access to open excavations and trenches, when not backfilled by the end of the workday.

The following subsections present the remedial system construction activity details for the Former Chromalloy Facility OU-I and a description of the remedial system equipment installed. The majority of the remedial system construction followed the DPE-RD and the P&T-RD. Modifications made in the construction of the treatment building and the P&T and DPE remedial systems in response to site conditions, property owner requests, and appropriate construction practices are presented in the following subsections.

2.1 Installation of Dual Phase Extraction Points

On September 26 and 27, 2001, Alliance initiated remediation construction activities with the installation of three DPE remediation points (designated DP-3, DP-21, and DP-22) around the Facility building southwestern corner using the hollow-stem auger (HSA) drilling methodology with a B-59 Mobil Drill rig under the supervision of an Alliance geologist. On February 4, 2002, Alliance installed four additional DPE points designated DP-4, DP-18, DP-19, and DP-20 using air-rotary drilling methodology with a Reich Drill T-650 rig at the southwest corner of the Facility building under the supervision of an Alliance geologist. The switch from HSA drilling methodology to the air-rotary drilling methodology was necessary to reach the necessary depths to set the DPE points within a reasonable time-frame through the very hard overburden soil. Talon Drilling, Inc. of Trenton, New Jersey was the subcontractor who installed the seven DPE points. The total number of DPE points installed at the Facility, including the previously installed points DP-1 and DP-2 in October 1998 for the DPE Pilot Study, is nine. Refer to Figure 2-1 for DPE point location map. The DPE point locations installed are consistent with the locations proposed in the DPE-RD, although some locations were modified to address site conditions.

The soil encountered at the installed DPE point appears to be separated into two zones. An upper zone ranging from grade to approximately 15 to 20 feet below grade (bg) consisting of sand, silt, and clay at variable percentages mixed with gravel and cobbles. This material is typically classified as glacial till, due to the predominance of clay and silt with unsorted coarse gravel and boulders. The lower soil zone roughly from 20 to 40 feet bg consists of unconsolidated material similar in composition to the upper zone and included weathered bedrock fragments. The lower zone, typically characterized as a lodgment till, was noted to be very dense and compacted. The soil observed at the DPE point locations is consistent with the soil noted within this portion of the Study Area in the RI/FS.

The DPE points were installed to depths ranging from 21 to 36 feet bg. In the DPE-RD Report, select DPE points were scheduled to be installed at either 30-foot (shallow points) or 40-foot (deep points on top of bedrock) bg depths. Not all points could be installed to the specified depths due to drilling methodology used and/or lithology encountered. The DPE points installed via hollow-stem auger (DP-3, DP-21, and DP-22) were drilled until refusal was encountered into the lodgment till. The DPE points installed via air rotary (DP-4, DP-18, DP-19, and DP-20 were drilled to depths specific to the lithology or physical feature encountered at the individual locations. DP-4 was installed to a depth of 36 feet bg to the top of bedrock. DP18 and DP-19 were installed to 30 feet bg as scheduled. DP-20 was installed to a depth of 21 feet bg to address the former hexane underground storage tank (UST) backfill area at the southwest corner of the Facility building. Alloy Technology reportedly used the UST for storage of hexane, which is an ingredient in one of their processes. The property owner reportedly removed the UST after Alloy Technology ceased operations at the Facility building in the fall of 2001. The UST was noted to be removed under guidance by the Rockland County Health Department. No detailed information regarding the UST history or removal is available.

All the DPE points were constructed with 4-inch diameter flush threaded schedule 40 PVC screen (0.02-inch slot) and casing with bottom caps and locking well caps until the well heads were completed. The screened intervals of all the DPE points were placed to influence the shallow groundwater table and create a vacuum on the vadose zone soil as well as the dewatered soil once the groundwater table is lowered. The annulus of the DPE points were completed with #1 sand, bentonite chips, and cement grout as appropriate for each point that is consistent with the DPE-RD. Refer to Appendix I for soil boring/well construction logs for the DPE points.

2.2 Installation of Recovery Well and Submersible Pump

Monitoring well MW-15B (now designated RW-1) was installed into competent bedrock encountered at 50 feet bg with steel casing (10-inch diameter) set to a depth of 60 feet bg in October/November 2000 (refer to Figure 2-2 for well location). Subsequent well development activities indicated that the well RW-1 had caved-in to a depth of 100 feet bg. A down-hole video survey indicated the well was obstructed at 100 feet bg and would require re-drilling and a re-design of well construction techniques to open the well to a depth 300 feet bg and prevent future cave-in of the well. The down-hole video survey and well log was used to develop a strategy to re-design the well completion. The well was reconstructed by driving an 8-inch diameter vertically slotted steel casing (slotted at 84 to 126 feet bg and 147 to 168 feet bg) and solid steel casing (remaining portions of 8-inch well) to a depth of 168 feet bg. A drive shoe was welded to the end of the 8-inch slotted casing to prevent the bedrock material from sloughing into the open borehole between the 8-inch casing and the 10-inch well bore. The top of the 8-inch casing was welded to the top of the 10-inch casing as an anchor point. The well remained on open bore-hole from 168 to 300 feet bg. The well installation and re-construction contractor was Samuel StotH2off Company of Flemington, NJ. The well was installed/re-constructed using an Ingersoll-Rand T4W air-rotary rig. Refer to Appendix I for soil boring/well construction details for this well.

On January 22, 2002, Samuel StotH2off Company of Flemington, NJ installed a Grundfos electrical submersible pump (Model # 150S150-7) in RW-1 using a cable tool lift truck. The pump was installed at a depth of 230 feet below the ground surface using 3-inch galvanized steel piping (10-foot lengths with couplers). A 3/4-inch PVC pipe was also installed in the well to shield a pressure transducer to be used for groundwater monitoring and submersible pump low water level shut-off device. A less than ¾-inch pressure transducer was installed for use in place of the previously operated 3-inch diameter down-well probe due to size limitations associated with the well construction and down-hole piping/couplers to the submersible pump.

2.3 Electrical Power Drop

In order to supply power to the treatment building, underground electric conduits were installed from a utility pole on Pine View Road to a constructed transformer pad and then to the treatment building. The transformer pad was excavated and constructed in January 2002. The trenching work was performed in January 2002 under Alliance supervision. Cal Mart Enterprises, Inc. (CMEI) excavated the electrical trenches and Vista Electrical Contractors Inc. (Vista) installed the conduit piping. Both CMEI and Vista are located in West Nyack, New York.

As per local Code requirements, Schedule 80 PVC was utilized for all underground electrical conduits. Refer to Figure 2-2 for As-Built locations of the electric conduit trenches. The piping trench location was altered slightly from what was specified in the P&T-RD and DPE-RD due to subsurface utilities and property owner's request to move the transformer location for future development plans. Additionally, in place of pea-gravel, rock screenings were utilized to backfill around and cover the pipes. This change was necessary, as no pea gravel was available from local stone suppliers that typically distribute rock screenings for such applications and the rock screenings were an adequate replacement. Refer to Figure 2-3 for the As-Built details on the piping trench cross-sections.

Note that while excavating at the west central portion of the existing Facility building to install the electrical conduit and the transformer pad, the soil removed from some locations had a petroleum/chemical odor. The soil from the excavation areas where odors were noted, PID screening showed elevated results, or excess soil remained after backfill activities was stockpiled on and covered with plastic at the Facility. Refer to Section 2.8 for further information related to the soil stockpile handling, sampling and eventual removal.

On September 20, 2002, Orange and Rockland Electric and Gas Utility (O&R Utilities) installed an electric meter in the treatment building and made the electrical connection terminations in the transformer and electrical cabinets in the treatment building. On October 8, 2002, O&R Utilities energized the treatment building electrical system.

2.4 Pumping Well and Discharge Line Connections to Treatment Building

The installation of the subsurface discharge line and remedial well line was performed in two stages. The first stage, performed between October 16 through 25, 2001, consisted of installing the discharge line from the Hackensack River to RW-1. The second stage of construction, performed in January and February 2002, consisted of installing the discharge line and remedial well line from RW-1 to the treatment building. Placement of these lines varied from the locations presented in the DPE-RD and P&T-RD to address underground utilities, existing above ground structures, property lines, and potential future development by the property owner. Underground piping consisted of schedule 40, 4-inch diameter (remedial well line) and 6-inch diameter (discharge line) schedule 40 PVC. The materials used to cover the piping in the trenches was rock screenings in place of the specified pea-gravel in the proposed remedial design for the reasons specified in Section 2.3. Refer to Figure 2-2 for discharge line and remedial well line layout.

The construction of the discharge line effluent spillway to the Hackensack River was changed from the specified spillway in the revised remedial design plans in order to accommodate site-specific conditions. The change entailed constructing a concrete/stone end wall using wooden forms in place of a pre-cast concrete structure and extending the discharge pipe beyond the concrete end wall. Additionally, Alliance increased the length of the stone spillway (from 72-inches to 144-inches), increased the thickness of the stone spillway (from 9-inches to over 16-inches), and added layers of geo-fabric to the stone spillway instead of placing one layer at the bottom of the stone. All of these changes were determined to be more favorable in increasing the outfall's ability to minimize erosion.

Excess soil generated from the trenching excavations adjacent to the Facility building that was not returned to the excavation after completing plumbing was stockpiled on plastic and covered with plastic with the soil generated from the transformer pad and the electrical piping trench for the Facility. Refer to Section 2.8 for further information related to the excavation soil handling, sampling and removal.

2.5 DPE Point Connection to Treatment Building

The installed DPE points were completed at ground surface and individually piped to the treatment building as specified in the DPE remedial design report. Slight changes in the layout of the piping were made from what was presented in the DPE-RD to adjust for the field located DPE points (refer to Figure 2-1 for as-built locations). The DPE points were connected to the treatment building as follows. A schedule 40 one-inch diameter PVC drop tube was installed to within two-feet of the bottom of each completed DPE well point. The drop tube passes through an airtight sanitary seal and is connected to two-inch diameter schedule 40 PVC pipe at each DPE point. This PVC pipe was used to connect each DPE point drop tube to the manifold in the treatment building. The individual DPE points in the manifold are equipped with a ball valve, sample port and clear sight tubing. The ball valve is used for adjusting the airflow and vacuum for each extraction point. The sample port may be utilized to obtain PID readings and airflow metering of each point, although it is unlikely that these parameters will be monitored due to air/water mixture flow through the piping causing false measurements. The sight tubing is used for visual observation of water removal.

The individual DPE point piping is connected to two horizontal four-inch diameter schedule 40 PVC pipe sections in the treatment compound that comprises a two-tiered DPE manifold. The two-tiers connect together via a four-inch diameter schedule 40 PVC 3-way connector, thus creating a single 22-point DPE manifold. The four-inch diameter PVC manifold pipe is connected to an inline water separator tank before the liquid-ring high vacuum pump. Only nine of the 22 DPE points are currently connected to the installed DPE points. Piping stub–outs that are capped/tapped below grade approximately 10 feet from the treatment building south wall were placed for DPE points yet to be installed while waiting for further Site work by the property owner.

While excavating the trench to install DPE System piping immediately adjacent to the former hexane UST excavation at the southwest corner of the Facility building, odors and elevated PID screening results were noted from the excavation. Soil generated from the excavation in this area was stockpiled on plastic and covered with plastic with the soil generated from the transformer pad and the electrical piping trench for the Facility. Refer to Section 2.8 for further information related to the excavation soil handling, sampling and removal.

2.6 Building Construction

The building was originally designed to be a 1,000 square foot (SF) building addition located on the southern side of the southwest corner of the Facility building. Due to the location of the property line, surface grading issues and Township code requirements, the building was reduced in size to 500 SF and was relocated to the western side of the southwest corner of the Facility building. The treatment building is in a central location between the P&T well (RW-1) and the DPE points. Further changes in the design of the treatment building (a 12-foot high building to 20-foot high building matching the existing building exterior) were implemented at the request of the property owner during implementation of construction activities. A copy of the final Township-approved plans (dated April 10, 2002) for the treatment building is presented in Appendix II. The treatment building was constructed to the April 10, 2002 submitted plans approved by Clarkstown.

The treatment building is constructed of concrete block exterior walls and aluminum facade with a steel-framed supported built-up roof designed to match the existing building. The design changes necessary to meet the requests of the property owner consisted of:

- Removal of the previous completed sloped concrete block work to re-build concrete block walls from horizontal block surface,
- Replacement of wooden supports with steel supports for block work at major door opening and common wall door of main building,
- Re-sizing of roll-up doorway (including block work and steel support) and roll-up door to accommodate addition of concrete footings and steel support structure for steel roof and top of block work,
- Installation of concrete footings at four corners of building for steel column structure supporting steel built-up roof and top of block work,
- Installation of steel built-up roof with steel bracing,
- Installation of an interior roof drain system to ground surface,

- Installation of a flush-mount access way for the electrical meter box, and
- Installation of aluminum facade.

None of these changes affect the ultimate design and operation of the remediation system. Construction activities, equipment installation, electrical for the treatment building were implemented from May through September 2002. On October 23, 2002, the Clarkstown Building Inspector and the Fire Marshall performed a Final Inspection of the building. As a result of the inspection, the building was verbally approved for a CO. Receipt of the CO is pending processing by the Township. An As-built drawing of the building has been included as Figure 2-5.

2.7 Process Equipment

Schedule 80 PVC pipe was used to connect the various pieces of process equipment together. Refer to Figure 2-6 for the equipment layout in the treatment building and Figures 2-7 and 2-8 for the as-built process and instrumentation diagrams (P&IDs), Appendix III for process equipment photographs and Appendix IV for detailed process equipment information.

2.7.1 Pump and Treat System

<u>Electrical Submersible Pump</u>

A 150S150-7 Grundfos electrical submersible pump with a 15 HP, 460 volt, pollution recovery motor and Teflon jacketed power cable were installed in the P&T well RW-1. The submersible pump is piped with 3-inch diameter schedule 40 galvanized steel pipe through the top of the well head. The steel pipe exits the well head through a sanitary seal with a galvanized steel adapter connection at the top of the sanitary seal to the bottom of a roadway-rated man-way vault. The 3-inch galvanized steel connects via an adapter to 4-inch diameter schedule 40 PVC piping to the treatment building.

Piping

Approximately 225 feet of trenched, four-inch diameter schedule 40 PVC connects the P&T well (RW-1) to the treatment building. The effluent line from RW-1 stubs up through the treatment building floor under the remedial system control panel. From the RW-1 stub up location, 4-inch schedule 80 PVC was used for the remainder of the groundwater treatment process equipment train to the 6-inch schedule 40 PVC stub up leading to the effluent outfall on the Hackensack River.

Air Strippers and Accessory Equipment

The air strippers were modified from two PRM Low-profile Model 4123 Air Strippers (as specified in the remedial design) to two PRM Low-profile Model 634 Model Air Strippers. The air strippers were modified to better accommodate the anticipated flow-rate of groundwater from the P&T and DPE Systems.

The air strippers were designed to be sufficient to treat the pumped groundwater to the specified discharge standards. Two carbon polishing units were designed and installed to provide back-up treatment to ensure achievement of discharge standards. These carbon units will be by passed upon demonstrating treatment efficiency of the air stripping units alone and upon approval by NYSDEC. Each air stripper has sump tanks, cover and 4 (3-feet by 6-feet) stainless steel trays, low air pressure switch, spray nozzles, sight tubes, and drain valves. Additionally the air strippers are equipped with high-high/high-low level sensors mounted in a clear 2-inch tube to operate transfer pumps (2); blower air pressure gauges (2); two inlet sample ports; and two-inch PVC flow sensor/tee connection to panel mounted meter and telemetry (2). The piping for the two air strippers were installed to allow the strippers to operate in series or parallel.

Each air stripper is equipped with an American Fan blower, Model BC-3-05-20A. These blowers are 7 ½ hp., 460 volt, 3 phase, TEFC blower/motor that produce 900 CFM airflow. An airflow damper is situated between blower and the air stripper. After each of the air strippers is a +GF+ Signet 515 PID totalizing flow meter with pulse output. These Signet flow meters are connected to the Pro Control System panel allowing for instant access of flow readings 24 hours a day and data logging capabilities.

Each air stripper sump is connected to an AMT Heavy Duty Straight Centrifugal discharge pump with a Viton shaft seal. Each AMT pump is a 10 hp., 460 volt, 3 phase, TEFC motor. The transfer pump is used to pump the water that has been treated to either further treatment or discharge. The size of the air stripper discharge pump was increased from a 5 HP (as presented in the remedial design) to a 10 HP centrifugal pump. This change was made to ensure a high safety factor to overcome potential back-pressure generated by the bag-filter assemblies and/or the liquid-phase carbon vessels.

Air discharges vertically from the air stripper via 8-inch flexible aluminum pipe through the roof. The flexible pipe is connected to roof-vents that discharges the air to the atmosphere 2-feet above the building roof.

Bag Filters

Two Krystal Klear Model 1818 Bag Filters with four-inch flange connections are installed within the groundwater treatment train. Each of these vessels is capable of handling 400 gpm of water flow. The first bag filter assembly (pre-stripper) is located before the air strippers, while the second bag filter assembly (post-stripper) is located after the air strippers, but before the liquid-phase carbon vessels. Each of the bag filters has bypass piping, which allows the groundwater treatment system to continuously operate during filter bag change-outs. The pre-treatment system bag filter was lined with 25-micron bags, while the post-stripper bag filter contained 50-micron bags. The micron rating of the bags may be adjusted during operation to allow for site specific circumstances.

Carbon Vessels

Two PRM, HP2000-Carbon vessels filled with liquid-phase activated carbon (1,100 pounds per vessel) are located at the end of the groundwater treatment train. The carbon vessels are 63 inches in diameter x 86 inches in height. The carbon vessels are piped to allow for series or parallel operation with backwash and bypass capabilities. After the carbon vessels, there is a Signet 8750 pH meter, a +GF+ Signet 515 PID totalizing flow meter with pulse output connected to the Pro Control System panel allowing for instant access of total flow readings 24 hours a day and data logging capabilities, and a Kent Turbine Meter (flow meter), model T-3000 Bronze, Magnetic Drive. The pH meter was installed to continuously monitor the pH of the discharge. The output of the pH meter is tied into the Pro Control System, which monitors the pH range of the effluent. If the pH levels in the effluent exceed the pH range allowed in the effluent discharge requirements to the Hackensack River, the system is set-up to allow remote shut down.

2.7.2 Dual Phase Extraction

The DPE System is mainly comprised of a Dekker Model VMX 550 oil sealed liquid ring pump (40 HP) capable of producing a maximum of 550 ACFM at 25 inches of mercury vacuum. The liquid ring pump is equipped with a back pressure gauge, oil level gauge, sealant isolation valve, wye strainer, NEMA 7 solenoid valve, separator drain, gauges (air flow, temperature, vacuum, and pressure), air-cooled heat exchanger, NEMA 7 high temperature switch, inlet check valve, low oil level switch, inline particulate filter. The air/water separator tank is equipped with a manual dilution valve with filter, vacuum relief value, and water flow totalizer meter. The DPE vacuum pump system is also equipped with an air flow and vacuum gauge transmitter that is connected to the Pro Control System panel. The Pro Control System allows for remote monitoring, data logging, and control of the liquid ring pump.

The liquid ring pump is connected to an air/water separator tank that is then connected to the manifold via four-inch diameter schedule 40 PVC pipe. The water (moisture and groundwater) extracted via the DPE process is collected in a 60-gallon carbon steel air-water separator tank (knock-out tank) with 3 level alarm/sensor. A Moyno, Model 36701, 2 HP transfer pump capable of pumping water at a rate of 30 gpm pumps water from the knock-out tank to the P&T groundwater treatment train. Before the DPE generated water reaches the P&T treatment train, the water is passed through a Kent Positive Displacement Meter, Model C-700 Bronze, magnetic drive flow meter. Additionally, the DPE System water flow passes through a +GF+ Signet 515 PID totalizing flow meter that is linked to the Pro Control System panel allowing for instant access of flow readings 24 hours a day and data logging capabilities.

The air exhaust from the liquid ring pump discharges vertically via 4-inch schedule 40 steel pipe connected to 4-inch schedule 80 PVC pipe extending through the roof. The pipe discharges the exhaust air into the atmosphere 2-feet above the 20-foot high roof. A sampling port was installed before and after the liquid ring pump for collecting air bag samples, air velocity readings, and PID readings.

2.7.3 Pro Control System

The Pro Control System panel receives data from transmitters wired to the P&T and DPE System components. Each day a summary of the current data is faxed by the Pro Control System to Alliance's fax machine (refer to Appendix IV for an example of the Pro Control System fax). At the site, this data is viewed either on the Pro Control System panel (located in the treatment building) or on a laptop computer using the Pro View software. The Pro View software is used to connect a laptop computer to the Pro Control System for an improved visual display (the display on the Pro Control System panel is approximately two by six inches). The Pro View software is also used to monitor the system from remote locations. The Pro Control System can automatically shut down the process equipment of the P&T and/or DPE Systems if the relayed data is outside of the operating parameter limits or an alarm condition is met. Items that are monitored and logged by the Pro Control include:

- System effluent pH
- Water flow rate (gpm) and totalizer from the total system
- Water flow rate (gpm) and totalizer from AST #1
- Water flow rate (gpm) and totalizer from AST#2
- Water flow rate (gpm) and totalizer from DPE System
- RW-1 total feet of head (recovery well water level)
- Dual phase extraction vacuum
- Dual phase extraction total air flow rate and totalizer

- Motor on and off time for all motors controlled by the Pro Control (Liquid Ring Pump, Moisture Separator Pump, AST #1 blower, AST #1 transfer pump, AST #2 blower, AST #2 transfer pump, RW-1 submersible pump)

Alarm conditions monitored by the Pro Control include:

- Low oil level for DPE System
- High temperature for the DPE System
- Moisture separator High-High sump level for DPE System
- Low pressure alarm for air stripper #1
- Low pressure alarm for air stripper #2
- Air stripper #1 High-High sump level
- Air stripper #2 High-High sump level

Whenever automatic shut down of the system occurs, the Pro Control System generates an Alarm Fax Report that is immediately transmitted to the fax machine in Alliance's Wilmington, DE office and notifies the operator in charge of the shut down via a call to the operator's cellular phone.

2.8 Air Monitoring, Excavation Soil Sampling & Removal, and Water Sampling

During excavation activities for installation of the electric transformer pad and electrical conduit at the west central portion of the Facility building and the DPE piping at the southwest corner of the Facility building, odors and elevated PID screening results (>25 ppmv) were noted at the excavations and/or soil stockpiles. Soil from the areas of noted odors, elevated PID screening results, and/or excess soil from excavation activities that was not used for back fill material was stockpiled on plastic and covered with plastic until final disposition could be determined. Visual inspection of the soil in the trenches and soil stockpiles did not show the presence of evident impact. Air monitoring of the trenching areas and soil where odors were noted did not last long. At these locations, the odors dissipated and PID air screening results decreased to non-detectable concentrations after approximately five minutes of waiting. The monitoring of other air quality parameters measured (dust, LEL, CO, O_2, etc.) did not show that any parameter measured in the trenching areas and soil with odors and PID elevated screening results to be a concern.

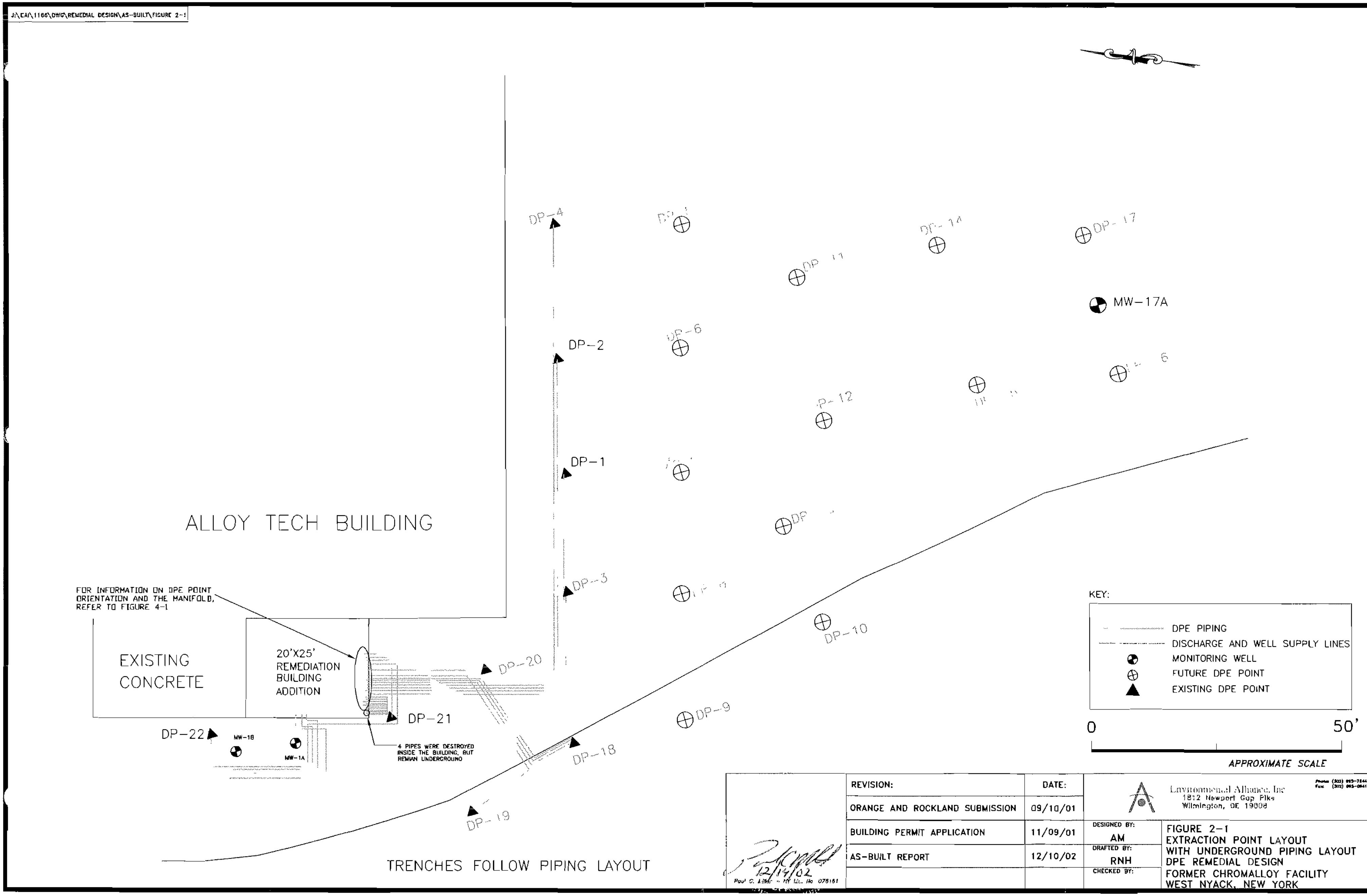
Air monitoring implemented during the other remedial construction activities conducted did not show odors, elevated PID screening results, or potential concentrations of concern for the other monitored parameters. The air monitoring documentation during remedial construction activities are stored at the Environmental Alliance, Inc. Wilmington, Delaware office files for the project.

The results from the soil samples collected from the transformer excavation on January 18, 2002 showed minimal detection of VOCs that are not associated with the main constituent of concern, TCE, at the Facility. Refer to the February 22, 2002 letter from Alliance to the NYSDEC presented in Appendix V for detailed information. The split soil samples collected with the NYSDEC from the soil excavation stockpile on January 23, 2002 and analyzed for VOCs confirmed the minimal detection of VOCs that are not associated with the main constituent of concern TCE at the Facility.

A water sample was also collected on January 23, 2002 from a small seep at the east side of the electrical trench wall (approximately 2.5 foot bg) adjacent to the loading dock and the concrete above ground storage tank (reportedly installed to contain hexane, but never used). The seep was noticed when Alliance personnel were specifically air monitoring/screening another area of the trench being exposed where the backhoe operator noticed odors from the freshly excavated soil. The analytical results showed the presence of acetone and 2-butanone at a concentrations of 230,000 ppb and 34,000 ppb, respectively.

At the conclusion of the excavation activities conducted at the site associated with the installation of the remedial system for the Facility, the remaining soil stockpile (approximately 100 cubic yards in volume) was sampled for all potential related site related constituents including the recently noted containments hexane, acetone, and 2-butanone for disposal options. The soil samples collected were analyzed for VOCs (via EPA methods 8260 +10 tentatively identified compounds and 8021B +10 tentatively identified compounds) and total priority pollutant metals (PP Metals). The VOC analytical results showed minimal estimated detection of VOCs that are below NYSDEC guidelines (Division Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels – January 24, 1994, Revised). The total PP Metals analytical results reported metal constituents to be below NYSDOH guidelines used to evaluate surficial soil samples collected from the Pine View Road residential area. However, concentrations of arsenic, chromium (total), mercury, nickel, and zinc was reported above NYSDEC guidelines (see above reference). Refer to the May 23, 2002 letter from Alliance to the NYSDEC presented in Appendix V for detailed information.

At the recommendation of the NYSDEC and for meeting soil disposal analytical criteria, additional soil samples were collected for TCLP metals analysis (RCRA 8 metal constituents + nickel and zinc) from previous total PP Metals sample locations and new locations to characterize metals in soil. The TCLP metals results reported all constituent concentrations to be less than the concentration necessary for the soil to be considered a characteristic hazardous waste. A summary table of the TCLP metals analytical results is presented in Appendix V. Based on the soil analytical results accumulated for the soil stockpile, the soil was determined to be non-hazardous. After approval of the soil profile through Ashland Environmental, the soil was loaded out on September 26, 2002 and transported for appropriate non-hazardous disposal at Envirite of Pennsylvania, Inc. in York, Pennsylvania (an Ashland Environmental facility). Refer to Appendix VI for soil disposal documentation. Upon load-out of the soil stockpile, the stockpile area (central west portion of the Facility building) was re-graded by Alliance to match the pre-existing condition of the area.



REVISION:	DATE:
ORANGE AND ROCKLAND SUBMISSION	09/10/01
BUILDING PERMIT APPLICATION	11/09/01
AS-BUILT REPORT	12/10/02

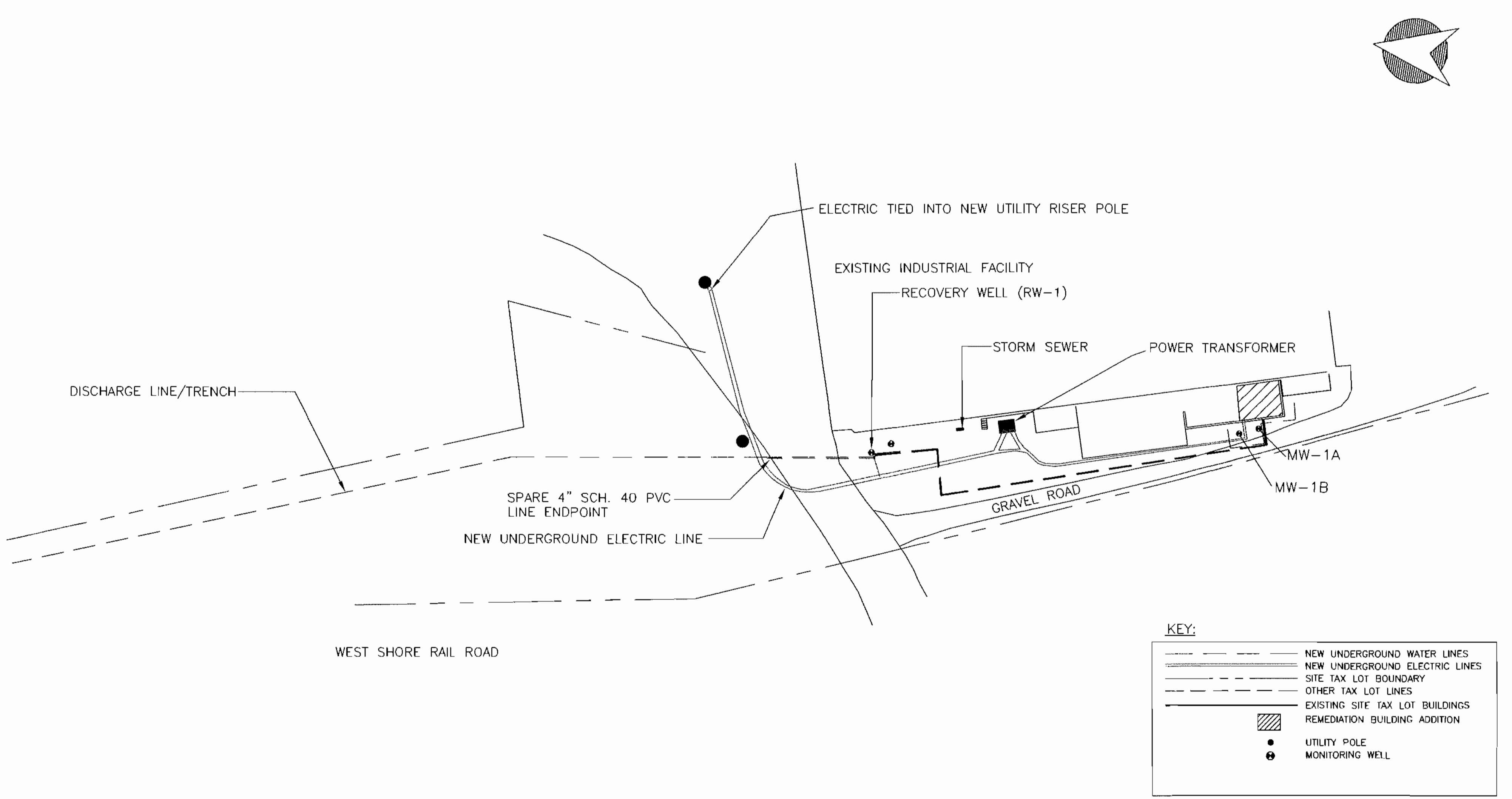
12/14/02

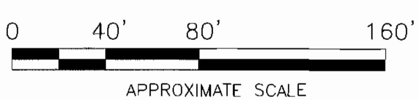
Environmental Alliance, Inc
1812 Newport Gap Pike
Wilmington, DE 19808

DESIGNED BY: AM
DRAFTED BY: RNH
CHECKED BY:

FIGURE 2-1
EXTRACTION POINT LAYOUT
WITH UNDERGROUND PIPING LAYOUT
DPE REMEDIAL DESIGN
FORMER CHROMALLOY FACILITY
WEST NYACK, NEW YORK

J:\EAI\1166\REMEDIAL DESIGN\AS-BUILT\FIGURE 2-2





Paul C. Miller – NY Lic. No. 078181
12/17/02

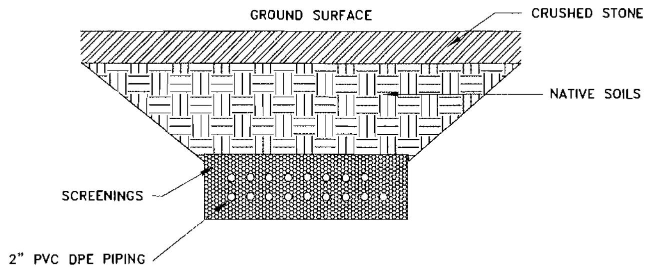
REVISION:	DATE:
ORANGE AND ROCKLAND SUBMISSION	09/10/01
BUILDING PERMIT APPLICATION	11/09/01
AS-BUILT REPORT	12/17/02

Environmental Alliance, Inc
1812 Newport Gap Pike
Wilmington, DE 19808

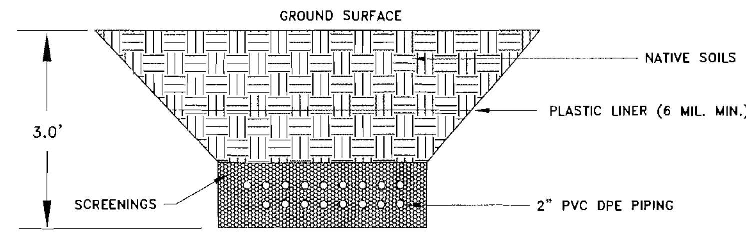
DESIGNED BY: ALM
DRAFTED BY: RNH
CHECKED BY:

FIGURE 2-2
ELECTRIC & WATER LINE
TRENCH LAYOUTS
169 WESTERN HIGHWAY
WEST NYACK, NEW YORK

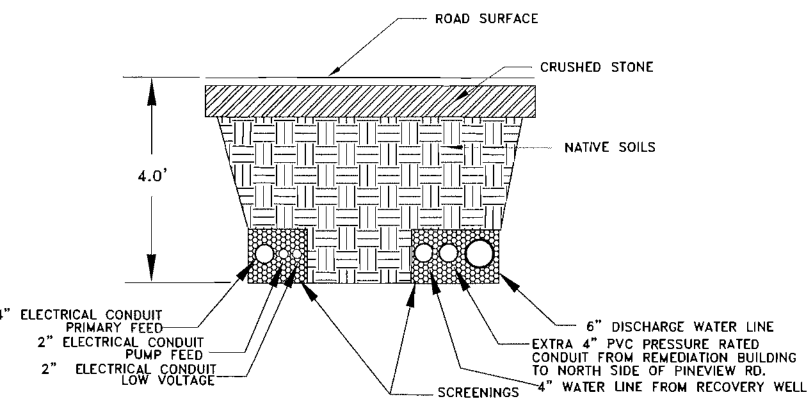
J:\EAI\1155\DWG\REMEDIAL DESIGN\AS-BUILT\FIGURE 2-3 TRENCH X-SECT



TYPICAL DPE TRENCH CROSS-SECTION
(TRAFFIC AREAS)

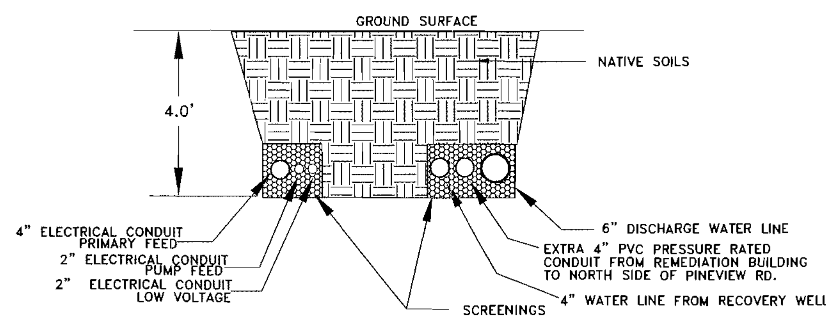


TYPICAL DPE TRENCH CROSS-SECTION
(ALL OTHER AREAS)



NOTE: DISTANCE BETWEEN ELECTRIC LINES AND WATER LINES VARY AND THE LINES ARE AT LEAST 3.0 FT APART

TYPICAL P&T TRENCH CROSS-SECTION
(TRAFFIC AREAS)



NOTE: DISTANCE BETWEEN ELECTRIC LINES AND WATER LINES VARY AND THE LINES ARE AT LEAST 3.0 FT APART

TYPICAL P&T TRENCH CROSS-SECTION
(ALL OTHER AREAS)

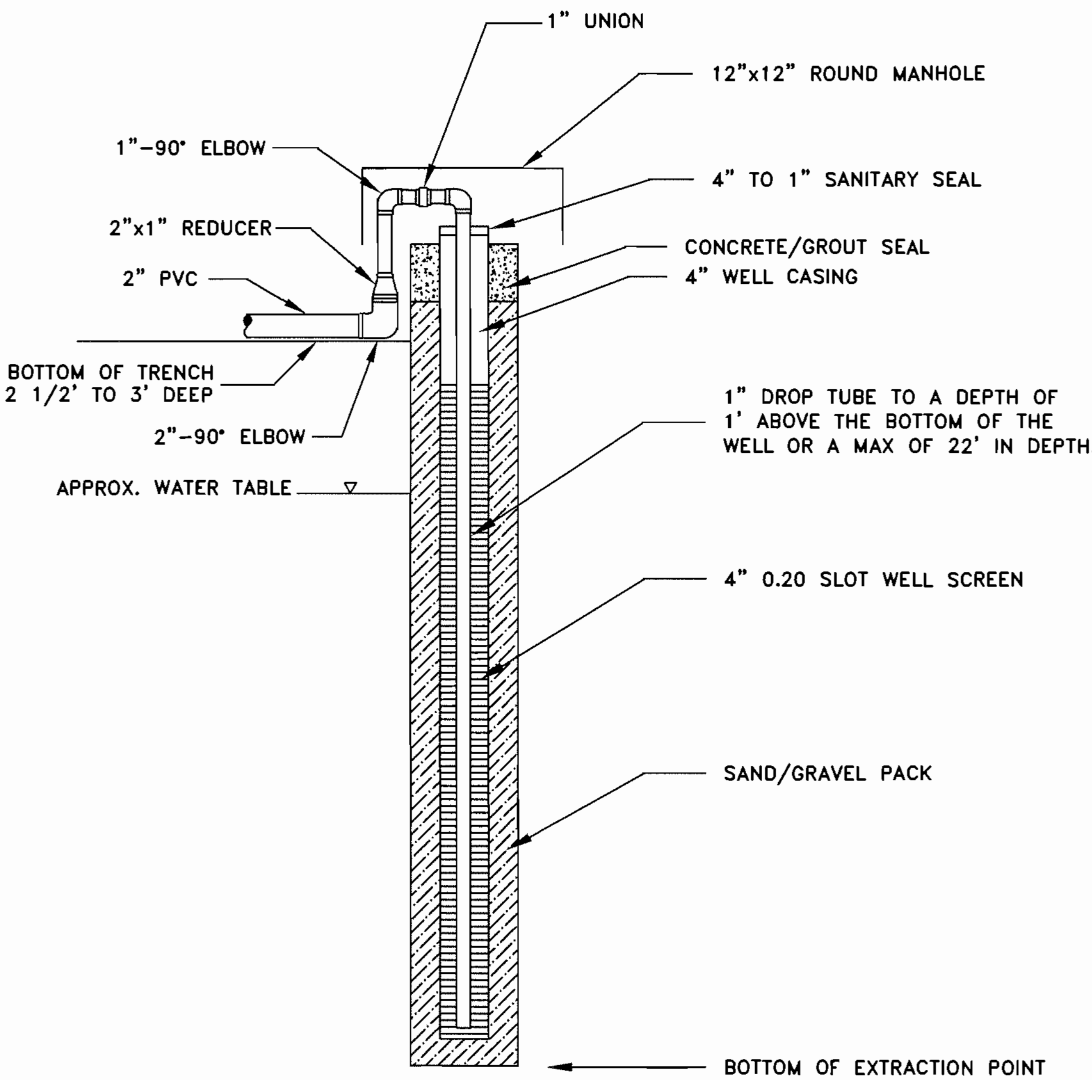
REVISION:	DATE:	
DRAFT DESIGN REPORT	10/30/00	
DPE REMEDIAL DESIGN	4/11/01	DESIGNED BY: AM
DPE REMEDIAL DESIGN COMMENTS	6/25/01	DRAFTED BY: RNH
AS-BUILT REPORT	12/10/02	CHECKED BY:

12/19/02
Paul G. Miller – NY Lic. No. 078181

Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808
Phone: (302) 995-7544
Fax: (302) 995-0941

FIGURE 2-3
TYPICAL TRENCH CROSS-SECTIONS
DPE REMEDIAL DESIGN
FORMER CHROMALLOY FACILITY
WEST NYACK, NEW YORK

J:/EAI/1166\REMEDIAL DESIGN\AS-BUILT\FIG 2-4 DPE POINT

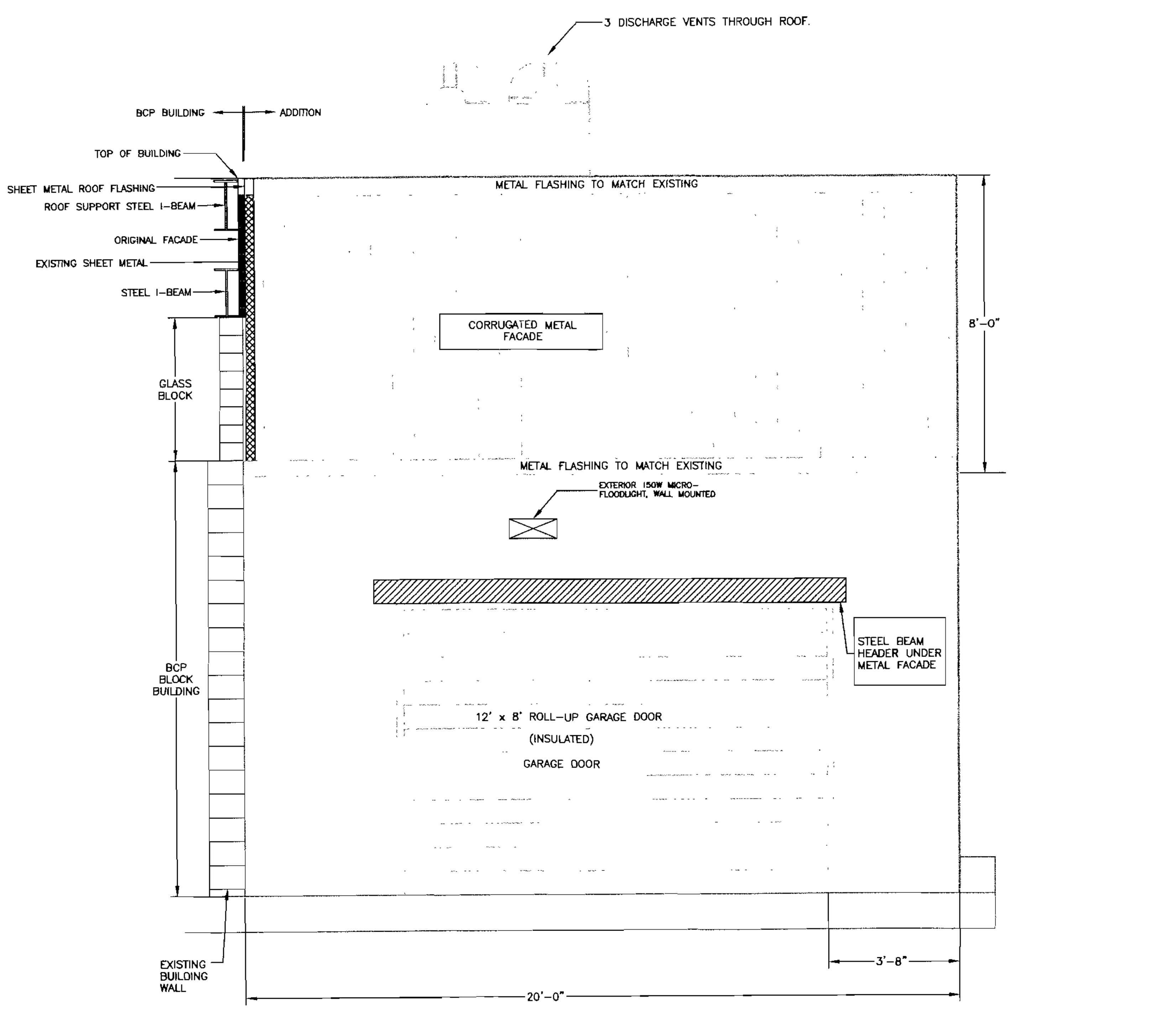


TYPICAL DPE POINT
CONSTRUCTION

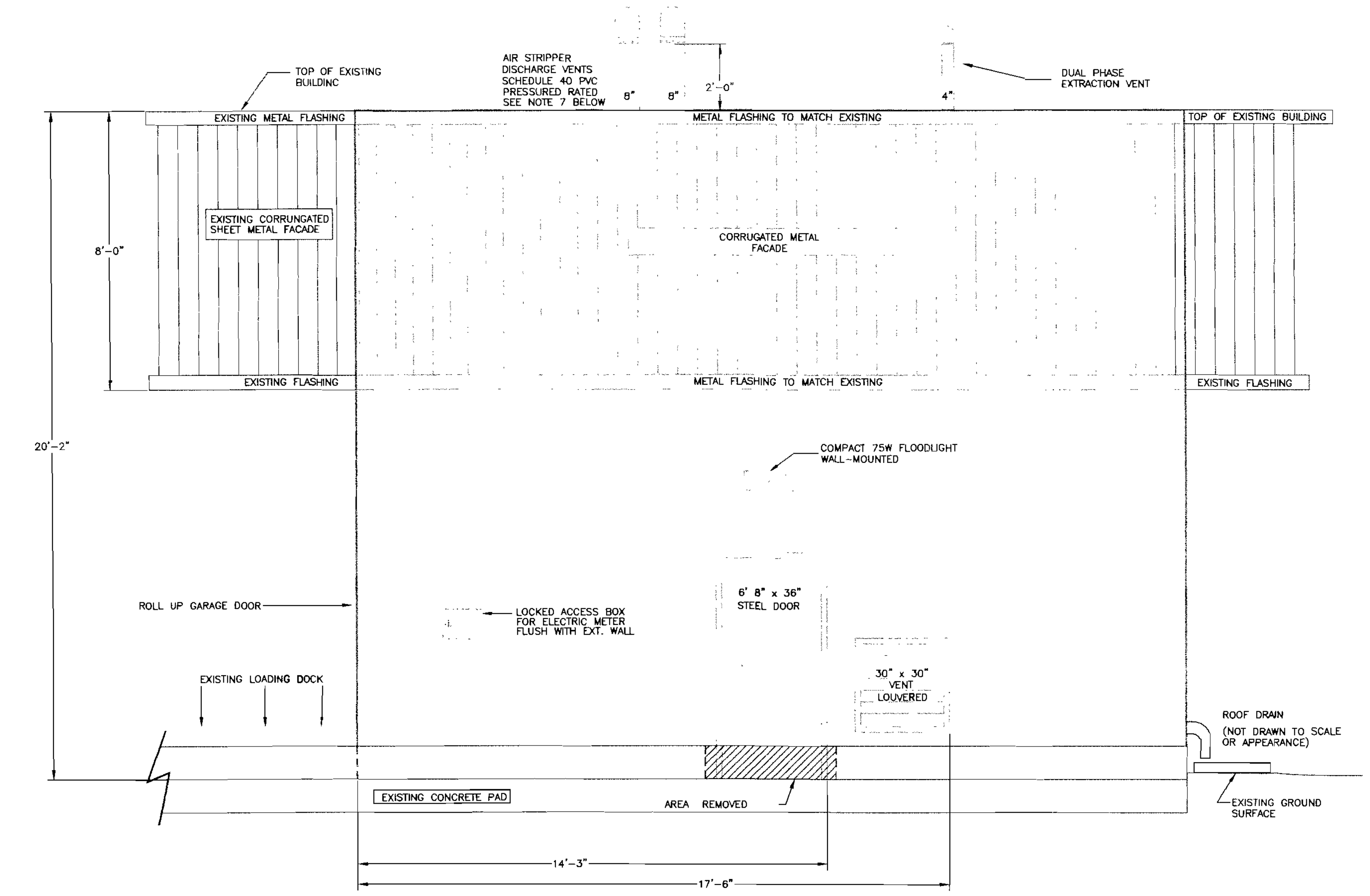
Paul C. Miller - NY Lic. No. 078181
12/19/02

REVISION:	DATE:	REVISION DATE: 12/2/02	Environmental Alliance, Inc. 1812 Newport Gap Pike Wilmington, DE 19808
ORANGE AND ROCKLAND SUBMISSION	09/10/01	DESIGNED BY: AM	
BUILDING PERMIT APPLICATION	11/09/01	DRAFTED BY: RNH	FIGURE 2-4 TYPICAL DPE POINT FORMER CHROMALLOY FACILITY WEST NYACK, NEW YORK
AS-BUILT REPORT	12/17/02	CHECKED BY:	

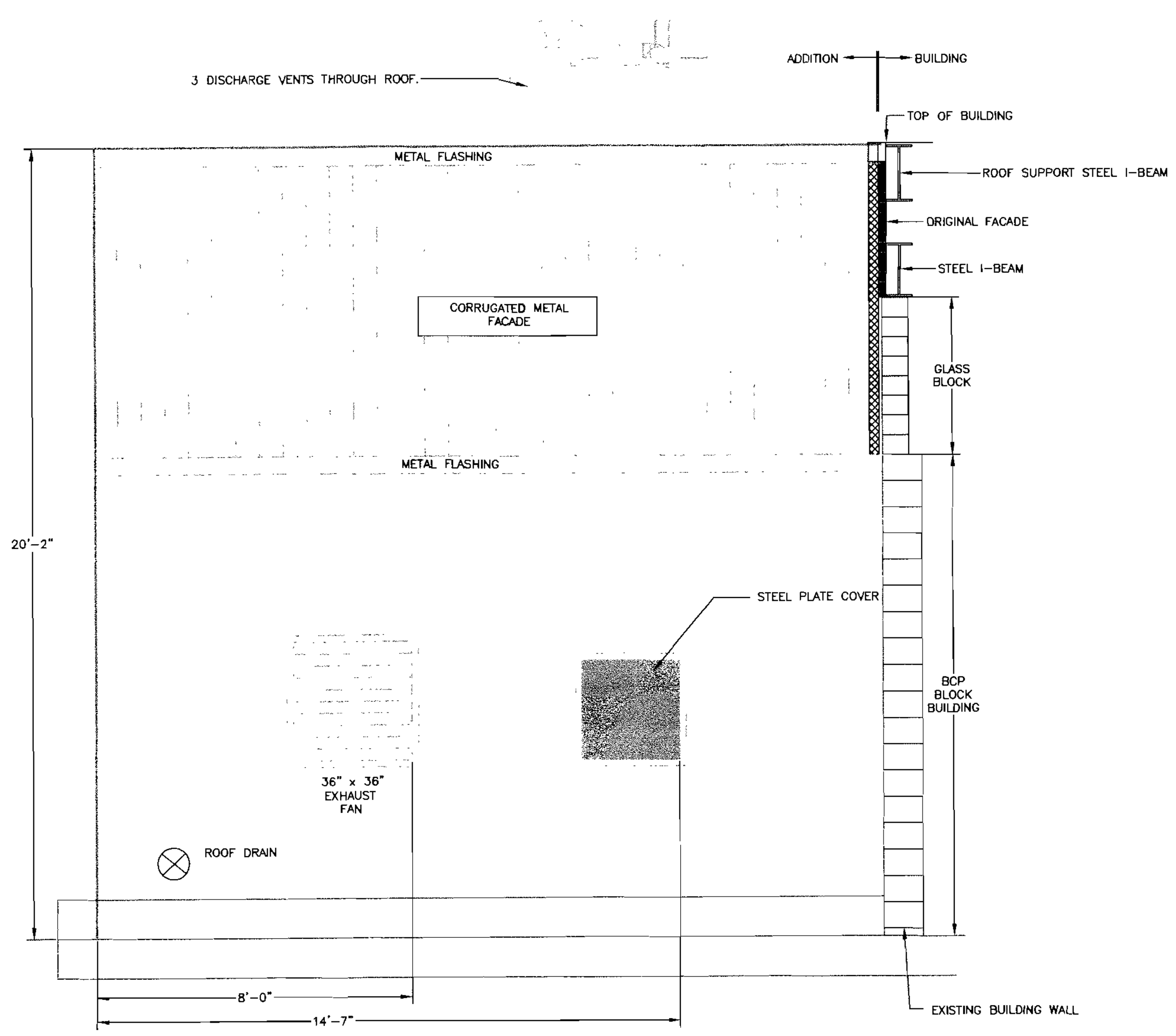
J:\EA\1166\REMEDIAL DESIGN\AS-BUILT\Figure 2-5



BUILDING LAYOUT–LEFT SIDE VIEW



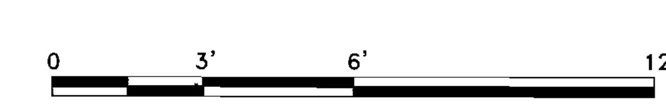
BUILDING LAYOUT–FRONT VIEW



BUILDING LAYOUT–RIGHT SIDE VIEW

GENERAL NOTES:

1. THE REMEDIATION BUILDING ADDITION ROOF HEIGHT IS EQUAL TO THE ROOF HEIGHT OF THE EXISTING BUILDING.
2. METAL FACADE INSTALLED AROUND THE TOP PERIMETER OF THE BUILDING MATCHES THE EXISTING BUILDING FACADE
3. NO EXTERNAL PIPES, ELECTRIC BOXES, OR OTHER ITEMS ARE ATTACHED TO THE EXTERIOR OF THE TREATMENT BUILDING WALLS, EXCEPT AS SHOWN.
4. CONNECTIONS BETWEEN EXISTING BUILDING AND THE BUILDING ADDITION WERE SEALED.
5. 30' DIA. EXHAUST FAN, TEMPERATURE ACTUATED, PLACED IN AN APPROPRIATE HOUSING ASSEMBLY (LOUVERE & FRAME)
6. BULDING PAINTED TO MATCH EXISTING
7. VENTS EXTEND 2' ABOVE BUILDING ROOF,
8. THE EXTERIOR LIGHTS ARE PLACED ON TIMING DEVICES FOR AUTOMATIC NIGHT OPERATION. THE TIMING OR PHOTO-OPTIC DEVICE(S), ALSO HAVE A MANUAL SWITCH TO ENERGIZE/DE-ENERGIZE THE EXTERNAL LIGHTS AS NEEDED.
9. THE ROOF DRAIN DOWN SPOUT DISCHARGES AT THE SOUTHERN WALL ONTO A CONCRETE SPILL PLATE.
10. THE WATER CONNECTION IS EXTENDED FROM THE EXISTING BUILDING HAS A CUT-OFF VALVE PLACED ON THE INSIDE OF THE EXISTING BUILDING AND A SECOND CUT-OFF VALVE PLACED IN THE TREATMENT BUILDING ADDITION. AN IN-LINE WATER METER IS PLACED WITHIN THE TREATMENT BUILDING ADDITION. A REMOTE METER READER HAS BEEN PLACED INSIDE THE EXISTING BUILDING.
11. THE SPRINKLER SYSTEM IN THE EXISTING BUILDING WAS EXTENDED INTO THE TREATMENT BUILDING ADDITION. THE ADDITIONAL SPRINKLER SYSTEM PIPE IS BLACK IRON WITH MALLEABLE FITTINGS. SPRINKLER HEAD TYPE INSTALLED IN THE TREATMENT BULDING ADDITION MATCHES THE SPRINKLER HEADS IN THE EXISTING BUILDING.



ENGINEER

ENVIRONMENTAL ALLIANCE

Engineering • Remediation • Consulting

12/11/02

Issue Date:

Revisions

No.	Date	Description
5	12/10/02	AS-BUILT REPORT
4	02/22/02	REVISED BUILDING - STEEL ROOF
3	11/09/01	BUILDING PERMIT APPLICATION
2	09/05/01	REVISED BUILDING DESIGN
1	05/10/01	BID SOLICITATION

Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808

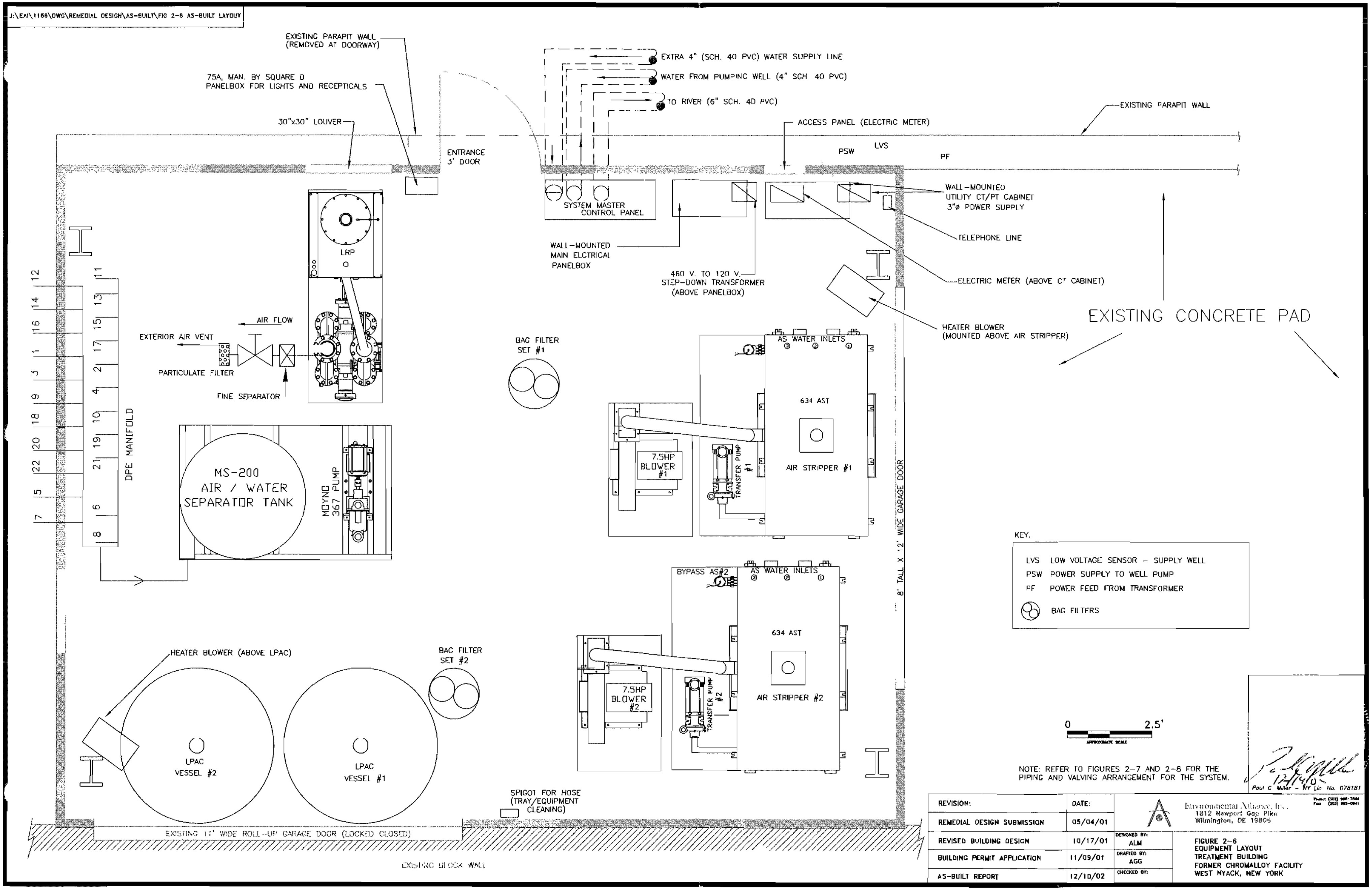
Phone: (302) 995-7544
Fax: (302) 995-0941

Project Number: 1166 **Drawn By:** AGG

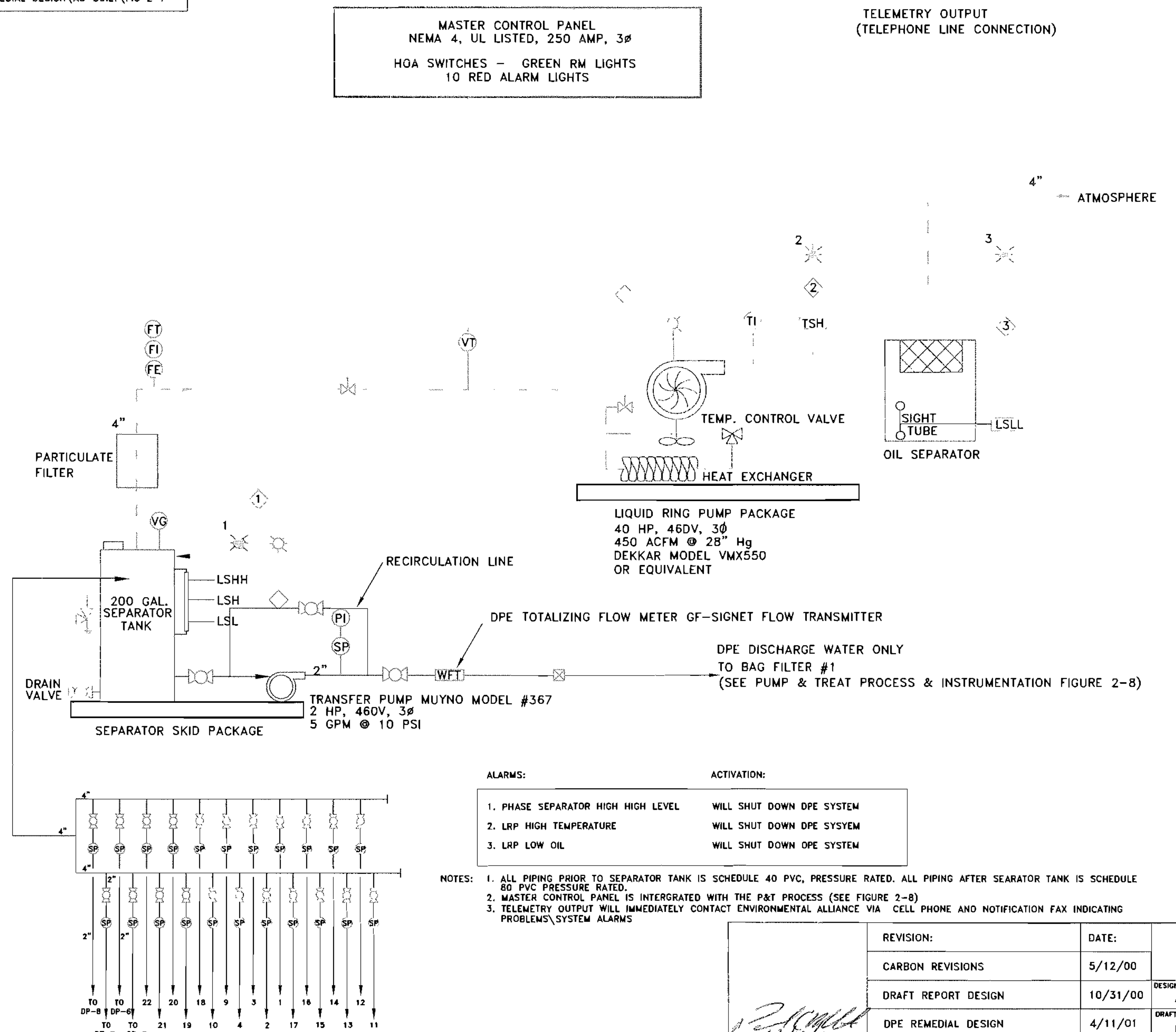
Designed By: ALM **Checked By:**

ALLIANCE BUILDING ADDITION
AS-BUILT REPORT
169 WESTERN HIGHWAY
WEST NYACK, NEW YORK

FIGURE 2-5


J:\EAI\1166\DWG\REMEDIAL DESIGN\AS-BUILT\FIG 2-6 AS-BUILT LAYOUT
EXISTING PARAPIT WALL (REMOVED AT DOORWAY)
75A, MAN. BY SQUARE D PANELBOX FOR LIGHTS AND RECEPTICALS
30"x30" LOUVER
ENTRANCE 3' DOOR
EXTRA 4" (SCH. 40 PVC) WATER SUPPLY LINE
WATER FROM PUMPING WELL (4" SCH 40 PVC)
TO RIVER (6" SCH. 40 PVC)
ACCESS PANEL (ELECTRIC METER)
EXISTING PARAPIT WALL
PSW
LVS
PF
SYSTEM MASTER CONTROL PANEL
WALL-MOUNTED UTILITY CT/PT CABINET 3"ø POWER SUPPLY
TELEPHONE LINE
WALL-MOUNTED MAIN ELCTRICAL PANELBOX
460 V. TO 120 V. STEP-DOWN TRANSFORMER (ABOVE PANELBOX)
ELECTRIC METER (ABOVE CT CABINET)
HEATER BLOWER (MOUNTED ABOVE AIR STRIPPER)
EXISTING CONCRETE PAD
LRP
AIR FLOW
EXTERIOR AIR VENT
PARTICULATE FILTER
FINE SEPARATOR
BAG FILTER SET #1
DPE MANIFOLD
12 14 16 1 3 9 18 20 22 5 7
11 13 15 17 2 4 10 19 21 6 8
MS-200 AIR / WATER SEPARATOR TANK
MOYNO 367 PUMP
AS WATER INLETS
634 AST
7.5HP BLOWER #1
TRANSFER PUMP #1
AIR STRIPPER #1
8' TALL X 12' WIDE GARAGE DOOR
BYPASS AS#2
AS WATER INLETS
634 AST
7.5HP BLOWER #2
TRANSFER PUMP #2
AIR STRIPPER #2
KEY.
LVS LOW VOLTAGE SENSOR – SUPPLY WELL
PSW POWER SUPPLY TO WELL PUMP
PF POWER FEED FROM TRANSFORMER
BAG FILTERS
HEATER BLOWER (ABOVE LPAC)
BAG FILTER SET #2
LPAC VESSEL #2
LPAC VESSEL #1
SPIGOT FOR HOSE (TRAY/EQUIPMENT CLEANING)
EXISTING 17' WIDE ROLL-UP GARAGE DOOR (LOCKED CLOSED)
EXISTING BLOCK WALL
0 2.5'
APPROXIMATE SCALE
NOTE: REFER TO FIGURES 2-7 AND 2-8 FOR THE PIPING AND VALVING ARRANGEMENT FOR THE SYSTEM.
12/14/02
Paul C. Miller – NY Lic. No. 078181
REVISION: | DATE:
REMEDIAL DESIGN SUBMISSION | 05/04/01
REVISED BUILDING DESIGN | 10/17/01
BUILDING PERMIT APPLICATION | 11/09/01
AS-BUILT REPORT | 12/10/02
Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808
DESIGNED BY: ALM
DRAFTED BY: AGG
CHECKED BY:
FIGURE 2-6
EQUIPMENT LAYOUT
TREATMENT BUILDING
FORMER CHROMALLOY FACILITY
WEST NYACK, NEW YORK

J:\EAI\1166\DWG\REMEDIAL DESIGN\AS-BUILT\FIG 2-7



ALARMS:	ACTIVATION:
1. PHASE SEPARATOR HIGH HIGH LEVEL	WILL SHUT DOWN DPE SYSTEM
2. LRP HIGH TEMPERATURE	WILL SHUT DOWN DPE SYSYEM
3. LRP LOW OIL	WILL SHUT DOWN DPE SYSTEM

NOTES:
1. ALL PIPING PRIOR TO SEPARATOR TANK IS SCHEDULE 40 PVC, PRESSURE RATED. ALL PIPING AFTER SEARATOR TANK IS SCHEDULE 80 PVC PRESSURE RATED.
2. MASTER CONTROL PANEL IS INTERGRATED WITH THE P&T PROCESS (SEE FIGURE 2-8)
3. TELEMETRY OUTPUT WILL IMMEDIATELY CONTACT ENVIRONMENTAL ALLIANCE VIA CELL PHONE AND NOTIFICATION FAX INDICATING PROBLEMS\SYSTEM ALARMS

LEGEND:

FE	AIR FLOW ELEMENT
FI	AIR FLOW INDICATOR
FT	AIR FLOW TOTALIZER
LSH	LEVEL SWITCH HIGH
LSHH	LEVEL SWITCH HIGH HIGH
LSL	LEVEL SWITCH LOW
LSLL	LEVEL SWITCH LOW LOW
M	MOTOR
MCP	MASTER CONTROL PANEL
PI	PRESSURE INDICATOR
SP	SAMPLE PORT
TI	TEMPERATURE INDICATOR
TSH	TEMPERATURE SWITCH HIGH
VG	VACUUM GAUGE
VT	VACUUM TRANSMITTER
WFT	WATER FLOW TRANSMITTER
	2" KENT TURBINE FLOW/TOTALIZER METER
	INTERLOCK/ALARM
	GATE VALVE
	CHECK VALVE
	VACUUM RELIEF VALVE
	BALL VALVE
	ALARM LIGHT
	RUN LIGHT
	CONTROL LINE
	WATER LINE
	AIR LINE
	OIL FLOW LINE

12/19/02
Paul C Miller - NY Lic. No. 074181

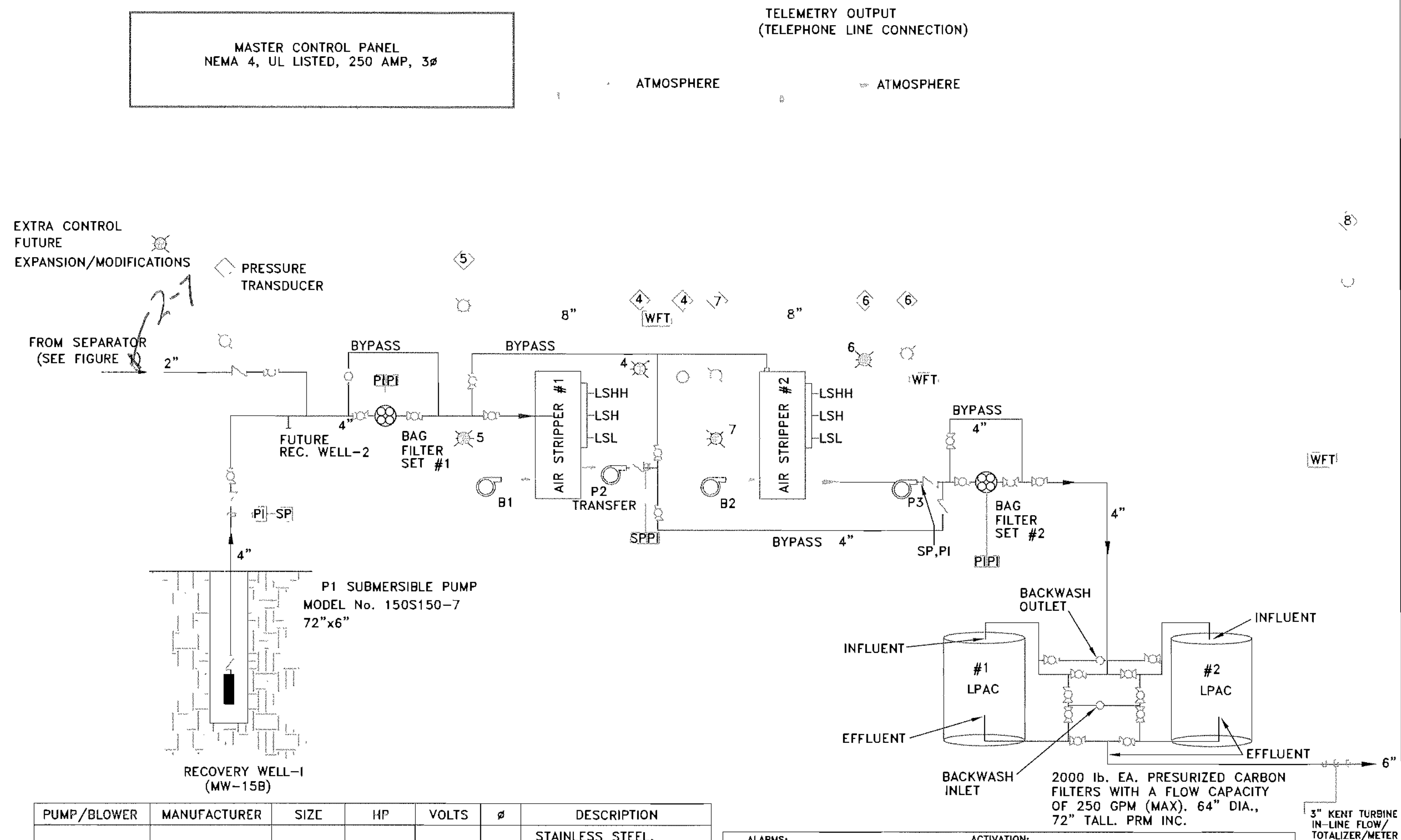
REVISION:	DATE:
CARBON REVISIONS	5/12/00
DRAFT REPORT DESIGN	10/31/00
DPE REMEDIAL DESIGN	4/11/01
AS-BUILT REPORT	12/17/02

DESIGNED BY: ALM
DRAFTED BY: RNH
CHECKED BY:

Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808
Phone: (302) 995-7544
Fax: (302) 995-0841

FIGURE 2-7
PROCESS & INSTRUMENTATION DIAGRAM
OPE REMEDIAL AS-BUILT
FORMER CHROMALLOY FACILITY
WEST NYACK, NEW YORK

J:\EAI\1166\DWG\REMEDIAL DESIGN\AS-BUILT\FIG 2-8



PUMP/BLOWER	MANUFACTURER	SIZE	HP	VOLTS	ø	DESCRIPTION
P1	GRUNDFOS	6 INCH	15	460	3	STAINLESS STEEL, SUBMERSIBLE PUMP, 150 GPM, 280' TDH
P2	AMT-4250-9X	200 MM	10 TEFC	460	3	CENTRIFUGAL PUMP
P3	AMT-4250-9X	200 MM	10 TEFC	460	3	CENTRIFUGAL PUMP
B1	AMERICAN FAN	–	7.5 TEFC	460	3	AIR BLOWER 900 cfm
B2	AMERICAN FAN	–	7.5 TEFC	460	3	AIR BLOWER 900 cfm

ALARMS:	ACTIVATION:
4. AS #1 WATER LEVEL SWITCH HIGH HIGH	WILL SHUT DOWN ENTIRE DPE & PUMP AND TREAT SYSTEM
5. AS #1 LOW AIR FLOW	WILL SHUT DOWN ENTIRE DPE & PUMP AND TREAT SYSTEM
6. AS #2 WATER LEVEL SWITCH HIGH HIGH	WILL SHUT DOWN ENTIRE DPE & PUMP AND TREAT SYSTEM
7. AS #2 LOW AIR FLOW	WILL SHUT DOWN ENTIRE DPE & PUMP AND TREAT SYSTEM
8. GF-SIGNET PH METER	WILL SHUT DOWN ENTIRE DPE & PUMP AND TREAT SYSTEM
9. LOW WATER LEVEL	WILL SHUT DOWN PUMPING WELL

NOTES:
1. ALL WATER LINES IN BUILDING SCHEDULE 80 PVC, PRESSURE RATED
2. BAG FILTER SETS: ROSEDALE WATER FILTER: EXTRA HIGH CAPACITY MULTI-BAG FILTERS, 18" DIA., 300 GPM (MAX)
3. AIR STRIPPERS (AS) MANUFACTURED BY PRODUCT RESOURCES MANAGEMENT, MODEL 634 OUAL, 13.5' X 4' WITH 4 TRAYS (EA.), SUMP TANKS, HI/LOW ALARMS
4. WATER SAMPLE PORTS ARE INSTALLED AFTER EACH TREATMENT PROCESS
5. MASTER CONTROL PANEL IS INTERGRATED WITH THE DPE PROCESS (SEE DPE REMEDIAL DESIGN, FIGURE 2-7)
6. TELEMETRY OUTPUT WILL IMMEDIATELY CONTACT ENVIRONMENTAL ALLIANCE CELL PHONE AND FAX NOTIFICATION INDICATING PROBLEMS/SYSTEM ALARMS

LEGEND:

FE	AIR FLOW ELEMENT
FI	AIR FLOW INDICATOR
FT	AIR FLOW TOTALIZER
LSH	LEVEL SWITCH HIGH
LSHH	LEVEL SWITCH HIGH HIGH
LSL	LEVEL SWITCH LOW
LSLL	LEVEL SWITCH LOW LOW
M	MOTOR
MCP	MASTER CONTROL PANEL
PI	PRESSURE INDICATOR
SP	SAMPLE PORT
TI	TEMPERATURE INDICATOR
TSH	TEMPERATURE SWITCH HIGH
VI	VACUUM INDICATOR
VT	VACUUM TRANSMITTER
WFT	WATER FLOW TRANSMITTER (GF-SIGNET)
	INTERLOCK
	GATE VALVE
	CHECK VALVE
	VACUUM RELIEF VALVE
	BALL VALVE
	ALARM LIGHT
	RUN LIGHT
	CONTROL LINE
	WATER LINE
	AIR LINE

Paul C Miller - P.E. Lic. No. 078181 12/10/02

REVISION:	DATE:
DRAFT REPORT DESIGN	10/30/00
PUMP AND TREAT REMEDIAL DESIGN	4/12/01
P&T REMEDIAL DESIGN SUBMISSION	5/4/01
AS-BUILT REPORT	12/10/02

DESIGNED BY: AM
DRAFTED BY: AG
CHECKED BY:

Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808
Phone: (302) 995-7544
Fax: (302) 995-0941

FIGURE 2-8
PROCESS & INSTRUMENTATION DIAGRAM
PUMP & TREAT CONCEPTUAL DESIGN
P&T AS-BUILT
FORMER CHROMALLOY FACILITY
WEST NYACK, NEW YORK

3.0 REMEDIAL SYSTEM START-UP TESTING

Remedial System start-up testing (P&T and DPE) was conducted from October 8 through 10, 2002. Wet testing of the non-operational P&T and DPE Systems for tightness was begun on October 8, 2002 by flooding the Remedial System components with tap water to evaluate system piping and connections for leaks. The wet testing also allowed for liquid phase carbon settlement within the vessels before pressurized flow from the remedial system operation. On October 9, 2002, P&T system operation was begun to evaluate that portion of the remediation system when operational. On October 10, 2002, the P&T System was initially re-started and balanced with subsequent start-up of the DPE System to evaluate operation of the P&T and DPE Systems. Once the DPE System was operational, the P&T System was shutdown and the DPE System was evaluated for operation by itself.

Containment of treated groundwater during the start-up testing of the P&T and DPE remedial Systems was not implemented as described in the P&T-RD and DPE-RD reports. Verbal approval was given by the NYSDEC for the non-containment of treated groundwater before initiation of start-up testing in response to Alliance's October 3, 2002 letter to NYSDEC requesting such an action (refer to Appendix V for copy of letter). Thus, all treated groundwater was discharged through the outfall piping to the Hackensack River.

The following subsections describe the remedial system start-up process.

3.1 Pump and Treat System

Start-up testing for the P&T System was conducted October 9, 2002. Static liquid levels in the bedrock and overburden monitoring well network (specifically wells RW-1, MW-15A, MW-1A, MW-1B, PW, MW-5A and MW-5B) were collected as baseline levels to evaluate the P&T System when operational. During the start-up of the P&T System, the bedrock and overburden network wells were monitored at 10 to 15 minute intervals to observe the recovery well capacity and short-term aquifer behavior. The P&T start up testing also was conducted to verify system operation, treatment system efficiency, and the structural integrity of the erosion control structure at the discharge line outfall to the Hackensack River. The P&T System air strippers and carbon vessels were set up for operation in series to employ the maximum treatment capability of the installed system during the start-up testing activities.

Start-up activities began with the submersible pump being turned on and the water flow throttled back via an inline ball valve to approximately 50 gpm, a safe low flow rate for operation of the submersible pump compared to the test rate of 80 gpm. This allowed for the inspection of the piping and process equipment for leaks as pressurized water filled these items. Water-pressure and pumping rates were monitored throughout the P&T System during testing. Pressure gauges on the bag filters were closely monitored for sediment clogging. Water back-pressure on the air strippers and blower air flow rate into the air strippers trays were measured as the system became saturated to ensure that the blowers operated according to design specifications. After the stripper trays became saturated and the gaskets compressed, all-threaded clamps were re-tightened to prevent leaks as necessary. Once the gaskets were tightened, the system was run until the back pressure gauge on the first bag filter vessel indicted the vessel was overloaded with sediments from the recovery well. The system was shut down for change out of the bag filters at this time. The P&T System was re-started and stopped to change the bag filters until the bulk of sediment collected in the recovery well was removed. Once the water from the recovery well was clear, the submersible pump was turned on and the flow rate was increased from 50 to 80 gpm. The submersible pump was run at this flow rate for continued evaluation of the P&T System. The P&T System was operated for approximately 5-hours total before the system was turned off. During operations, pumping effects (i.e. an increase in the depth to water) were noted at the bedrock wells PW, MW-1B, and MW-5B. Additionally, pumping effects were noted at MW-15A and to a lessor extent wells MW-1A and MW-5A. The water draw down effects noted at MW-15A gave cause for cutting the P&T System start-up short of the projected 8-hour maximum of testing as during shakedown testing the plan called for minimal draw-down in the upper portion of the aquifer.

Water samples were collected at four points throughout the P&T System. The sample locations were before Air Stripper No.1 (MW-15B), after Air Stripper No.1 (AST#1 EFF), after Air

Stripper No.2 (AST#2 EFF), after Carbon No. 1 (CARBON#1 EFF), and at the point of discharge outfall (EFFLUENT – 10/9/02). The collected samples were submitted to ChemTech Laboratories Inc. of Mountainside, New Jersey under proper chain of custody. The groundwater treatment samples (AST#1 EFF, AST#2 EFF, CARBON#1 EFF) were analyzed for VOC's via EPA analytical method 8260. The point of discharge outfall EFFLUENT – 10/9/02 sample was analyzed for the NYSDEC approved discharge parameters listed in Table #-1 below (see Appendix VII for the NYSDEC Effluent Limitations and Monitoring Requirements), with the exception of pH and flow (which are monitored by the in-line pH meter and an in-line flow meter). The P&T start-up test results are presented in Section 4.0 of this report.

Table 3-1
Effluent Limitation Requirements

Parameter	Limit (ug/L)	Parameter	Limit (ug/L)	Parameter	Limit (ug/L)
Cadmium, Total	42	1,1,1,2-Tetrachloroethane	50	Carbon Tetrachloride	4
Chromium, Total	500	1,1,1 Trichloroethane	10	Chloroform	70
Copper, Total	144	1,1,2 Trichloroethane	10	Methylene Chloride	10
Lead, Total	150	1,1 Dichloroethane	10	sec-Butylbenzene	50
Nickel, Total	1000	1,1 Dichloroethene	7	Tetrachloroethene	7
Zinc, Total	1000	cis-1,2 Dichloroethene	10	Trichloroethene	10
Arsenic	100	trans-1,2 Dichloroethene	10	Vinyl Chloride	3
Benzene	5				

3.2 DPE System

On October 10, 2002, the P&T System was re-started and with the air strippers running within design parameters, the DPE System was started. Before start-up of the P&T and DPE Systems, baseline depth to water and vacuum/pressure data for DPE points/wells DP-1, DP-2, DP-3, DP-4, MW-1A, and MW-2A was recorded. The depth to water was measured using a water level indicator that records the depth to water to within 0.01 feet. The pressure/vacuum was measured by fitting each point/well with an airtight seal (Furnco coupling) and connecting a magnehelic gauge, capable of recording vacuums or pressure to within 0.01 inch of water, to the sealed well head.

Before starting the DPE System liquid ring pump (LRP), the oil level in the sight tube was noted. The LRP was started with all of the DPE points shut off via ball valves and the dilution intake valve on the Moisture Separator (MS) tank open to allow a vacuum of at least 25-inches of mercury. Individual DPE points were opened starting with DP-20 and following with DP-18, DP-19, DP-22, and DP-21. Each DPE point was opened slowly to allow the point to dewater somewhat and stabilize. Airflow velocity with the Kurz meter (hot wire anemometer) and VOC concentrations with the PID through the vacuum pump were monitored at the DPE effluent air port.

As the DPE System was brought online (DPE points DP-20 and DP-18 only), the operation of the combined operation of the P&T and DPE Systems was evaluated for about 1-hour. Once the DPE System monitoring showed the process equipment had stabilized the P&T System was shut down. The efficiency of the DPE System was then evaluated with the air strippers and carbon units fully engaged in series for operation with the DPE System for about 2-hours. Start-up monitoring of the DPE System was performed to verify design specifications of the DPE equipment and to confirm the ability of the treatment system to treat influent from the shallow aquifer with DPE-only operation. Site monitoring was conducted to observe groundwater draw down and vacuum influence in the select monitoring network points/wells to demonstrate the radius of influence for operated DPE points. Effluent air vapor monitoring was conducted to confirm the potential to emit (PTE) as calculated based on pilot test results.

Air bag samples of the DPE effluent were collected and analyzed via TO-14 analysis for VOCs (including Hexane) and via TO-03 for total petroleum hydrocarbon (C1 –C10). In addition water samples were collected from the DPE System influent (DPE-INF) and point of discharge outfall (EFFLUENT2 – 10/10/02). The DPE System influent sample (DPE-INF) was analyzed for VOC's via EPA analytical method 8260. The point of discharge outfall EFFLUENT2 – 10/10/02 sample was analyzed for NYSDEC approved discharge parameters. The DPE start-up test results are presented in Section 4.0 of this report.

4.0 REMEDIAL SYSTEM START-UP RESULTS

4.1 P&T System Start-Up Results

The P&T System RW-1 submersible pump was operated at approximately 50 gpm for 2-hours and 80 gpm for 3-hours during the 5-hour start-up test. During the start-up testing on October 9 and 10, 2002, RW-1 groundwater draw down influences were noted at bedrock wells PW-1, MW-5B, MW-1B, and MW-2B, and overburden well MW-15A. The groundwater draw down influences observed at the bedrock wells over the limited length of the start-up testing at low to mid-range of pump operation indicates the system is capable of influencing the surrounding groundwater system in bedrock. The groundwater draw down influence of about 2.5 feet observed at MW-15A (within 10-feet of RW-1) suggests a hydraulic connection between the overburden and bedrock hydrogeologic units in the area directly around RW-1.

The RW-1 influent (pretreatment) sample showed VOC concentrations ranging from estimated concentrations of 1,1-dichloroethene, 1,1,2-trichloroethane, benzene, chloroform, toluene, and trans-1,2-dichloroethene below 5 parts per billion (ppb) to 15,000 ppb of TCE. The start-up testing VOC concentrations for RW-1 are within the historical VOC concentration ranges reported for this well. The start-up testing results show TCE as the main VOC constituent present, which is also consistent with historical data for the well and the site. The subsequent intermediate treatment samples collected after each air stripper and prior to the carbon units showed a significant reduction in VOC concentrations. The analytical results for the AST#1 sample (after air striper No. 1 treatment) shows a significant reduction of VOC concentrations. TCE was reported at 25 ppb and cis-1,2-dichloroethene at an estimated concentration of 2.6 ppb. The AST#2 sample (after air striper No. 2 treatment) results report only an estimated TCE concentration of 2.5 ppb. The CARBON#1 Eff sample (after carbon vessel No. 1 treatment) is non-detect for all VOCs concentrations. The EFFLUENT – 10/9/02 sample from outfall 001 reported non-detectable VOC concentrations and individual inorganic concentrations (total), below the NYSDEC discharge limits. Refer to Tables 4-1 and 4-2 for summaries of pretreatment sample, intermediate treatment system samples and outfall sample results.

The total volume of water treated by the P&T System was approximately 10,000 gallons for the day of start-up testing on October 9, 2002 and 4,912.5 gallons for October 10, 2002, which is well below the 435,000 gallons per day discharge limit. The pH range recorded via an in-line pH meter after carbon treatment was consistently between 6.0 and 9.0 during the operation of the P&T System. On occasion, pH levels dropped slightly below 6.0 or above 9.0 after filter bag changes and re-start of the P&T System. Once flow was maintained and stabilized, pH measurements would then range between 6.0 and 9.0.

Additionally, no overt signs of erosion were noted during P&T System start-up operations (maximum 80 gpm) at the erosion control structure at the remedial system outfall 001 to the Hackensack River.

4.2 DPE Remedial System Start-Up Results

The P&T System was turned-on initially and then the DPE System was turned-on after the P&T System was balanced. Once warmed-up and balanced, the DPE System process was operated at approximately 525 to 550 ACFM and 25-inches of mercury for the entire start-up test.

The influence of the DPE System was measured by changes in groundwater water level (groundwater influence) and vacuum (vacuum influence) from background data collected at the selected monitoring wells and points varied from location to location. During the October 10, 2002 start-up testing, the groundwater influence exerted (water level change of 0.1-foot or greater) by the DPE System was observed at DP-4, DP-1, and DP-2. Vacuum influence during DPE start-up testing (vacuum change of 0.1-inch of H_20 or greater) was observed at MW-1A, DP-4, DP-1, and DP-2. These values indicate the DPE System is creating an influence through the subsurface environment. Due to the limited operation time of the DPE start up test, a determination of the DPE System radius of influence (ROI) is not provided as the ROI value would not be representative of actual system operation. The ROI of the DPE System will be determined during full system operation.

The water from the DPE System (untreated) showed VOC concentrations ranging from 18 ppb (vinyl chloride) to 7,000 ppb (2-butanone). The other VOC constituents reported between this range were acetone, cis-1,2-dichloroethene, and TCE. The VOCs reported in the DPE System influent is consistent with historical VOCs reported in the area, however, the 2-butanone and acetone concentrations reported are much greater than previously reported. The detection of these two constituents also correlates with the water sample collected from the seep in the electrical trench near DPE point DP-22. It is possible that the 2-butanone present in the DPE process water is a result of the PVC glue used to connect the DPE piping. There are no discharge requirements for 2-butanone in the effluent limitations and monitoring requirements (Appendix VII); however, Alliance will continue to monitor this constituent to determine if the concentrations reduce after the initial start-up period (estimated to be 1-2 months) of the DPE System. If it continues to persist after the initial start-up period, it will be further evaluated and addressed as necessary at that time.

No intermediate treatment system samples were collected during the DPE start-up testing. The EFFLUENT#2 – 10/10/02 sample for the DPE start-up test from outfall 001 reported non-detectable VOC concentrations and individual inorganic concentrations (total), below NYSDEC discharge limits. Refer to Tables 4-1 and 4-2 for summaries of pre-treatment sample and outfall sample results.

The measured amount of water removed by the DPE System was approximately 197 gallons for the day of start-up testing on October 10, 2002. The P&T System operation on October 10, 2002 (discussed earlier) removed 4,912.5 gallons of water from RW-1. The total water treated and discharged on October 10, 2002 was 5,109.5 gallons, which is well below the 435,000 gallons per day discharge limit. The pH range recorded via an in-line pH meter after carbon treatment was consistently between 6.0 and 9.0 during the operation of the DPE System only.

The DPE System effluent air sample (EFFLUENT – 10/10/02) analyzed for VOCs via TO-14 method showed a total organic concentration of 188,110 ppbv with the highest individual organic constituent, hexane, reported at a concentration of 110,000 ppbv. The air sample (EFFLUENT – 10/10/02) analyzed for TPH (C1-C10) via TO-03 method showed a concentration of 470 ppbv calculated as n-hexane. The majority of the reported constituents in the air bag samples consisted of hexane and other petroleum related compounds, some chlorinated solvents, acetone, and 2-buatone. The elevated concentration of hexane and other related petroleum constituents is believed to be associated with the former hexane UST located at the southwest corner of the Facility building. Refer to Table 4-3 for a summary of the air bag sampling results.

4.3 Air Emissions

Alliance initially performed Potential to Emit (PTE) calculations to evaluate the air emissions from the remedial system. The PTE for the DPE System was estimated on the highest concentration of TCE measured during the DPE pilot test. Alliance revised the PTE for the DPE based on the start-up effluent data (see Appendix VIII). The revised PTE for the DPE System is 1.155 tons per year of VOCs (Appendis VIII). This revised PTE contribution from the DPE System represents actual start-up and should slowly decline as the system stabilizes with continued operation.

The table provided in Appendix VIII includes the original PTE estimate for the groundwater P&T System is based on the highest observed VOC value for each constituent was selected from each well within the projected cone of depression to determine the geometric mean. The cumulative geometric means were used to calculate the PTE contribution from the groundwater system. As with all groundwater pump and treat systems, the initial influent concentration will gradually decline with continued operation. The first year total VOC PTE is estimated to be 2.47 tons/yr, which is lower than the 10 ton/yr hazardous air pollutant (HAP) threshold for Title V.

4.4 Air Guide-1 Analysis

NYSDEC provides guidance DAR-1 (Air Guide-1) for the control of toxic ambient air contaminants in New York State. A major component of DAR-1 is the Ambient Air Quality Impact Screening Analysis. This analysis allows for the calculation of ambient impacts resulting from the operation of a source, or multiple sources, of air contamination. Predicted impacts are compared to guideline concentrations and this comparison is used in determining the degree of control required for the acceptable operation of the source(s) under review.

Alliance utilized Air Guide-1 program from NYSDEC, Division of Air Resources web page to perform a contaminant assessment summary for the constituents detected in the DPE effluent air stream during the start up testing. Air Guide-1 requires UTME and UTMN coordinates and emission rates in lbs/hour (or tons pre year). Alliance obtained the UTME and UTMN coordinates from the USGS Topographic Map (Figure 1-2), while the emission rates were obtained from the rates in the PTE table. The inputted data and the program results are included in Appendix VIII. No constituents exceeded the published Short-Term Guideline Concentrations (SGC) or the Annual Guideline Concentration (AGC). Only two constituents in the DPE effluent were identified as having the potential to exceed 1% of the actual annual percentage of the AGC. These constituents are TCE (10%) and hexane (3.2%). Both of these constituents are well below the actual permitted annual emission percentage and, therefore, do not present a concern.

4.5 Conclusions

Based on the start-up data, the P&T and DPE Systems operated consistent with the expectations presented in the P&T-RD and DPE-RD. All equipment operated efficiently and effectively once balanced. The filter system reduced suspended solids before the groundwater treatment process. The air strippers and carbon units effectively treated VOCs influent to the system via RW-1 or the DPE points to non-detectable levels and maintained consistent pH levels. Inorganic concentrations remained below discharge limits. Groundwater influences were noted at the bedrock wells close to RW-1 during P&T System operations. Groundwater and vacuum influences were noted at overburden wells/DPE points in the area of the operational DPE points during DPE System operations. The discharge of treated groundwater across the erosion control structure did not impact the Hackensack River bank.

It is curiously noted that there was a hydraulic link between RW-1 and MW-15A based on the groundwater influence noted during P&T operations; however, the P&T test performed was too short and at too low a flow to make an accurate projection of its ROI. As mentioned earlier, the DPE test performed was also too short to make an accurate projection of the system ROI.

Once NYSDEC authorization is given to start-up the remedial systems, Alliance will begin operations with the DPE System for a period of time (estimated at 1-2 months) to remove residual VOCs in the overburden and to draw down the upper portion groundwater levels. Once the DPE System has stabilized and ROI has been determined, the P&T System operations will be initiated.

During full time operation of the DPE System, the presence of acetone and 2-butanone (reported in the overburden environment and DPE System influent) will be monitored closely to evaluate groundwater conditions and treatment system capabilities. The presence of hexane and associated constituents in the effluent air sample collected during DPE System operations will also be monitored closely during full time operation of the system to evaluate if there is a consistent source of hexane (from former hexane UST area), or just a minor source. It should be noted that the VOC concentrations identified in the DPE start-up testing should represent maximum contaminant levels and that the air emissions associated with this worst case condition was determined to be acceptable in accordance with the NYSDEC DAR-1.

During the full-time operation of the P&T, monitoring of the ROI from RW-1 will be performed, with close attention paid to MW-15A and other wells in the area (PW-1, MW-5B, and MW-5A). The P&T System will be brought online slowly, starting at 50 gpm and slowly increased over 4-5 hours to a rate that the well can sustain without dewatering (estimated to be 135 gpm). Alliance will closely monitor the ROI at the nearby wells (overburden and bedrock), which will provide the relationship of the P&T Systems effects on the draw down of any residual contamination in the saturated overburden soil into the fractured bedrock at the Facility. Estimated VOC emissions from the P&T System operations have not changed from those estimated in the P&T-RD Report.

Overall, the P&T and DPE Systems are primed for full time operation to address the residual VOCs in the Study Area bedrock and residual VOCs in the site overburden. O&M Plan details for the DPE and P&T Systems are provided in Section 5.0.

TABLE 4-1
GROUNDWATER TREATMENT SYSTEM DATA SUMMARY
FORMER CHROMALLOY FACILITY
WEST NYACK, NEW YORK

Sample ID:	AST#1 EFF	AST#2 EFF	CARBON#1 EFF	MW-15B*	DPE-INF	TRIP BLANK
Lab Sample ID:	P4592-01	P4592-02	P4592-03	P4592-05	P4592-07	P4592-08
Date Sampled:	10/09/02	10/09/02	10/09/02	10/09/02	10/10/02	10/09/02
VOCs (ug/L)						
1,1-Dichloroethene				1.5 J		
1,1,2-Trichloroethane				3.8 J		
2-Butanone					7,000	
Acetone					610	
Benzene				1.5 J		
Chloroform				4.3 J		
cis-1,2-Dichloroethene	2.6 J			460	140	
Methylene Chloride						2.6 J
Tetrachloroethene				33		
Toluene				2.2 J		
trans-1,2-Dichloroethene				1.8 J		
Trichloroethene	25	2.5 J		15,000	43	
Vinyl Chloride				8.2	18	
Total VOCs	25		ND	15,501.2	7,811	
Qualifiers	2.6 J	2.5 J		15.1 J		2.6 J
TICs	0	0	0	0	0	0

J = Estimated concentration.
Non-reported constituents were not detected above their analysis method detection limit.
Blank spaces for reported constituents indicated non-detectable results for the sample analyzed.
Refer to the entire data package for the list of constituents analyzed.
Samples analyzed by Chemtech - Project #P4592.
*New well is designated RW-1.

TABLE 4-2
GROUNDWATER TREATMENT SYSTEM EFFLUENT DATA SUMMARY
FORMER CHROMALLOY FACILITY
WEST NYACK, NEW YORK

Sample ID: Lab Sample ID: Date Sampled:	NYSDEC Effluent Limitations	**EFFLUENT** **P4592-04** **10/09/02**	**EFFLUENT2** **P4592-06** **10/10/02**						
VOCs (ug/L)									
Total VOCs Qualifiers		**ND**	**ND**						
TICs	NA	0	0						
Inorganics (ug/L)									
Arsenic	100	60.4	37.9						
Cadmium	42	< 0.12	< 0.12						
Chromium	500	1.8 B	3.0 B						
Copper	144	2.3 B	10.2 B						
Lead	150	2.2 B	3.2						
Nickel	1,000	0.43 B	< 0.20						
Zinc	1,000	30.8	26.9						

NYSDEC = New York State Department of Environmental Conservation.
NA = Not Available or Not Analyzed.
J = Estimated concentration.
B = the reported value was less than the CRDL but greater than or equal to the IDL.
Non-reported constituents were not detected above their analysis method detection limit.
Blank spaces for reported constituents indicated non-detectable results for the sample analyzed.
Refer to the entire data package for the list of constituents analyzed.
Samples analyzed by Chemtech - Project #P4592.

TABLE 4-3
DPE EFFLUENT AIR DATA SUMMARY
FORMER CHROMALLOY FACILITY
NYACK, NEW YORK

SAMPLE ID:	EFFLUENT							
DATE:	10/10/02							
EPA Method #	TO-14							
ANALYTE (ppbv)								
Chlorodifluoromethane	500							
Pentane	2,700							
Acetone	5,200							
Carbon Disulfide	490 J							
Methylene Chloride	1,900							
Hexane	110,000							
cis-1,2-Dichloroethene	290 J							
2-Butanone	4,600							
1,1,1-Trichloroethane	300 J							
Benzene	140 J							
Isooctane	12,000							
Heptane	3,900							
Trichloroethene	660							
Toluene	11,000							
Octane	4,000							
Tetrachloroethene	8,400							
Ethylbenzene	2,100							
m/p-Xylene	9,300							
o-Xylene	4,800							
Cumene	490							
4-Ethyltoluene	2,600							
1,3,5-Trimethylbenzene	1,300							
1,2,4-Trimethylbenzene	2,660							
Total Organics	188,110							
Qualifiers	1,220 J							
TPH (C1-C10) - TO-03	470 *							

J = Detected below method detection limit (MDL) and is an estimated value.
* = Calculated as n-Hexane, estimated value.

5.0 OPERATIONS AND MAINTENANCE PLAN

The O&M Plan presented in this section is consistent with those proposed in the P&T-RD and DPE-RD reports, with minimal adjustments made based on the construction of the combined remedial system and the results of the start-up testing. Upon the receipt of this O&M Plan approval from the NYSDEC, the DPE remedial system will be activated. After sufficient time (estimated 1-2 months) to fully evaluate the DPE System operation and effectively reduce residual VOC concentrations in the overburden environment, the P&T remedial system will be activated and the systems will run simultaneously. Monitoring/maintenance activities will be initiated once one or both of the remedial systems are operational. The DPE and P&T System operation and maintenance activities are presented below.

5.1 System Operations

Discharge monitoring of remedial system operations will be in compliance with the NYSDEC communicated Effluent Limitations and Monitoring Requirements (ELMR) (refer to Appendix VII for chemicals of concern to be monitored details). The following items meet the requirements of the ELMR as well as Alliance's standard operating procedures for the remedial system:

5.1.1 DPE System

- During start up of the DPE System the monitoring frequency for the process will be accelerated so that the site responses can be monitored during this dynamic phase of the project. Site visits and system monitoring will be conducted daily for the first week of operation and twice weekly for each of the next three weeks of operation (unless more frequent visits are considered necessary). After this first month of accelerated site monitoring, the routine schedule for site monitoring will be weekly to twice monthly site visits as necessary.

- During the start up phase of monitoring, during each site visit the DPE system will be monitored as follows. Each of the DPE points will be monitored at the manifold for flow, vacuum, VOC via the FID/PID (if no water is present), and the presence or relative amount of water being extracted. In addition, the vacuum response and water levels in the shallow monitoring wells in the vicinity of the operating DPE points will also be measured. Adjustments to the flow and vacuum at each individual DPE point will be adjusted to minimize any short circuiting that may be apparent and to maximize the rate of VOC extraction and the radius of influence. In addition to this, a Tedlar™ airbag will be collected from the vapor effluent the DPE process on a weekly basis with analysis via TO-14.
- During DPE System only operation, the water discharged from the treatment system will be analyzed for selected VOCs and metals on a monthly basis. Treatment system effluent water monitoring for pH and the total discharge volume will be collected on a daily basis via automated monitoring. Discharge monitoring of system operations described above will be in compliance with the NYSDEC Effluent Limitations and Monitoring Requirements (refer to Appendix VII for ELMR details and Table 3-1).
- Semi-monthly recording of DPE remedial system water totalizers for total flow.

Following the start up Phase of operations, the routine monitoring schedule will be as follows:

- Semi-monthly recording of treatment system pressure readings (air strippers, water lines).
- Semi-monthly monitoring of bag filters via site inspection.
- Semi-monthly monitoring of air stripper vapor effluent and DPE vapor effluent with a PID.
- Monthly collection of DPE effluent vapor sample via Tedlar™ air bag for VOC analysis (method TO-14).
- Monthly collection of DPE influent water (after manifold) for VOC analysis (EPA method 8260).
- Quarterly monitoring of groundwater levels and vacuum influence at select wells will be conducted. Note that the wells gauged may include, but are not limited to MW-1A, MW-2A, MW-3A, MW-15A, and MW-17A.

- Adjustments to the process will be made as necessary to maximize the rate of VOC withdraw.

5.1.2 P&T System

During start up of the P&T system the site will be monitored to document the influence of the long term pumping of RW-1. The monitoring will be conducted as an extended (i.e. 3-month) pump test on this well and the surrounding shallow and bedrock wells. This monitoring will be completed using both electronic methods (i.e. data loggers) as well as manual methods. As with the DPE System start up, it is expected that daily site visits will be completed during the first week of operation of the P&T System to monitor its operations and make adjustments as necessary. After the first week of operation, it is expected that the equipment monitoring frequency will be reduced to weekly or twice monthly.

The routine monitoring schedule of the P&T System will be as follows:

- Treatment system effluent water sample analysis for selected VOCs and metals will be conducted on a weekly basis when the P&T System is operating. The weekly effluent samples will be collected with analysis for the constituents specified in the ELMR (via EPA method 8260) and metals (via EPA method 200.7). Treatment system effluent water monitoring of pH and totalizer for flow rate will be collected on a daily basis via automated monitoring. All monitoring for type of system operations described above will be in compliance with the NYSDEC Effluent Limitations and Monitoring Requirements (refer to Appendix VII for ELMR details and Table 3-1).
- Semi-monthly recording of P&T remedial system water totalizers for total flow.
- Semi-monthly recording of treatment system pressure readings (air strippers, water lines).
- Semi-monthly monitoring of bag filters via site inspection.
- Semi-monthly monitoring of air stripper vapor effluent with a PID.
- Monthly collection of recovery well (RW-1) water (pre-treatment) for VOC analysis (EPA method 8260).

- Monthly monitoring of groundwater levels at select wells will be conducted. Note that the wells gauged may include, but are not limited to #41, MW-1A, MW-1B, MW-2A, MW-4A, MW-4B, MW-9B, MW-11A, MW-11B, MW-12A, MW-12B, MW-15A, and MW-16B.

5.1.3 General Operations

Non-ELMR activities (i.e. bag filter checks and pressure readings) may also be implemented at a greater frequency than specified above. However, after system operations have stabilized to optimum operating conditions, it is expected that the non-EMLR monitoring activities will be implemented at the above frequency. Note that the EMLR monitoring frequency and parameters will be evaluated for need by the NYSDEC as the effluent data set is built. Alliance anticipates that the frequency of monitoring could be changed from weekly to monthly and the metals analysis could be dropped from the required analytical parameters with approval by the NYSDEC after optimum operating conditions and the associated data set supports such changes.

5.2 Quarterly Groundwater Monitoring

In addition to the remedial system O&M activities described in Section 5.1, a groundwater monitoring program (GMP) will be conducted to evaluate lower groundwater and upper groundwater/vadose zone clean up. The GMP for remedial system evaluation will be implemented on the same schedule (January, April, July, and October) currently implemented by Alliance at the Facility for groundwater monitoring. The currently implemented quarterly groundwater monitoring program for the Study Area utilizes normal flow purging (typically three well volumes and groundwater quality parameter stabilization) and sampling techniques. Due to the large quantity of groundwater generated during purging of the bedrock wells and associated difficulties/hazards with transportation and treatment, Alliance proposes conducting testing of the low-flow sampling protocol in conjunction with a normal purge sampling event to evaluate this protocol's applicability. Implementation of such a protocol also limits the generation of contaminated groundwater pursuant to Sequa's Waste Minimization and Pollution prevention programs and lowers operational costs.

In general, the low-flow sampling protocol involves lowering a low-flow pump within a well to be placed at a depth where groundwater flows through the bedrock and is representative of groundwater quality for the area (refer to Appendix IX for detailed procedures and information regarding the low-flow sampling protocol proposed). Selection of the zone to be sampled at each well will be based on the physical and chemical data gathered from previous studies conducted. A sample will be collected from that zone after low flow purging (< one liter per minute) and the monitoring of groundwater quality parameters: temperature, pH, and conductivity indicating these parameters have stabilized. Once the low-flow sample is collected, a normal purge will be conducted as currently implemented for the Study Area and a second sample will be collected. The data for the wells tested in such a manner will be evaluated to determine a corollary between the normal flow and low-flow sampling methods and establish a criteria to evaluate data for continued use of the low-flow sample protocol. The results of this evaluation will be submitted to the NYSDEC for review and comment. Upon NYSDEC approval, the low-flow sampling protocol will be implemented for the Study Area.

The wells selected for quarterly monitoring events of the GMP, including the ROD designated Point of Compliance (POC) monitoring wells MW-1B, MW-4B, MW-11B, and MW-12B, are: MW-1A, MW-2A, MW-2B, MW-9B, MW11A, MW-12A, MW-15A, MW-16B, MW-18B, MW-19A, and MW-20A. Monitoring wells designated with an "A" are in the overburden, while monitoring wells with a "B" are lower level bedrock wells. In April of each year, wells #12, #20, #25, #35, #36, MW-3A, MW-3B, MW-4A, MW-5A, MW-5B, MW-6A, MW-6B, MW-7B, MW-8B, MW-13A, MW-13B, MW-14A, MW-14B, and MW-16A will also be included with the wells monitored quarterly. This will provide an annual event to detail the Study Area conditions over time. This GMP may be modified in writing to NYSDEC to allow for adjustments in well locations and/or types at analysis. Approval by NYSDEC of any modifications to the monitoring plan will be requested prior to implementing a change.

Quarterly Progress Reports (Update Reports) will be submitted to the appropriate parties regarding OU-I items as per the Order on Consent. Additionally, reporting on a quarterly basis for the first two years of P&T and DPE System operation is required, after which an annual report will be submitted as required in the Order on Consent.

5.3 P&T System Maintenance

Routine maintenance for the P&T System will be on an as needed basis, which will be dictated by the above operation parameters discussed in Section 5.1. Typical maintenance items may include, but are not limited to:

- Bag filters change out
- Air stripper cleaning
- Recovery well rehabilitation
- Carbon vessel backwash

During normal operations, the bag filters will become loaded with sediment and will need to be changed. It is anticipated that the bag-filters will need to be changed frequently (daily to 2-3 times per week) during the initial start-up. Once the system has stabilized, the frequency of bag filter change-outs will diminish. During normal operations, the pre and post bag filters pressure gauges will not register a pressure reading. Once a 2 psi differential between the pre and post-bag filters pressure gauges is observed, the bag filters will be replaced. During servicing, the flow of water will be set to bypass the bas filter assembly. The bags removed will be placed in a 55-gallon drum for proper disposal. It is estimated that it will take an employee 10-15 minutes to change the bag filters.

The air stripper maintenance (cleaning) schedule will be determined, as system operation proceeds and routine maintenance needs become apparent. The determining factor which indicates that an air stripper may need cleaning is a decrease in air flow rate from the design specification, thus diminishing the removal efficiency. This occurs when the flow of air to the stripper decreases due to increased back-pressure. The main cause of increased back-pressure is the clogging of the air stripper trays. This is the result of sediment settling out on the trays (most of which should be captured by the bag filters), iron precipitate fouling, or biological fouling.

An indication that the air stripper requires cleaning will be when the back pressure of air flow into the stripper increases 20% from its start up (clean) condition. To confirm that the trays are fouled, an internal inspection via the ports on the air strippers will be performed. Before opening the ports, the stripper to be inspected will be isolated from the treatment train and the power to its equipment will be locked-out. Once this safety process is complete, employees will look in the ports with a flashlight to inspect the trays for fouling and sediment.

If cleaning of the air strippers is needed, the air strippers will be taken apart to power wash the individual trays. Both the P&T and DPE Systems will be temporarily shutdown during tray-cleaning operations. A minimum of two people will be employed to dismantle and move the trays. It is estimated that cleaning each air-stripper tower will take 4-5 hours per stripper. Prior to reassembling the strippers once clean, the foam gaskets between the trays will be inspected for integrity and be replaced if needed. Once the trays are reassembled, the clamp rods will be tightened as needed to prevent leaks. Fluids generated during the cleaning process will be properly disposed.

Back-washing of the carbon units and recovery well rehabilitation will be performed on an as-necessary basis and may never be needed.

5.4 DPE System Maintenance

Routine maintenance for the DPE System will be on an as needed and scheduled basis, which will be dictated by the above operation parameters discussed in Section 5.1. Typical maintenance items may include, but are not limited to:

- Dekker VMAX vacuum pump.
  - Check seal fluid-level in reservoir every 1,000 hours or approximately one and one-half months of operation. A high fluid level may indicate a building up of water within reservoir, which should be drained.
  - Seal fluid strainer in the fluid line should be cleaned after the first 50 hours of operation and subsequently checked/cleaned every 1,000 to 3,000 hours (approximately one and one-half to 4 months). If an excessive temperature (above 185°F) for the oil discharge is noted, the strainer should be checked/cleaned.
  - Seal fluid change every 10,000 hours of normal operation or approximately once a year with factory certified synthetic oil. Under extreme conditions, the seal fluid should be changed more frequently.
  - Bearings require re-greasing every 3,000 hours or approximately four months of operation with high temperature lithium based grease of #2 consistency (typically Texaco Premium RB and Chevron SR1 #2).
  - Filter elements for air dilution inlet and for soil vapor inlet should be cleaned or replaced every 1,000 to 3,000 hours (approximately one and one-half to 4 months). If an excessive pressure drop is noticed, these filters should be checked.
- Moyono transfer pump.
  - Packing lubrication should be performed on a weekly basis with grease, typically, MPG-2.Multi-Purpose Grease (DuBrois Chemical) or equivalent.
  - Bag Filter should be changed when pressure gauge before filters reads above 35 psi.
  - The strainer between the water knockout tank and the transfer pump should be cleaned when a noticeable decrease in flow rate has occurred (normal flow rate when transfer pump is running is approximately 12 gpm).

5.5 Reporting

In accordance with the Order on Consent, a report will be prepared to document the operating results and data received for each calendar quarter. This report will be submitted to NYSDEC summarizing the data that has been received to that date and will discuss the operations of the system.

APPENDIX I

SOIL BORING/WELL LOGS

Log of Boring: MW-15B (RW-1)
Date: 01/26/01
Date(s) Drilled: 10/26,11/11,11/12,12/18,12/19/00
Boring Depth: 300'
Boring Diameter: 14"/10"
First Water Depth: 28'/60'
Bedrock Depth: 40'
Elevation: NA
Number of Samples: None collected
Logged By: AJA

Client: Sequa Corporation
Project Name: Former Chromalloy Facility
Project Number: 1166
Location: West Nyack, NY

Driller: Samuel Stothoff Co., Inc.
Drill Rig: Ingersoll-Rand T4W
Drill Method: Wet rotary air hammer
Sampling Method: None
Page: 1 of 4

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
0							Ground Surface			
0–2							0'-0.25' Grass, roots and topsoil.			
2–8							0.25'-8' Red brown medium to coarse sand and gravel, some silty clay, damp.			Note: borehole cave-in at 38'. Drive temporary steel casing (14" diam.) to 40'.
8–16							8'-16' Red brown silty clay, some fine to coarse sand, moist.			
16–27							16'-27' Red brown silty fine sand, rock fragments, firm, dry.			Set permanent steel casing (10" diam.) to 59', cement/ bentonite grout annulus via tremie pipe.
27–33							27'-33' Red brown coarse sand and gravel, interbedded silt/clay, moist to wet, hard.			
33–36							33'-36' As above, less silt and clay, wet, softer.			Note: open borehole obstructed by cave-in at various depths. Drive 8" diam. steel casing and slotted casing to 168' to keep borehole open.
36–40							36'-40' Dark red brown weathered rock, some large gravel and coarse sand, wet, very hard.			
40–50							40'-50' Red brown weathered bedrock, sandy.			
50–59							50'-59' Red brown sandstone, soft to firm.			Slotted casing is at 84'-126' and 147'-168'. 8" casing is welded at top of 10" casing.
59–63							59'-63' Red brown fine sandstone and large fracture zone.			
63–70							63'-70' As above, some fracturing, coarse grained.			
70–75							70'-75' Interbedded sandstone/shale.			
76										

Log of Boring: MW-15B (RW-1)

Date: 01/26/01
Date(s) Drilled: 10/26,11/11,11/12,12/18,12/19/00
Boring Depth: 300'
Boring Diameter: 14"/10"
First Water Depth: 28'/60'
Bedrock Depth: 40'
Elevation: NA
Number of Samples: None collected
Logged By: AJA

Client: Sequa Corporation
Project Name: Former Chromalloy Facility
Project Number: 1166
Location: West Nyack, NY

Driller: Samuel Stothoff Co., Inc.
Drill Rig: Ingersoll-Rand T4W
Drill Method: Wet rotary air hammer
Sampling Method: None

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
77, 79, 81							75'-81' As above, sandstone medium to coarse grained.			
81, 83							81'-84' As above, harder.			
85, 87, 89							84'-90' As above, softer.			
91, 93							90'-93' Red brown sandstone.			
95, 97, 99, 101							93'-102' As above, fracture zone.			
103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127							102'-127' Red brown sandstone.			
129, 131, 133							127'-133' As above, fracture zone.			
135, 137, 139, 141, 143, 145							133'-146' Red brown sandstone, soft.			
147, 149, 151							146'-148' As above, fracture zone.			

Log of Boring: MW-15B (RW-1)
Date: 01/26/01
Date(s) Drilled: 10/26,11/11,11/12,12/18,12/19/00
Boring Depth: 300'
Boring Diameter: 14"/10"
First Water Depth: 28'/60'
Bedrock Depth: 40'
Elevation: NA
Number of Samples: None collected
Logged By: AJA

Client: Sequa Corporation
Project Name: Former Chromalloy Facility
Project Number: 1166
Location: West Nyack, NY

Driller: Samuel Stothoff Co., Inc.
Drill Rig: Ingersoll-Rand T4W
Drill Method: Wet rotary air hammer
Sampling Method: None
Page: 3 of 4

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
153 155 157 159 161 163 165 167 169							148'-170' Red brown sandstone.			
171 173 175 177 179							170'-179' As above, fracture zone.			
181 183 185 187 189							179'-190' Red brown sandstone.			
191 193 195 197 199 201 203 205 207 209 211 213 215 217 219 221 223 225 227							190'-235' Gray sandstone with siltstone interbeds.			

Log of Boring: MW-15B (RW-1)
Date: 01/26/01
Date(s) Drilled: 10/26,11/11,11/12,12/18,12/19/00
Boring Depth: 300'
Boring Diameter: 14"/10"
First Water Depth: 28'/60'
Bedrock Depth: 40'
Elevation: NA
Number of Samples: None collected
Logged By: AJA

Client: Sequa Corporation
Project Name: Former Chromalloy Facility
Project Number: 1166
Location: West Nyack, NY

Driller: Samuel Stothoff Co., Inc.
Drill Rig: Ingersoll-Rand T4W
Drill Method: Wet rotary air hammer
Sampling Method: None

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
228–235										
235–240							235'-240' As above, fracture zone.			
240–290							240'-290' Gray sandstone, some shale/siltstone interbeds.			
290–300							290'-300' Gray shale/siltstone.			
							End of Boring			

Depth scale: 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282, 284, 286, 288, 290, 292, 294, 296, 298, 300, 302

BORING / WELL LOG

CLIENT: Sequa
PROJECT NAME: Former Chromalloy Facility
PROJECT NUMBER: 1166
LOCATION: 169 Western Highway West Nyack, New York
DATE: 10/13/98

BORING NUMBER: DP-1
BEDROCK DEPTH: Not Encountered
BORING DEPTH: 25 feet
BORING DIAMETER: 6 5/8"
TOC ELEVATION: NA
NO. OF SAMPLES: 9 Collected

DRILLER: Soil Testing Inc.
DRILL RIG: Diedrich D-120
DRILL METHOD: Hollow Stem Auger
DATE(S) DRILLED: 10/13/98
LOGGED BY: DOUG Bower
FIRST WATER DEPTH: 23.5 feet

ANNULUS COMPLETION: Set screen 3 to 25 feet (20 slot); casing 0 to 3 feet (4inch schedule 40 PVC)
Annulus: #1 sand 2.5 to 25 feet; bentonite 1.5 to 2.5 feet; cement1.5 grade.

**********SAMPLES********** Note: Spoon sample sub-intervals within lithology description measured from top of recovered sample.

Spoon Interval	Recovery	Blow Count	Time	Lithological Description	Comments
				0 to 5 feet- Reddish brown clay with rock fragments and pebbles, minor fine sand (fill) dry; no odor; hand auger at 2.5 feet; a lot of trash and debris.	Background: 0.0 PID
5'-7'	12"	2-8-10-10	11:15	5 to 7 feet- Red brown fine grained sandy clay with minor rock fragments; dry, no odor.	0.0 PID units
				7 to 9 feet- No recovery	
9'-11'	24"	22-28-32-37	11:23	9 to 11 feet- Red brown clayey silt with minor fine to medium sand and few rock fragments; dry; no odor. Collected sample at 22 inches.	0.0 PID units
11'-13'	6"	33-50/6	11:30	11 to 13 feet- Red brown clayey silt with fine to medium sand and red sandstone fragments; dry; no odor.	0.0 PID units
13'-15'	18"	13-30-30-32	11:45	13 to 15- Firm red brown clay with pockets of medium to coarse sand and red sandstone fragments; dry; no odor. Black staining (9 to 15 inches), took sample at 14 to 15 inches; headspace reading 13.9 PID	0.0 PID units
15'-17'	16"	18-27-32-35	12:00	15 to 17 feet- At 7" same as above, without staining. At 9" - red brown clayey silt with fine sand and sandstone fragments; dry; no odor.	0.0 PID units
17'-19'	10"	50/6	12:05	17 to 19 feet- Stiff red brown silt with fine sand and some clay; minor red sandstone fragments; dry; no odor.	0.0 PID units
19'-21'	22"	17-30-41-45	12:20	19 to 21 feet- Same as above with pockets of light grey fine sand; no visible staining; dry; no odor. Collected sample at 15".	55.8 screening / 86.9 headspace at 17 inches.
21'-23'	22"	35-50/4	12:25	21 to 23 feet- Same as above. Collected sample at 15 inches.	72.8 screening / 89.3 headspace at 15 inches
23.5'-25.5'	9"	50/5	12:40	23.5 to 25.5 feet- Red brown and grey medium to coarse sand with red sandstone fragments; wet; no odor; refusal at 25.5 feet; Collected sample at 9 inches.	

BORING / WELL LOG

CLIENT: Sequa
PROJECT NAME: Former Chromalloy Facility
PROJECT NUMBER: 1166
LOCATION: 169 Western Highway West Nyack, New York
DATE: 10/14/98

BORING NUMBER: DP-2
BEDROCK DEPTH: 39.5 feet
BORING DEPTH: 40.5 feet
BORING DIAMETER: 4 1/4"
TOC ELEVATION: NA
NO. OF SAMPLES: 6 Collected

DRILLER: Soil Testing Inc.
DRILL RIG: Diedrich D-120
DRILL METHOD: Hollow Stem Auger
DATE(S) DRILLED: 10/14/98
LOGGED BY: Doug Bower
FIRST WATER DEPTH: ~5 feet

ANNULUS COMPLETION: Set DP-2 at 39.5 feet: screen 39.5 to 9.5 (2 inch schedule 40 PVC;10 slot) casing 9.5 to 0 feet (2 inch schedule 40 PVC). Annulus: #1 sand 39.5 to 7 feet; bentonite 7 to 2 feet cement 2 to 0 feet.

**********SAMPLES********** Note: Spoon sample sub-intervals within lithology description measured from top of recovered sample.

Spoon Interval	Recovery	Blow Count	Time	Lithological Description	Comments
				0 to 7 feet- Dark brown and red brown gravel and cobbles with clayey coarse sand matrix; wet at 5 feet; no odor.	Background 0.0 PID 0.0 PID units
				7 to 10 feet- Red brown clay with some fine sand gravel; wet; no odor.	0.0 PID units
15'-17'	20"	38-21-15-100/4	15:10	15 to 17 feet Red brown stiff clay with pockets of light grey fine sand and some red sandstone fragments; dry; no odor. Collected sample at 5".	0.0 PID units (sample headspace)
				17 to 23 feet- Same as above; increasing sand and gravel content with depth.	0.0 PID units
				23 to 25 feet- Gravel and red sandstone fragments with red brown sand/clay matrix dry; no odor.	0.0 PID units
25'-27'	6"	100/6	15:30	25 to 27 feet- Red brown coarse sand with some gravel and red sandstone fragments; wet; no odor.	8.7 screening / 19.3 headspace at 4 inches.
30'-32'	5"	100/5	15:45	30 to 32 feet- Same as above. Collected sample at 3 to 4 inches.	19.0 screening / 10.7 headspace at 5 inches
35'-37'	9"	38-100/3	16:00	35 to 37 feet- Red brown stiff clay with red sandstone fragments; pocket of light Grey fine sand at 8 inches; dry; no odor.	38.1 screening / 8.4 headspace at 6 inches.
38'-40'	6"	100/6	16:10	38 to 39.5 feet- Reddish brown fine sandy silt; brittle; dry; bottom 2 inches is weathered red sandstone; no odor. Collected sample at 5 inches.	19.4 screening / 5.7 headspace at 5 inches.
39.5-41.5'	6"	100/6	16:30	39.5 to 40 feet- Same as above. Collected sample at 3 to 4 inches. Auger refusal at 40.5	180 screening / 129 headspace at 3 inches.

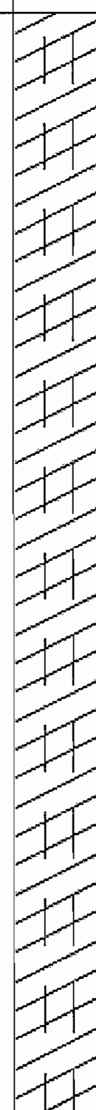
Log of Boring: DP-3
Date: 02/06/02
Date(s) Drilled: 09/26/01
Boring Depth: 21'
Boring Diameter: 0.66'
First Water Depth: 12'
Bedrock Depth: NA
Elevation: NA
Number of Samples: None collected
Logged By: AJA

Client: Sequa
Project Name: Sequa - Former Chromalloy
Project Number: 1166
Location: 169 Western Highway
West Nyack, New York
Driller: Talon Drilling
Drill Rig: Mobile Drill B-59
Drill Method: Hollow stem auger
Sampling Method: Split spoon

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
							Ground Surface			
0–2	1	0-2	16"	12-12-4-3	1104	0.0	Brown to olive gray fine sandy silt & clay, small grained, soft, moist (Top 2" gravel with fines fill).			Ambient air 0.0 PID units.
2–5						0.0	Gray-olive fines with gravel, moist.			
5–6.5							As, above, more gravel (1" diameter).			
6.5–8							Light brown fines, sand & clay with small gravel (<1/2").			
8–10.5						0.0	Auger refusal - offset 3' east. Gray fines (sandy silt & clay) with gravel (<1" diameter, moist, mostly gravel).			
10.5–12							Auger refusal - offset 3' east. Red sandy silty clay with gravel.			
12–14							As above, less gravel, saturated.			
14–16							As above, no gravel, saturated.			
16–18							Same as above.			
18–20							Same as above.			
20–22						0.0	Same as above.			
							End of Boring			

Log of Boring: DP-4
Date: 02/06/02
Date(s) Drilled: 02/04/02
Boring Depth: 36.5'
Boring Diameter: 0.66'
First Water Depth: 10'
Bedrock Depth: NA
Elevation: NA
Number of Samples: None collected
Logged By: AJA

Client: Sequa
Project Name: Sequa - Former Chromalloy
Project Number: 1166
Location: 169 Western Highway
West Nyack, New York
Driller: Talon Drilling
Drill Rig: Reich Drill T-650
Drill Method: Air rotary
Sampling Method: None used
Page: 1 of 1

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
						Ground Surface			
0						Red brown silty clay with some sand layers and rock fragments mixed in - observed gravel at 8'. Firm with depth. Moist to wet at 10'.			Ambient air 0.0 PID units.
10					110				
18					1.5				Ambient air 0.5 PID units.
36.5						End of Boring			

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38

Environmental Alliance, Inc. Filename: 1166/DP-4

Log of Boring: DP-18
Date: 02/06/02
Date(s) Drilled: 02/04/02
Boring Depth: 31'
Boring Diameter: 0.66'
First Water Depth: 7'
Bedrock Depth: NA
Elevation: NA
Number of Samples: None collected
Logged By: AJA

Client: Sequa
Project Name: Sequa - Former Chromalloy
Project Number: 1166
Location: 169 Western Highway
West Nyack, New York
Driller: Talon Drilling
Drill Rig: Reich Drill T-650
Drill Method: Air rotary
Sampling Method: None used
Page: 1 of 1

Depth (feet bgs)	Lithological Description	Comments
0	Ground Surface	
0–5	Brown to red brown fine sandy silty clay, damp, fill.	Ambient air 0.0 PID units.
5–7	Boulder.	
7–12	Red brown fine sandy silty clay, moist to wet.	
12–18	As above with rock fragments, damp.	
18–21	Sandy silt, some clay, dry to damp, firm.	Ambient air 1.2 PID units.
21–31	As above with gravel and rock fragments, firm.	
31	End of Boring	

Environmental Alliance, Inc. Filename: 1166/DP-18

Log of Boring: DP-19

Date: 02/06/02
Date(s) Drilled: 02/04/02
Boring Depth: 30'
Boring Diameter: 0.66'
First Water Depth: 8'
Bedrock Depth: NA
Elevation: NA
Number of Samples: None collected
Logged By: AJA

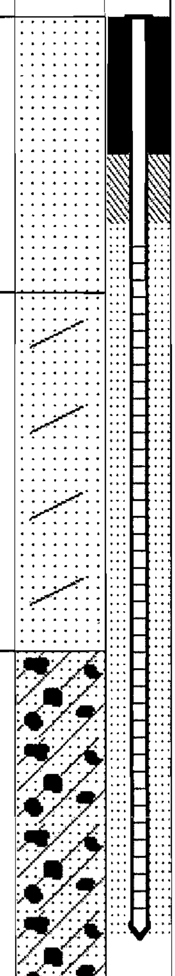
Client: Sequa
Project Name: Sequa - Former Chromalloy
Project Number: 1166
Location: 169 Western Highway
West Nyack, New York
Driller: Talon Drilling
Drill Rig: Reich Drill T-650
Drill Method: Air rotary
Sampling Method: None used
Page: 1 of 1

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
						Ground Surface			
0						Brown to red brown silty sandy clay with gravel, damp, fill.			
8						Red brown silty clay, some sand and gravel, moist to wet, stiff.			Ambient air 0.0 PID units.
18						As above, firm, dry.			
23						Red brown sandy gravel with some silt and clay, firm, dry.			
30						End of Boring			

Log of Boring: DP-20
Date: 02/06/02
Date(s) Drilled: 02/04/02
Boring Depth: 21'
Boring Diameter: 0.66'
First Water Depth: 9'
Bedrock Depth: NA
Elevation: NA
Number of Samples: None collected
Logged By: AJA

Client: Sequa
Project Name: Sequa - Former Chromalloy
Project Number: 1166
Location: 169 Western Highway
West Nyack, New York
Driller: Talon Drilling
Drill Rig: Reich Drill T-650
Drill Method: Air rotary
Sampling Method: None used
Page: 1 of 1

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
						Ground Surface			
0						Tan medium sand, damp, fill.			
6					106	Red brown medium sandy clay, some silt, damp to moist, moist to wet at 9'.			Ambient air 7.6 PID units.
14						As above with gravel mixed in at 15' and rock fragments mixed in at 18', firm.			Ambient air 1.7 PID units.
21						End of Boring			



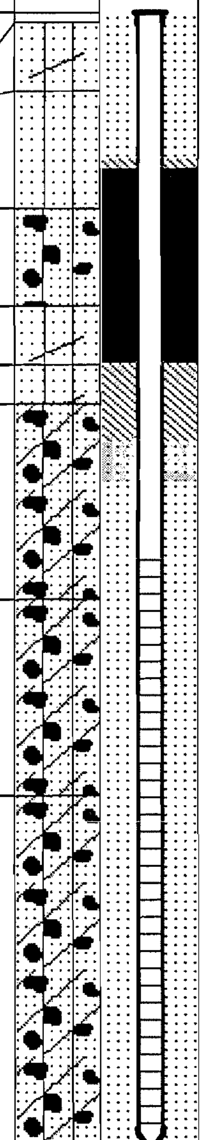
Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24

Log of Boring: DP-21

Date: 02/06/02
Date(s) Drilled: 09/26/01 - 09/27/01
Boring Depth: 29'
Boring Diameter: 0.66'
First Water Depth: NA
Bedrock Depth: NA
Elevation: NA
Number of Samples: None collected
Logged By: AJA

Client: Sequa
Project Name: Sequa - Former Chromalloy
Project Number: 1166
Location: 169 Western Highway
West Nyack, New York
Driller: Talon Drilling
Drill Rig: Mobile Drill B-59
Drill Method: Hollow stem auger
Sampling Method: Split spoon
Page: 1 of 1

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
0					1645		Ground Surface Grass, roots, soil.			Ambient air 0.0 PID units.
							Brown sandy silt with clay.			
2							Gray sandy silt, moist to wet at 4'.			
4–6						2.3	As above, some gravel, saturated.			
8							Red brown sandy silty clay, moist.			
10						467 to 14.8	Hard drilling.			
12–14						1.3 2.1 0.0	Red brown clay with silt, sand & gravel, rock fragments, dry, very hard.			
16–18					09/27	0.0 3.4 to 0.6	Same as above.			
20–28						1.3	Same as above, more sandy.			
							End of Boring			



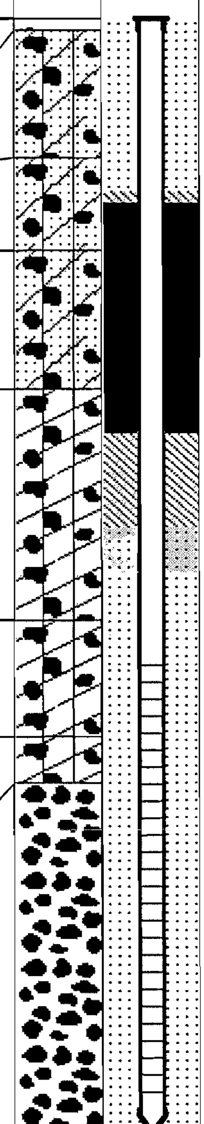
Environmental Alliance, Inc.

Filename: 1166/DP-21

Log of Boring: DP-22
Date: 02/06/02
Date(s) Drilled: 09/27/01
Boring Depth: 24'
Boring Diameter: 0.66'
First Water Depth: NA
Bedrock Depth: NA
Elevation: NA
Number of Samples: None collected
Logged By: AJA

Client: Sequa
Project Name: Sequa - Former Chromalloy
Project Number: 1166
Location: 169 Western Highway
West Nyack, New York
Driller: Talon Drilling
Drill Rig: Mobile Drill B-59
Drill Method: Hollow stem auger
Sampling Method: Split spoon

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
0					1145		Ground Surface			
0–1							Grass, roots, soil.			Ambient air 0.0 PID units.
1–3							Fines (brown clay with sand & silt mixed with cobbles, gravel & concrete).			
3–5							Same as above.			
5–8						0.3	Red brown clay, some silt & sand, weathered rock fragments, moist.			
8–13						2.1	Red brown clay & silt, fine dry powder with some rock fragments.			
13–15.5							Same as above - becomes damp, harder drilling, larger pieces of gravel.			
15.5–17						0.0	Same as above, finer red brown silt & clay.			
17–24							Chunkier red brown fines, gravel & weathered rock.			
24							End of Boring			



Environmental Alliance, Inc.

Filename: 1166/DP-22

APPENDIX II
FINAL APPROVED TOWNSHIP PLANS

TOWN OF CLARKSTOWN * OFFICE OF THE BUILDING INSPECTOR
10 MAPLE AVE. * NEW CITY, NY 10956 * (845) 639-2100

APPLICATION FOR BUILDING * OCCUPANCY * DEMOLITION PERMIT

(Applicant to complete numbered items)

1. TAX MAP 88 / 65.13
BLOCK A / 2
LOT 17 / 11

ZONING DISTRICT M

PERMIT NO. BADD 01-1432
FEE (C.O FEE INCL.) $ 428.00
RENEWED

RECEIVED
NOV 16 2001
OFFICE OF THE BUILDING INSPECTOR
TOWN OF CLARKSTOWN

JOB COPY
BUILDING INSPECTOR
TOWN OF CLARKSTOWN

VERIFIED BY ASSESSORS OFFICE:
DATE 11/19/01 BY LG

RECEIVED BY:

2. DATE Nov. 9, 2001

3. LOCATION: NO. 169 STREET: Western Highway HAMLET: West Nyack
OR SUBDIVISION/SITE Bradley Corporate Park sec.: 88 block: A lot: 17
PROJECT NAME: Former Chromalloy - Remedial Action NYSDEC Site #344039 Record of Decision 3/31/99

4. NAME AND ADDRESS OF:
OWNER: John Magee, Bradley Corp. Park 500 Bradley Hill Road, Blauvelt, NY TEL NO.: 845-358-7300
LESSEE: Sequa Corporation, 3 University Plaza, Hackensack, NJ 07601 TEL NO.:
AGENT OF OWNER/LESSEE Environmental Alliance, Inc, 1812 Newport Gap Pike Wilmington, DE 19808 TEL. NO.: 302-995-7544

IF A CORPORATION - RESPONSIBLE OFFICER FOR:
OWNER: John Magee TEL. NO.: 845-358-7300
LESSEE. TEL NO.:
AGENT OF OWNER/LESSEE: William Smith TEL. NO.: 302-995-7544

5. ESTIMATED CONSTRUCTION VALUE $ 30,000.00

6. EXISTING AND/OR PROPOSED USE OF STRUCTURE OR LAND: Existing manufacturing and warehouse facility. No change in site uses. Proposed 500 S.F. building addition to house remediation system.

7. DESCRIBE BRIEFLY THE NATURE OF THE PROPOSED WORK OR USE: A 500 S.F. Block building addition shall be constructed on an existing concrete pad that was previously part of the existing building (See attached P.E. certification letter for pad viability). Building will be unoccupied and will contain pumps, motors & carbon filters in a non-explosive environment. (complete reverse side) Constructed per NYSDEC Order on Consent.

OFFICIAL USE ONLY

PERMIT GRANTED FOR: Construct 500 SF Bldg for Remediation Equipment per ~~DE~~ NYSDEC ~~Consent Order~~.

SEE FIRE INSPECTOR'S REQUIREMENT SHEET

DATE: 11/27/01 BUILDING INSPECTOR: Charles Maner

THIS PERMIT EXPIRES 18 MONTHS AFTER DATE OF ISSUANCE

8. BULK

col 1 ZONE M 2 GROUP 3 USE

		REQUIRED	EXISTING	PROPOSED
4	Floor area ratio	50% max	24.6 %	24.8 %
5	Lot area	60,000 SF.	6.58 acres	No Change
6	Lot Width	150 ft		No change
7	Front yard depth	50 ft		No Change *
8	Side yard width	50 ft		No Change *
9	Total width both side yards	125 ft		No Change *
10	Rear yard depth	50 ft.		No change *
11	Maximum building height in feet and inches per foot of distance from lot line			No Change

* Building to be constructed on existing concrete pad. Existing lot depths may not meet setbacks -

9. SIZE OF BUILDING

	EXISTING	PROPOSED	COMPLETED
Square feet floor area	60,475	500	60,975
Front in feet			No change in Footprint
Rear in feet			No Change in Footprint
Maximum depth in feet			No Change in Footprint.
Number of stories	1/2	1	1 (Industrial Manufacturing), 2 (warehouse), 1 (addition)

10. Name and address of person(s) responsible for the supervision of the work performed pursuant to the State Uniform Code and the Clarkstown Zoning Ordinance.

	NAME	ADDRESS	TEL NO.
General Contractor	Currently out to Bid		
Registered Architect			
Professional Engineer	Paul Miller, P.E.	1812 Newport Gap Pike, Wilmington DE 19808	302 995 7544
Builder	Currently OUT TO BID		
Rockland County Home Improvement License #	PENDING DUE TO [redacted] BIDS		
Workman's Compensation Carrier			
Rockland County Plumbing, Heating, A/C License #	PENDING DUE TO BIDS.		

11. Affidavit

Town of Clarkstown
County of Rockland ss:
State of New York

CARL WORTENDYKE being duly sworn, deposes and says:
(PRINT NAME) (owner, lessee, or agent of the owner/lessee) (circle one)

that JOHN MAGEE is the owner in fee of the premises to which this application applies, that he (the applicant) is duly authorized to make this application, and that the statements contained here are true to the best of his knowledge and belief, and that the work will be performed in the manner set forth in the application and in the plans and specifications filed therewith, and in accordance with the State Uniform Building Code and all other applicable laws, or ordinances and regulations of the Town of Clarkstown (I also declare the structure or area described in this application will not be occupied or used until I have obtained a Certificate of Occupancy)

Signature of Applicant

Sworn to me this 14 day of Nov. 2001

Virginia M. Higgins
Notary Public, State of New York

VIRGINIA M. HIGGINS
Notary Public State Of New York
No. 4974911
Residing in Rockland County
Commission Expires Nov. 28 2002

OFFICIAL USE ONLY

☐ Dept. of Environmental Control Approval ☐ Special Flood Hazard Area - Zone ______

SEPARATE APPLICATION FOR CERTIFICATE OF OCCUPANCY
IS REQUIRED PRIOR TO ANY USE OR OCCUPANCY

OFFICE OF THE BUILDING INSPECTOR

PETER J. BEARY
BUILDING INSPECTOR

10 MAPLE AVENUE
NEW CITY, NEW YORK 10956/5099
(845) 639-2100

MARK PAPENMEYER
CHIEF FIRE SAFETY INSPECTOR

FIRE & SAFETY REQUIREMENT
FIRE INSPECTOR
TOWN OF CLARKSTOWN

APPLICANT: ENVIROMENTAL ALLIANCE, INC.
169 WESTERN HIGHWAY
WEST NYACK, NY 10994

DATE: 11/26/01
MAP-BLOCK-LOT: 88-A-17
65.13-2-11
PERMIT #: 01-1432

The following requirements have been determined by the Fire Inspector as necessary for protection and/or safety. The equipment is to be installed in the building or premises indicated above. (Code of the Town of Clarkstown 143-37).

( ) 1. Install a complete sprinkler system throughout entire premises and to be supervised (water flow and all valves) with direct connection to Rockland County Fire Control Center (44-Control).

(**XXX**) 2. An existing sprinkler system is present in this premises. The sprinkler system must be altered at this time to provide complete protection. Have sprinkler heads and/or piping altered to reflect new work. Sprinkler system to be supervised (water flow & all valves with direct connection to Rockland County Fire Control Center (44 Control).

(**XXX**) 3. Submit plans for sprinkler system/alarm system to this office for approval prior to any work beginning.

( ) 4. Submit I.S.O. (Insurance Services Organization) approved stamp sprinkler plans prior to final inspection.

( ) 5. Install a complete fire detection system throughout with direct connection to Rockland County Fire Control Center (44-Control).

( ) 6. An existing fire detection system is present in this premises. The fire detection system must be altered at this time to provide complete protection. Have fire detection system altered to reflect new work.

(SEE OTHER SIDE)

JOB COPY
BUILDING INSPECTOR
TOWN OF CLARKSTOWN

) 7. Install manual fire alarm pull boxes with tamper covers at convenient locations near exits throughout the interior of the premises connected to the fire alarm system. AUDIBLE/VISUAL WARNING DEVICES TO BE INSTALLED CONNECTED TO EXISTING FIRE ALARM SYSTEM.

( ) 8. Install manual fire alarm pull boxes on the exterior of the building connected to the fire alarm system.

(**XXX**) 9. Install emergency lighting throughout as directed by the Fire Inspector.

(**XXX**) 10. Install proper number and type of portable fire extinguishers throughout. (Minimum of 2, 5lb. A.B.C. type).

(**XXX**) 11. No barrier, lock or fastening device may be installed on any exit door which would prevent free escape from building.

( ) 12. Install panic type hardware on all exit doors.

(**XXX**) 13. Install exit lights over all exit doors, and directional exit lights as directed by the Fire Inspector. (Must be with emergency power back up.)

) 14. Install grease filter system and fire extinguishing system in hoods. Submit plans for approval of hood and fire extinguishing system to this office PRIOR to beginning work. Fire extinguishing system to be connected into Fire Alarm System where possible.

( ) 15. Install annunciator panel to indicate location of fire alarm. Panel to be located in an easily accessible area visible to the Fire Department.

( ) 16. Install indicating lights on the exterior of the building to indicate if alarm is a manual pull box or water flow alarm.

( ) 17. Install "Knox" lock box; Information and order form to be obtained from the Fire Inspector.

ADDITIONAL REQUIREMENTS OR COMMENTS:

REV-4/92

CHIEF FIRE SAFETY
INSPECTOR

Stein Environmental Engineering
31 Concord Drive
New City, New York 10956
Tele. 845 634 3726 Fax. 845 708 9714

October 22, 2001

Mr. Andrew Applebaum
Environmental Alliance
1812 Newport Gap Pike
Wilmington, DE 19808

Floor Slab & Foundation Investigation
Alloy Tech Building - West Nyack, New York

Dear Mr. Applebaum

In accordance with your request and authorization I inspected the subject floor slab and subsoil on October 18, 2001, examined two 2" Dia. concrete cores removed from the floor slab at the locations shown on Drawing S1102201 (attached herewith), examined the soil profile in two 30" deep test pits which are also located on the attached drawing, visually classified the subsoil and load tested the soil in the test pits at a depth 30 inches below the top of the slab.

The concrete core samples measured 9" in length (thickness of the slab) and showed no sign of deterioration. The soil was granular in texture with a substantial number of stones (>1/2" in size). Soils were load tested at 2.1ton per sq. ft. (tsf) with no evidence of yield.

The layout of equipment and vessels together with the loaded weights of same provided by you on October 22, 2001 indicate a total load of 28,600 pounds exclusive of piping, and miscellaneous light supplies. The heavy equipment is skid mounted and the 9" slab can distribute the load. Allowing 15% of the 28,600 pound load for miscellaneous items, the average equipment loading on the slab = 1.15 x 28,600 / (20 x 25) = 66 pounds per square foot (psf). More concentrated loading of 2 to 3 that amount could only produce a bearing stress of 200 psf.

A live load of 100 psf together with a building and roof load of 60 psf when added to the equipment load produces a total of less than 400 psf or 0.2 tsf.

It is my conclusion and opinion that the slab and subsoil are such that they can safely bear the design loads.

Respectfully submitted,
William J. Stein
William J. Stein, P.E.
NY License No. 036025

JOB COPY
BUILDING INSPECTOR
TOWN OF CLARKSTOWN

TOWN OF CLARKSTOWN

BUILDING ZONE ORDINANCE

This PERMIT Notice

To be fastened on a part of the building for which it is issued where it may be plainly seen by all persons

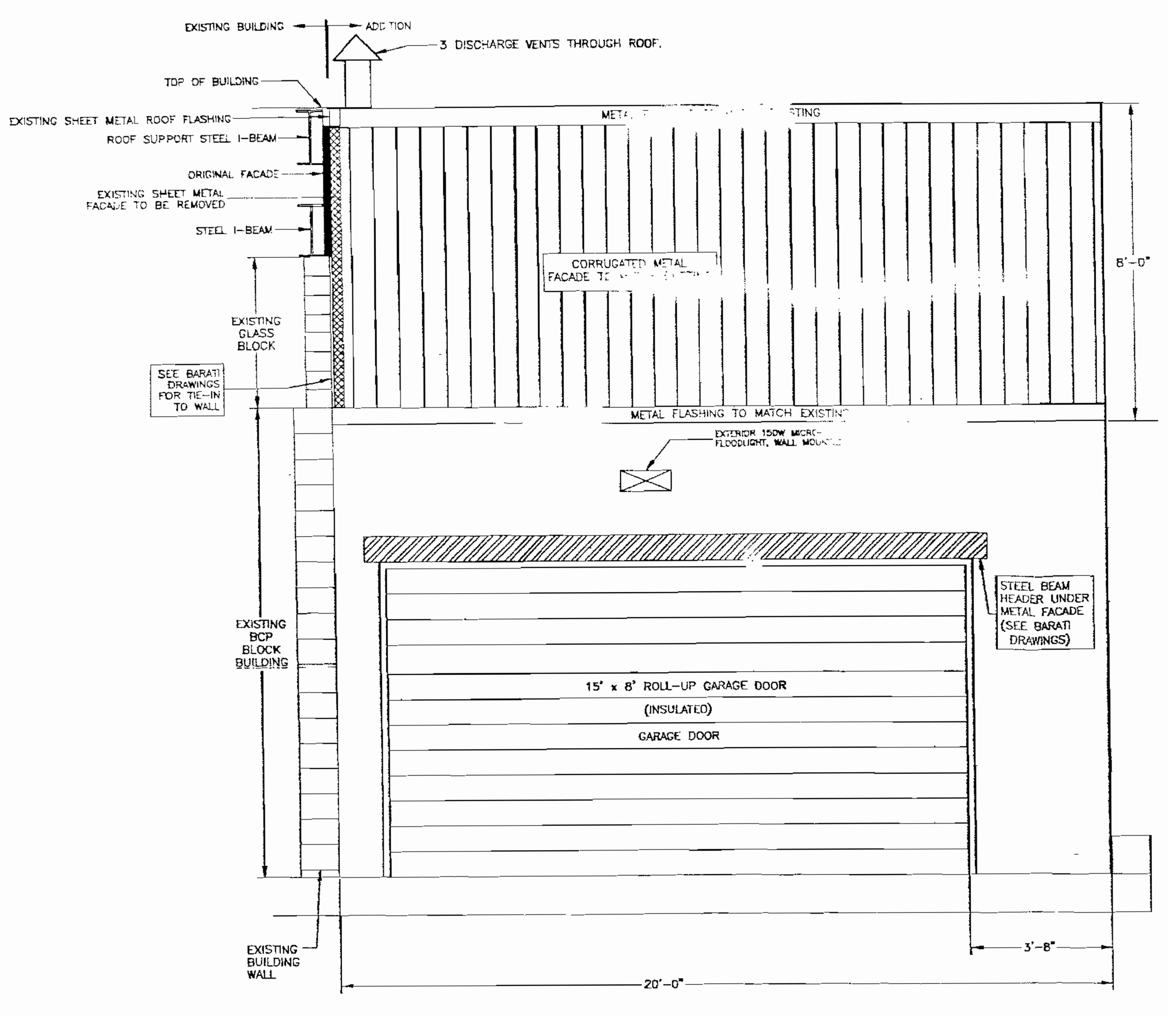
BADD

Permit No. 01-1432 has been Issued for this building

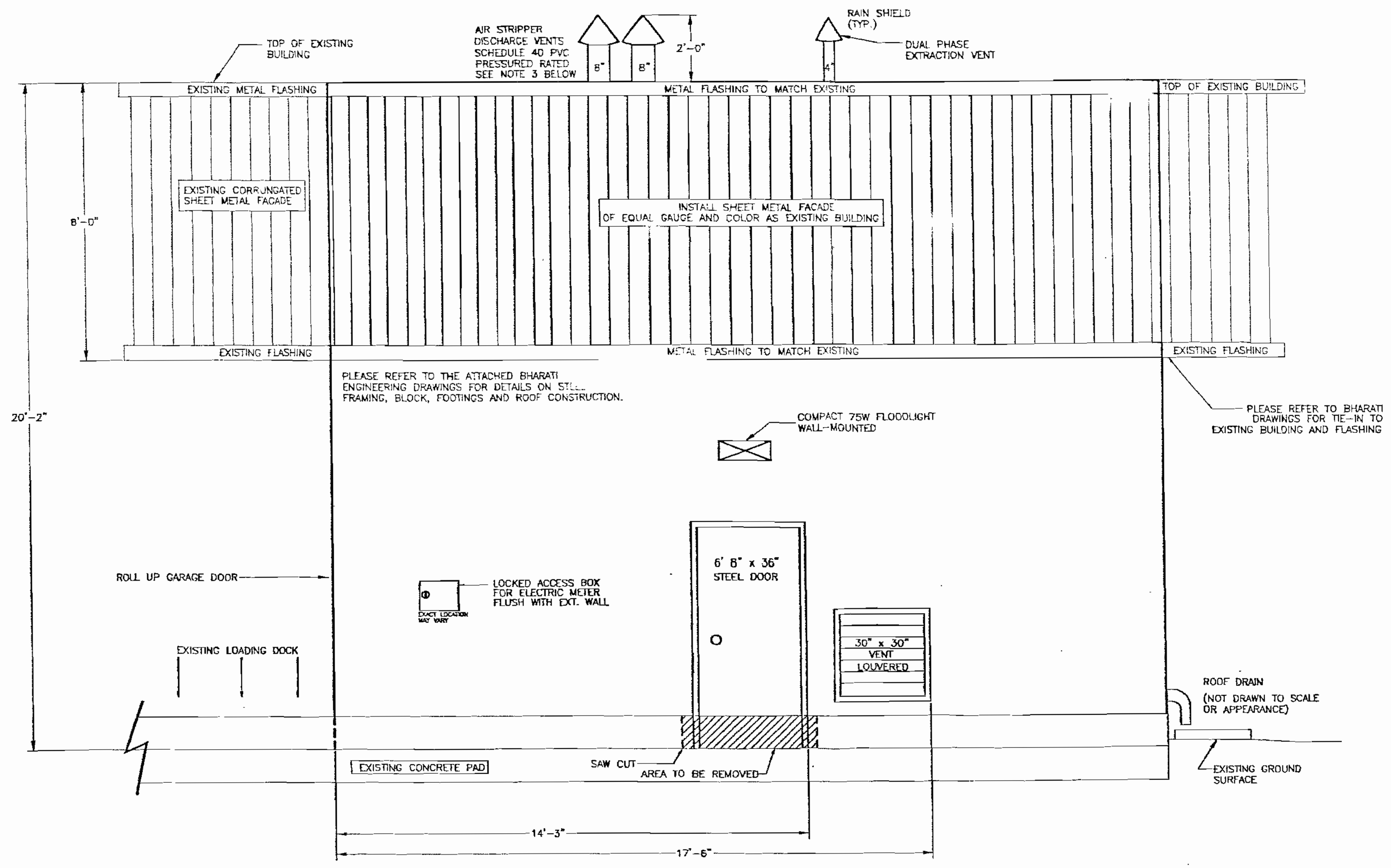
This notice shall not be removed from building to which it is attached and the building shall not be used until a Certificate of occupancy has been issued by the "Building Inspector"

Date ~~11/28~~ 11/27/01

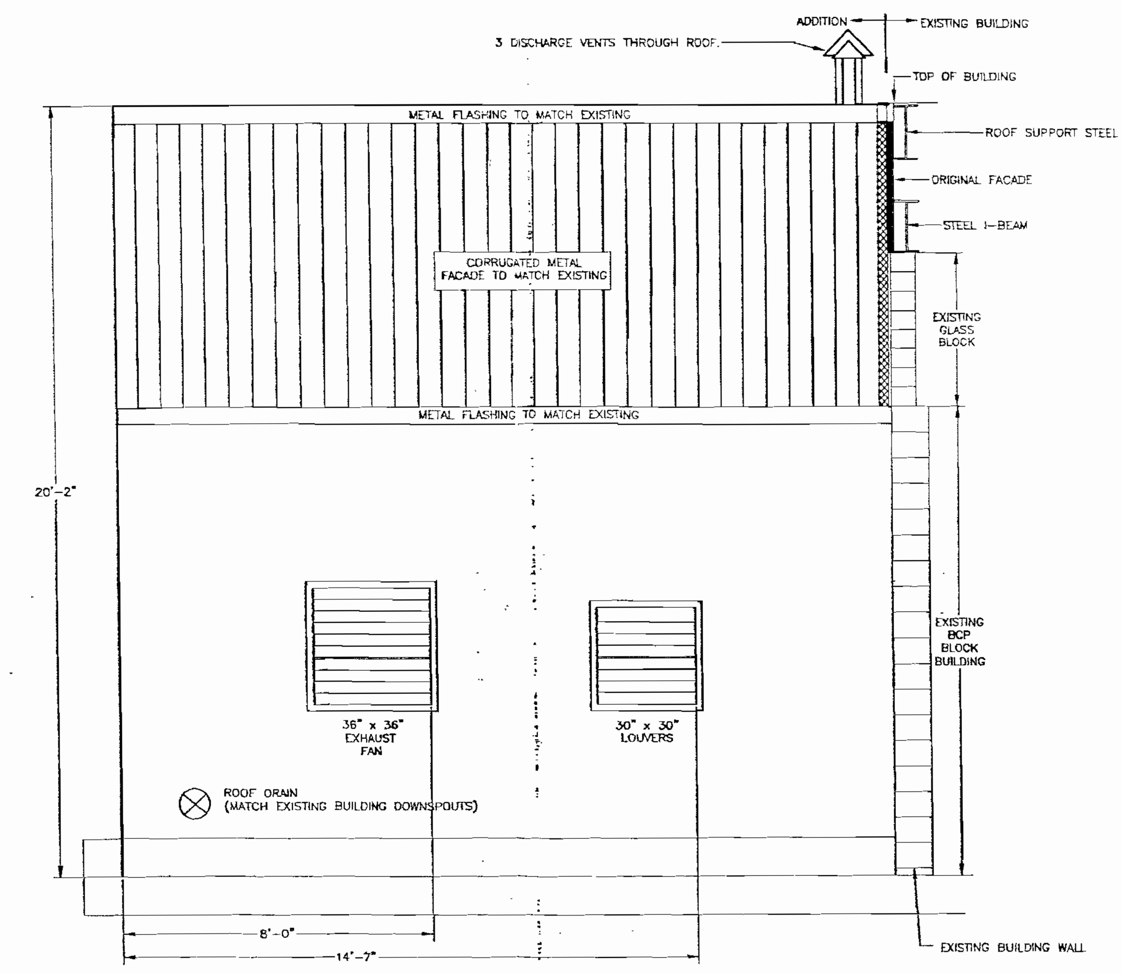
[signature]
Building Inspector



BUILDING LAYOUT–LEFT SIDE VIEW



BUILDING LAYOUT–FRONT VIEW



BUILDING LAYOUT–RIGHT SIDE VIEW

0 3' 6' 12'
APPROXIMATE SCALE

Approves the Architectural Appearance only.

GENERAL NOTES:

1. THE TREATMENT BUILDING ADDITION ROOF HEIGHT WILL BE EQUAL TO THE ROOF HEIGHT OF THE EXISTING BUILDING. & color 4/10/02 4/15/02
2. THE METAL FACADE TO BE INSTALLED AROUND THE TOP PERIMETER OF THE BUILDING ADDITION WILL MATCH IN APPEARANCE THE EXISTING BUILDING FACADE.
3. NO EXTERNAL PIPES, ELECTRIC BOXES, OR OTHER ITEMS WILL BE ATTACHED TO THE EXTERIOR OF THE TREATMENT BUILDING WALLS, EXCEPT AS SHOWN.
4. SEAL ALL JOINTS/CONNECTIONS BETWEEN EXISTING BUILDING AND THE BUILDING ADDITION.
5. EXHAUST FAN TO BE 30" DIA. ~~FAN~~, TEMPERATURE ACTUATED, PLACED IN AN APPROPRIATE HOUSING ASSEMBLY (LOUVERE & FRAME). Color 4/10/02 4/15/02
6. PAINT BUILDING WITH ~~PAINT PROVIDED~~ BY BRADLEY CORPORATE PARK.
7. BUILDING CONTRACTOR ~~TO~~ INSTALL VENTS AND RAIN SHIELDS. VENTS TO EXTEND 2' ABOVE BUILDING ROOF, PIPING TO BE STUBBED INTO BUILDING ADDITION AT LEAST 12", HAVING AN OPEN END CONNECTION AT TERMINATION WITHIN THE BUILDING
8. THE EXTERIOR LIGHTS SHALL BE PLACED ON TIMING DEVICES FOR AUTOMATIC NIGHT OPERATION. THE TIMING ~~OR PHOTO-OPTIC~~ DEVICE(S) SHALL HAVE A MANUAL SWITCH TO ENERGIZE/DE-ENERGIZE THE EXTERNAL LIGHTS AS NEEDED.
9. THE ROOF DRAIN DOWN SPOUT SHALL DISCHARGE AT THE SOUTHERN WALL ONTO A CONCRETE SPILL PLATE. & SUBMETER 4/10/02 4/15/02
10. THE WATER CONNECTION SHALL BE EXTENDED FROM THE EXISTING BUILDING, HAVING A CUT-OFF VALVE ~~PLACED ON~~ THE INSIDE OF THE EXISTING BUILDING AND A SECOND CUT-OFF VALVE PLACED IN THE TREATMENT BUILDING ADDITION. AN IN-LINE WATER METER SHALL BE PLACED IN THE WATER LINE WITHIN THE TREATMENT BUILDING ADDITION. ALLIANCE ANTICIPATES A MAXIMUM WATER USAGE OF 15,000 GALLONS PER YEAR (1,250 GAL/MONTH). THE ESTIMATED ANNUAL WATER COST IS $54 (USING CURRENT UNITED WATER, NY RATES). WATER USAGE OVER THIS ANNUAL LIMIT WILL BE SUBJECT TO BILLING BY BRADLEY CORPORATE PARK FOR THE AMOUNT USED OVER THE LIMIT AT THE UNITED WATER, NY GOING SEASONAL RATE.
11. A WASH TUB SINK THAT DISCHARGES (PUMPED) INTO THE TREATMENT SYSTEM SHALL BE INSTALLED IN THE TREATMENT BUILDING ADDITION PENDING APPROVAL BY THE NYSDEC. THE SINK SHALL BE INSTALLED IN THE MOST LOGICALLY AVAILABLE LOCATION AFTER REMEDIAL EQUIPMENT HAS BEEN INSTALLED.
12. THE SPRINKLER SYSTEM IN THE EXISTING BUILDING WILL BE EXTENDED INTO THE TREATMENT BUILDING ADDITION. THE ADDITIONAL SPRINKLER SYSTEM PIPE WILL BE BLACK IRON WITH MALLEABLE FITTINGS ONLY (NO COPPER). SPRINKLER HEAD TYPE INSTALLED IN THE TREATMENT BUILDING ADDITION WILL MATCH THE SPRINKLER HEADS IN THE EXISTING BUILDING.
13. PLEASE REFER TO THE ATTACHED BHARATI ENGINEERING DRAWINGS FOR FOR STRUCTURAL AND ROOF CONSTRUCTION DETAILS.

ENGINEER

ENVIRONMENTAL ALLIANCE
Engineering • Remediation • Consulting

JOB COPY
BUILDING INSPECTOR
TOWN OF CLARKSTOWN

These Plans Approved subject to complete Compliance with all the Requirements of the State Building Construction Code and subject to inspection at different stages of construction.
Plans examined by Ord on 5-3 20 02
Building Permit No. 01-1832 (amended)
Name of Owner Bradley Corp. Park
Date 5/3 20 02 Per Building Inspector

4/10/02
4/15/02
4-10-02

Issue Date:

No.	Date	Revisions Description
4	02/22/02	REVISED BUILDING - STEEL ROOF
3	11/09/01	BUILDING PERMIT APPLICATION
2	09/05/01	REVISED BUILDING DESIGN
1	05/10/01	BID SOLICITATION

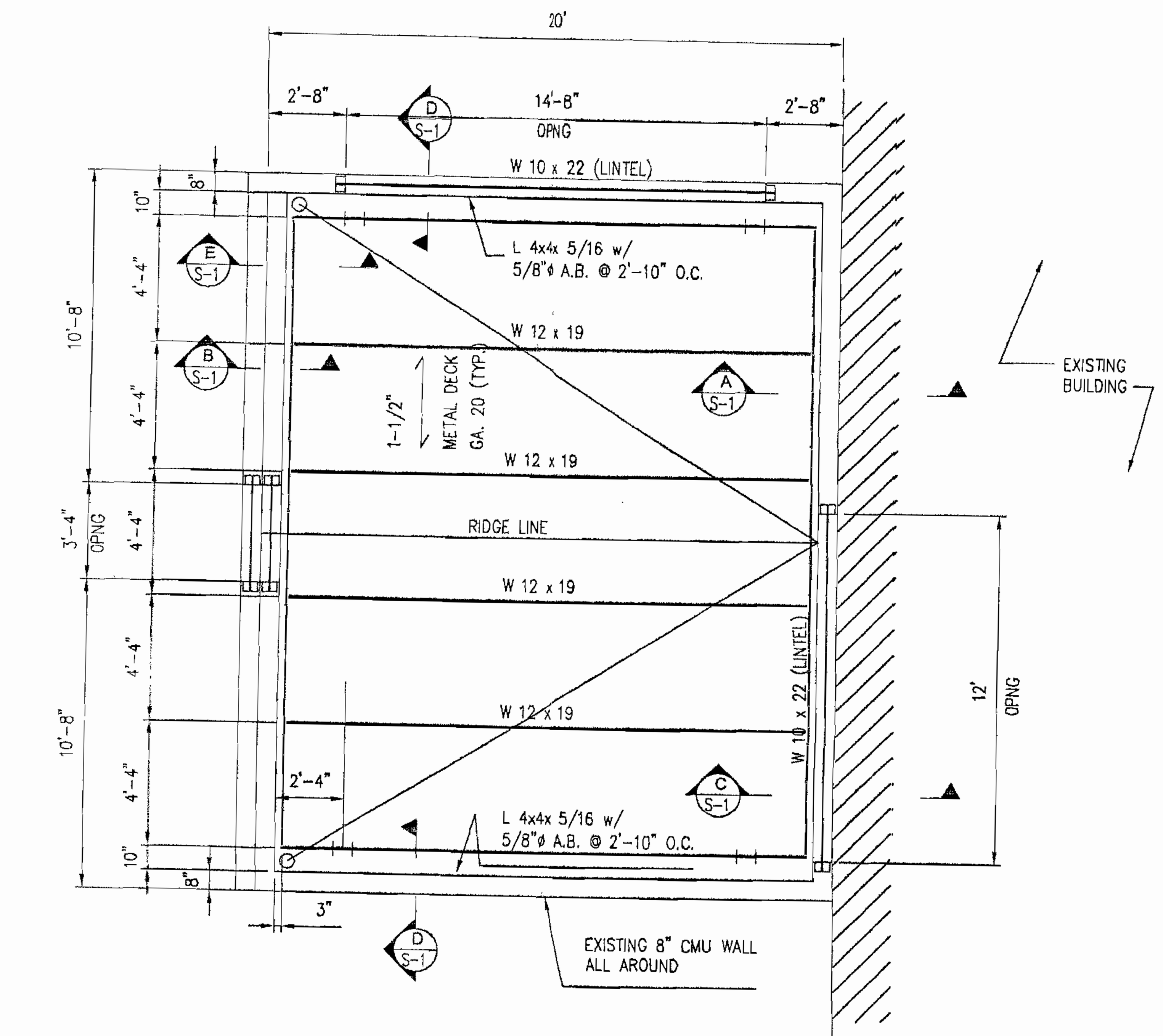
Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808
Phone: (302) 995-7544
Fax: (302) 995-0941

Project Number: 1166
Drawn By: AGG
Designed By: ALM
Checked By:

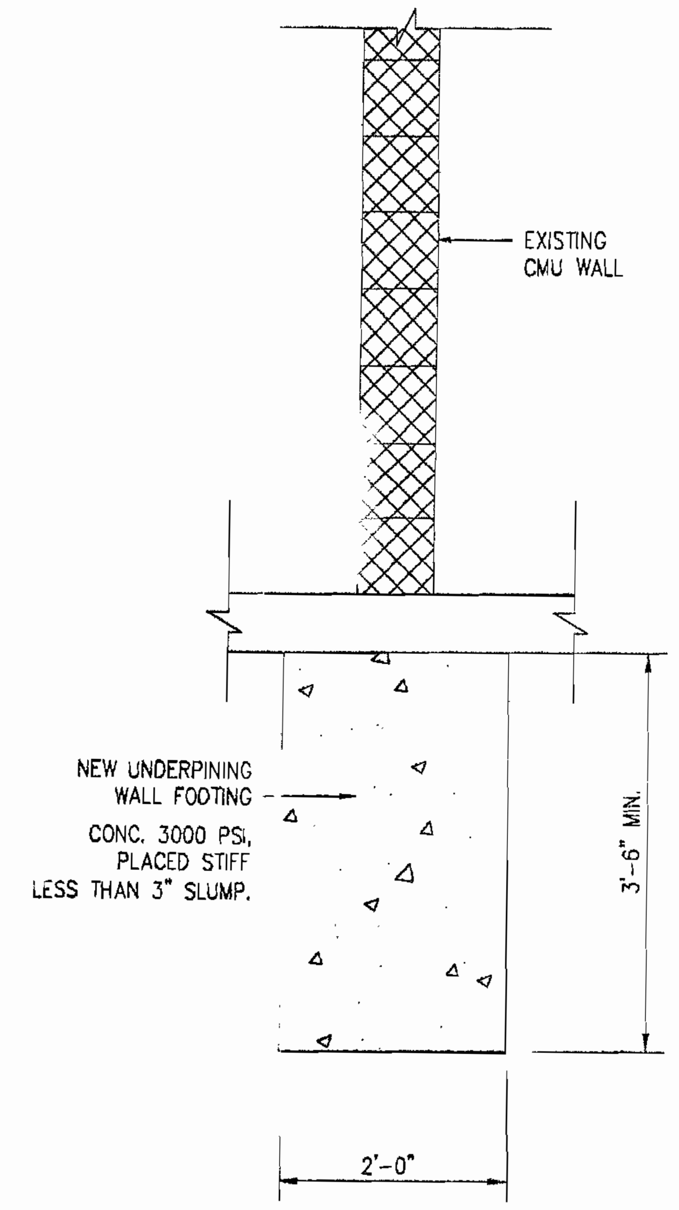
ALLIANCE BUILDING ADDITION
REMEDIAL DESIGN - BID
169 WESTERN HIGHWAY
WEST NYACK, NEW YORK

DWG-01

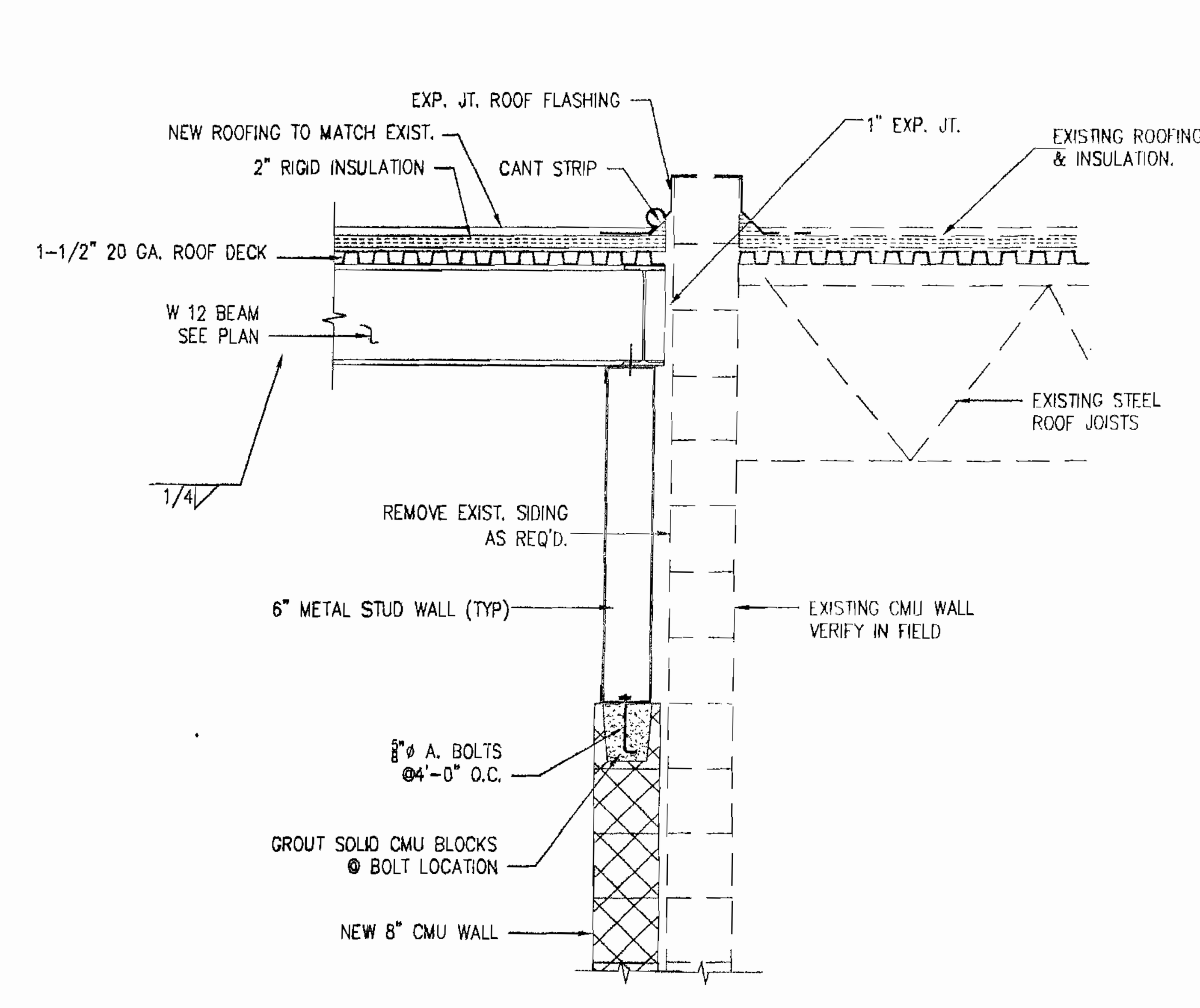
RECEIVED
APR 18 2002
OFFICE OF THE BUILDING INSPECTOR
TOWN OF CLARKSTOWN



ROOF FRAMING PLAN W/ BEAMS
1/4" = 1'-0"

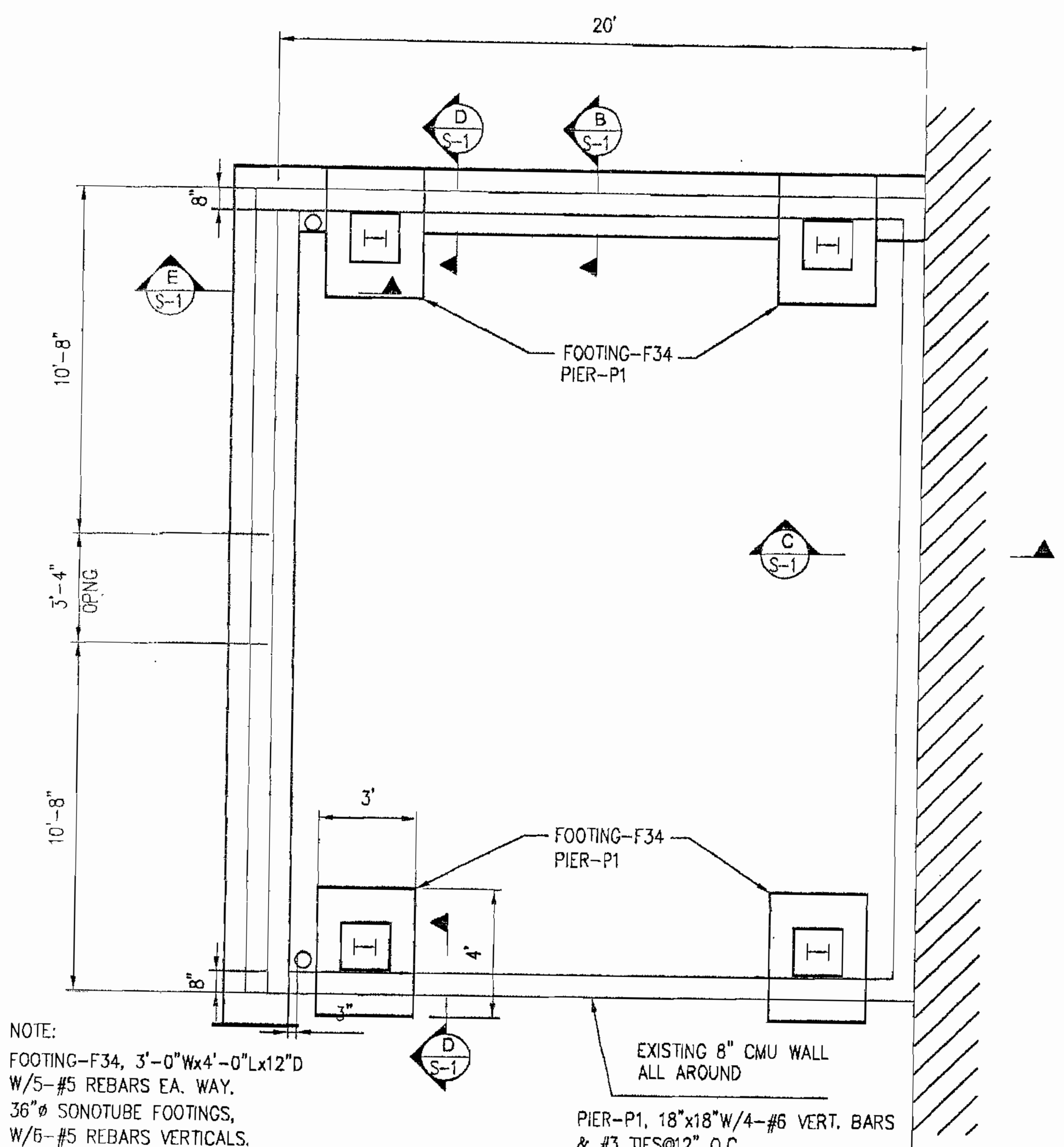


B S-1 SECTION
3/4" = 1'-0"



C S-1 SECTION
3/4" = 1'-0"

JOB COPY
BUILDING INSPECTOR
TOWN OF CLARKSTOWN



NOTE:
FOOTING-F34, 3'-0"Wx4'-0"Lx12"D W/5-#5 REBARS EA. WAY.
36"ø SONOTUBE FOOTINGS, W/6-#5 REBARS VERTICALS. MAY BE USED INSTEAD OF F34.

FOUNDATION PLAN W/ FOOTINGS
1/4" = 1'-0"

These Plans Approved subject to complete compliance with all the Requirements of the State Building Construction Code and subject to insp... at different stages of construction
Plans ... by CM on 5-3 20 02.
Building Permit No. 01-1432 (Amended)
Name of Owner Bradley Corp Pl.
Date 5-3 20 02
Per [signature]
Building Inspector

Approved the Architectural Appearance only.

[signature]	4/10/02
[signature]	4/15/02
[signature]	4/11/02
ISSUED CONSTN. APRIL 10, 2002	TRB

Structural Engineers:
BHARATI PE, P.C.
93 DEMAREST MILL ROAD
WEST NYACK, N.Y. 10994
845-623-2565
845-624-3302

Owner:
PROPOSED ADDITION
169 WESTERN HIGHWAY
WEST NYACK, NEW YORK

Sheet Title:
PLAN, SECTIONS AND DETAILS

4/10/02

S-1

GENERAL NOTES

1. CONTRACTOR VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS, CONFIRM WITH ARCHITECTURAL DRAWINGS. REPORT ANY DISCREPANCIES TO THE ARCHITECT AND THE ENGINEER IN WRITING, PRIOR TO PROCEEDING WITH WORK.
2. CONTRACTOR PROTECT EXISTING FACILITIES, STRUCTURES AND UTILITY LINES FROM ALL DAMAGE.
3. CONTRACTOR IS RESPONSIBLE FOR ADEQUATE BRACING OF STRUCTURAL MEMBERS, WALLS AND NON-STRUCTURAL ITEMS DURING CONSTRUCTION.
4. DEPRESS SLABS FOR FLOOR FINISHES PER ARCHITECTURAL DETAILS.
5. BUILDING CODES
   THESE PLANS HAVE BEEN PREPARED IN ACCORDANCE WITH THE NEW YORK STATE UNIFORM FIRE PREVENTION AND BUILDING CODE, LATEST EDITION. ALL WORK SHALL BE PREFORMED IN ACCORDANCE WITH THIS CODE, AND OTHER LOCAL ORDINANCES.
6. STRUCTURAL DESIGN LOADS IN PSF:
   ROOF UPLIFT LOADS : 14 PSF
   WIND LOADS FOR WALLS: 15 PSF
   FOR EAVES & CORNICES: 30 PSF (UPWARDS)

	DEAD LOAD	LIVE LOAD	TOTAL LOAD
ROOF LEVEL	15	30	45
FLOOR LEVEL	55	100	155

7. ALL WORK SHALL BE COORDINATED WITH ARCHITECTURAL, ELECTRICAL, AND MECHANICAL DRAWINGS. DISCREPANCIES IN DIMENSION AND INTERFERENCE SHALL BE REPORTED TO OUR OFFICE IN WRITING PRIOR TO START OF CONSTRUCTION.
8. THE GENERAL CONSTRUCTION CONTRACTOR SHALL INCLUDE IN HIS BIDS, AMOUNT REQUIRED FOR COORDINATING HIS WORK WITH WORK OF OTHER TRADES.

FOUNDATION NOTES

1. FOUNDATION DESIGN IS BASED ON AN ALLOWABLE SOIL BEARING PRESSURE OF 3000 PSF. THIS BEARING VALUE MUST BE VERIFIED BY A SOILS ENGINEER BEFORE PLACING CONCRETE IN THE FOOTINGS. SHOULD CONDITIONS VARY THE ARCHITECT AND THE ENGINEER SHALL BE NOTIFIED IN WRITING BEFORE CONTINUATION OF WORK.
2. ALL FOOTINGS SHALL BE PLACED DIRECTLY ON VIRGIN SOIL.
3. CENTER ALL FOOTINGS UNDER THEIR RESPECTIVE COLUMNS OR WALLS, UNLESS OTHERWISE SHOWN ON PLANS.
4. STRUCTURAL CONCRETE FOR FOUNDATIONS SHALL CONFORM TO ACI 301 AND SHALL ATTAIN A MINIMUM ULTIMATE 28 DAY COMPRESSIVE STRENGTH AS FOLLOWS:
   A. FOOTINGS 3000 PSI
      SLAB ON GRADE 4000 PSI
      WALLS AND GRADE BEAMS 3000 PSI
   B. AGGREGATES SHALL BE CLEAN AND WELL GRADED, MAXIMUM SIZE 3/4". CONCRETE COMPRESSIVE TESTS SHALL CONFORM TO ASTM C39.
   C. USE NORMAL WEIGHT CONCRETE FOR ALL STRUCTURAL FOUNDATION MEMBERS (145 PCF).
   D. MAXIMUM CONCRETE SLUMP SHALL BE 4" – LIMIT TO 3" FOR UNDERPINING FOOTINGS.
   E. ALL CONCRETE SHALL BE MIXED, TRANSPORTED AND PLACED IN ACCORDANCE WITH ACI STANDARDS 318, 304, AND 301.
   F. ALL REINFORCING BARS SHALL BE OF NEW BILLET STEEL CONFORMING TO ASTM A615, GRADE 60.
   G. USE PLAIN COLD DRAWN ELECTRICALLY WELDED STEEL WIRE FABRIC CONFORMING TO ASTM A185.
   H. ALL VERTICAL SURFACES OF CONCRETE SHALL BE FORMED FOR WALLS AND PIERS.
   I. PROVIDE THE FOLLOWING MINIMUM CONCRETE COVER FOR ALL REINFORCING STEEL.
      SLAB ON GRADE 1-1/2"
      WALLS AND PIERS 2"
      FOOTINGS 3"
5. COMPACT CLEAN INTERIOR SAND FILL HAVING LESS THAN 10% FINES, TO 95% OF MODIFIED PROCTOR MAXIMUM DRY DENSITY, AS PER ASTM D-1557 AT OPTIMUM MOISTURE CONTENT. ALL FILL SHALL BE PLACED IN SIX INCH LOOSE LIFTS (MAXIMUM) COMPACTED WITH VIBRATORY ROLLERS. FILL MATERIAL AND COMPACTION SHALL BE TESTED AND CONTROLLED BY QUALIFIED LABORATORY APPROVED BY THE STRUCTURAL ENGINEER. IN PLACE DENSITY TESTS SHALL BE TAKEN FOR EACH 1,000 s.f. IN EACH LIFT.
6. STEPPING OF CONTINUOUS FOOTINGS SHALL BE CONSTRUCTED AT MAXIMUM SLOPE OF 1 VERTICAL TO 2 HORIZONTAL, UNLESS NOTED.
7. DEWATER ALL EXCAVATIONS TO ALLOW INSTALLATION OF FOOTINGS IN DRY ATMOSPHERE.
8. BOTTOM OF ALL EXTERIOR FOOTINGS SHALL BE THREE FEET SIX INCHES BELOW FINISHED GRADE.
9. WHERE PIPES PASS THROGH WALLS, DROP BOTTOM OF FOOTINGS, SO THAT PIPES PASS OVER THE TOP OF FOOTINGS.
10. SOIL UNDER THE FOOTINGS SHALL BE PROTECTED FROM FREEZING.
11. EXTREME CAUTION SHALL BE EXERCISED DURING THE EXCAVATIONS FOR UTILITIES, SO AS NOT TO UNDERMINE THE BUILDING FOUNDATIONS.

STRUCTURAL NOTES

1. STRUCTURAL STEEL
   A. STRUCTURAL STEEL CONSTRUCTION SHALL CONFORM TO AISC "MANUAL OF STEEL CONSTRUCTION", NINTH EDITION, AND SHALL BE FABRICATED AND INSTALLED IN ACCORDANCE WITH AISC "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES" AS ADOPTED SEPTEMBER 1, 1986.
   B. STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING ASTM SPECIFICATIONS:
      BEAMS, GIRDERS, WF-COLUMNS, MISC. STEEL – A 36 AND A-572 GR. 50
      PLATE – A 36
      STRUCTURAL TUBE – A 500, GRADE B
      STRUCTURAL PIPE – A 501 OR A 53, TYPE E
   C. BOLTED CONNECTIONS SHALL BE MADE USING A325-SC BOLTS, 3/4" DIAMETER INSTALLED IN ACCORDANCE WITH "SPECIFICATIONS FOR STRUCTURAL JOINTS USING ASTM A325 BOLTS OR A490 BOLTS" UNLESS OTHERWISE DETAILED.
   D. ANCHOR BOLTS SHALL BE OF A36 OR A307 STEEL.
   E. ALL STEEL SHALL BE SHOP PAINTED WITH GRAY ZINC CHROMATE PRIMER 2.0 MILS IN THICKNESS. DO NOT PAINT WITHIN 3" RADIUS OF FIELD WELDING OR FRICTION BOLTING IS TO BE DONE, AND EXCEPT WHERE STEEL IS TO RECEIVE SPRAY APPLIED FIREPROOFING. ALL WELDS AND BARE SPOTS SHALL RECEIVE TOUCHUP PAINT.
   F. FOR MISCELLANEOUS STEEL NOT SHOWN ON THESE DRAWINGS, SEE ARCHITECTURAL AND MECHANICAL DRAWINGS.
   G. WELDING SHALL BE DONE BY CERTIFIED WELDERS PER AMERICAN WELDING SOCIETY STANDARDS. USE AWS A5.1 OR A5.5 E70XX SERIES ELECTRODES. THE ENGINEER MAY REQUEST NON DESTRUCTIVE TESTING TO VERIFY PROPER WELDS.
   H. SUBMIT SHOP AND ERECTION DRAWINGS TO THE STRUCTURAL ENGINEER FOR REVIEW AND APPROVAL. NO FABRICATION OF STEEL SHALL COMMENCE WITHOUT APPROVED SHOP DRAWINGS. SHOP DRAWINGS ARE PREPARED AND USED BY THE CONTRACTOR AS INSTRUMENTS TO SEQUENCE HIS WORK AND TO FACILITATE FABRICATION AND ERECTION. REVIEW OF SHOP DRAWINGS SHALL BE FOR GENERAL DETAIL AND ARRANGEMENT ONLY. CONTRACTOR SHALL BEAR FULL RESPONSIBILITY FOR DIMENSIONS, PROPER FIT, AND DETAILED DESIGN OF CONNECTIONS. THEIR APPROVAL BY THE STRUCTURAL ENGINEER IS NOT TO BE CONSTRUED AS A WAIVER OF CONSTRUCTION CONTRACT REQUIREMENT OR RESPONSIBILITIES, UNLESS THE CONTRACTOR HAS BEEN GRANTED A DEVIATION IN WRITING.
   I. ALL STEEL MEMBER CONNECTION DETAILS SHALL CONSIST OF TWO SIDED CLIP ANGLES AND BE DESIGNED FOR THE MAXIMUM CAPACITY OF THE MEMBER, UNLESS NOTED OTHERWISE.
   J. COLUMNS SHALL BE MILLED FOR FULL BEARING. APPROVED TEMPORARY BRACING SHALL BE INSTALLED DURING ERECTION, AS REQUIRED TO PREVENT DISTORTION OR DAMAGE TO THE FRAMEWORK DUE TO WIND, EARTHQUAKE AND ERECTION FORCES.
   K. STEEL ERECTOR SHALL PROVIDE A FIRE WATCH DURING ALL FIELD WELDING OPERATIONS.
   L. THE STEEL CONTRACTOR SHALL BE RESPONSIBLE FOR EXACT LOCATION, ELEVATION AND ALIGNMENT OF ALL HUNG LINTELS. THE CONTRACTOR SHALL SUBMIT ALL NECESSARY ADJUSTABLE CONNECTIONS PROPOSED, TO THE ARCHITECT FOR APPROVAL.
   M. THE STRUCTURAL STEEL CONTRACTOR SHALL VERIFY THE FOUNDATION CONSTRUCTION FOR ANCHOR BOLTS LOCATIONS, ELEVATION OF TOP OF CONCRETE AND/OR LEVELING AND BEARING PLATES, ALIGNMENT, ETC., PRIOR TO START OF ERECTION.
2. STEEL DECK
   A. THE DECK SHALL BE DESIGNED AND MANUFACTURED IN ACCORDANCE WITH THE "SPECIFICATIONS FOR DESIGN OF LIGHT GAGE COLD FORMED STEEL STRUCTURAL MEMBERS", AND SHALL CONFORM TO THE STEEL DECK INSTITUTE'S RECOMMENDED SPECIFICATIONS.
   B. STEEL DECK SHALL BE DETAILED TO PROVIDE DIAPHRAGM ACTION FOR THE ENTIRE SHEAR FORCES.
   C. STEEL DECK UNITS SHALL BE ERECTED AND ANCHORED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND ERECTION DRAWINGS.
   D. ROOF DECK SHALL BE GALVANIZED STEEL, 20 GAGE – 1-1/2" DEEP TYPE 'B' WIDE RIB ROOF DECK. MIN I=.213 IN>4/FT. UNITS SHALL BE INTERLOCKED OR NESTED AT LAPS AND WELDED TO JOISTS OR BEAMS WITH 5/8" PUDDLE WELDS AT 12" ON CENTERS. FASTEN SIDE LAPS BY WELDS AT MAXIMUM SPACING OF 2'-0" AND ALONG SIDES OF THE BUILDING PLUG WELD EDGE OF DECK TO SUPPORT BEAMS @ 18' O.C. DECK SHALL BE CONTINUOUS OVER A MINIMUM OF 3 SPANS.
   F. DECK UNITS SHALL BE MANUFACTURED AND INSTALLED IN ACCORDANCE WITH CURRENT "DESIGN MANUAL FOR COMPOSITE DECKS, FORM DECKS, AND ROOF DECKS" PUBLISHED BY THE STEEL DECK INSTITUTE.
   G. DECKING CONTRACTOR SHALL PROVIDE ADDITIONAL STEEL ANGLE SUPPORTS AT ALL COLUMNS, AND ROOF DRAIN LOCATIONS. PERMANENT ANGLES SHALL BE PAINTED.
3. LIGHT GAGE COLD FORMED STEEL STUDS
   A. ALL MEMBERS SHALL BE COLD FORMED FROM GALVANIZED STRUCTURAL QUALITY SHEET STEEL MEETING THE REQUIREMENTS OF ASTM A446 GRADE A, MINIMUM YIELD OF 33000 PSI FOR 18 GAGE AND LIGHTER, AND ASTM 446 GRADE D, MINIMUM YIELD OF 50000 PSI FOR 16 GAGE AND HEAVIER. ALL MEMBERS SHALL BE MARKED, SO THAT SUPPLIED MATERIALS CAN BE FIELD VERIFIED. GALVANIZED FINISH SHALL COMPLY WITH ASTM A-525, G60 COATING.
   B. THE EXTENT OF STRUCTURAL LIGHT GAGE FRAMING IS SHOWN ON THE CONTRACT DOCUMENTS AND INCLUDES ALL COLD FORMED FRAMING 20 GAGE AND HEAVIER. FRAMING INCLUDES, BUT NOT LIMITED TO, FLOOR JOISTS, WALL STUDS AND RUNNER TRACKS COMPLETE WITH CLIPS, BRIDGING AND STIFFENERS, AS REQUIRED FOR A COMPLETE FRAMING PACKAGE.
   C. SUBMIT SHOP DRAWINGS AND CALCULATIONS FOR ALL FRAMING MEMBERS AND CONNECTIONS PER AISI. LIST ALL DESIGN CRITERIA AND INDICATE MEMBER STRESSES, DEFLECTIONS AND CONNECTION DETAILS FOR PROPER ASSEMBLY. SHOP DRAWINGS SHALL BE REVIEWED BY THE CONTRACTOR, AND BEAR THE SEAL AND SIGNATURE OF A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF NEW JERSEY, BEFORE SUBMITTING TO THE ENGINEER OF RECORDS FOR APPROVAL.
   D. ALL WALL STUDS SHALL BE 16 GAGE AND SHALL MEET MINIMUM SECTION PROPERTIES AS DEVELOPED BY U.S. STEEL CORPORATION OR APPROVED EQUAL. ALL INSTALLATIONS SHALL BE AS PER APPROVED MANUFACTURERS SPECIFICATIONS.
   E. DO NOT SPLICE OR CUT HOLES IN ANY FRAMING MEMBER, UNLESS APPROVED BY THE ARCHITECT AND/OR ENGINEER. REINFORCE AROUND SUCH HOLES AS REQUIRED.
   F. JOISTS SHALL BEAR DIRECTLY OVER WALL STUDS, OR PROVIDE HEADER TO DISTRIBUTE THE LOADS.
4. CONCRETE MASONRY UNITS (CMU)
   A. CONCRETE MASONRY UNITS SHALL CONFORM TO ASTM C90, 45% SOLID, WITH MINIMUM COMPRESSIVE STRENGTH OF UNITS=1500 PSI. DESIGN COMPRESSIVE STRENGTH SHALL EQUAL fm'=1150 PSI AND DENSITY OF 140 PCF.
   B. USE TYPE M MORTAR IN ALL EXTERIOR WALLS, TYPE S MORTAR MAY BE USED IN INTERIOR WALLS. MIX 1 PART PORTLAND CEMENT, 1/4 TO 1/2 PART HYDRATED LIME, AND 2-1/4 TO 3 PARTS SAND, MIXED ON SITE.
   C. USE STANDARD TRUSS TYPE DUR-O-WALL 9 GAGE GALVANIZED WIRE CONFORMING TO ASTM A82, IN EVERY OTHER COURSE OF MASONRY WALL. USE PREFABRICATED CORNERS AND TEES AT WALL INTERSECTIONS. OVERLAP DISCONTINUOUS ENDS A MINIMUM OF 12 INCHES.
   D. CALCIUM CHLORIDE OR ANY OTHER AIR-ENTRAINING ADMIXTURES ARE PROHIBITED TO BE USED IN THE MORTAR.
   E. PILASTERS AND WALLS SUPPORTING STEEL BEARING PLATES SHALL BE GROUTED SOLID FOR A WIDTH OF 32" FOR FOUR COURSES IN DEPTH.
   F. FIRST MASONRY COURSE ON FOOTING SHALL BE GROUTED SOLID WITH CONCRETE, UNLESS OTHERWISE NOTED ON DRAWINGS. ALL COURSES BELOW GRADE MUST BE FILLED SOLID WITH CONCRETE.
   G. MASONRY WALLS SHALL BE BRACED DURING CONSTRUCTION. NO WALL SHALL BE BUILT HIGHER THAN 10 TIMES THICKNESS OF WALL WITHOUT BRACING.
   H. PROVIDE VERTICAL CONTROL JOINTS AT A MAXIMUM DISTANCE OF 50 FEET ON CENTER, FOR STRAIGHT WALLS, USING SASH BLOCKS AND DUR-O-WALL PREFORMED REGULAR RAPID CONTROL JOINT (OR EQUAL OF EXTRUDED RUBBER). DISCONTINUE WALL REINFORCING AT JOINTS. LOCATE VERTICAL JOINTS AT COLUMN CENTER, UNLESS SPECIFIC LOCATIONS ARE INDICATED ON DRAWINGS.
   I. ALL MASONRY SHALL BE LAID UP IN RUNNING BOND PER ACI. USE TWO CELL UNITS.
   J. MASONRY TESTING SHALL FOLLOW PROJECT SPECIFICATIONS. THREE SPECIMENS SHALL BE TESTED BEFORE CONSTRUCTION STARTS, AND ADDITIONAL THREE SPECIMENS DURING CONSTRUCTION FOR EACH 5000 SQ. FT. OF WALL AREA. TESTS SHALL CONFORM TO ASTM E447. MORTAR TESTING SHALL CONFORM TO ASTM C27, USING SIMILAR GUIDELINES.
   J. MASONRY WALLS WERE DESIGNED AND INSTALLED, PRIOR TO OUR INVOLVEMENT. OUR FIRM IS NOT RESPONSIBLE FOR DESIGN OR CONSTRUCTION OF MASONRY BEARING WALLS.
5. LINTELS FOR NON-LOAD BEARING WALLS
   A. PROVIDE MINIMUM OF 5" BEARING FOR STRUCTURAL STEEL LINTELS AND 8" FOR PRECAST CONCRETE LINTELS. GROUT THREE COURSES UNDER THE LINTEL SUPPORTS.
   B. STEEL LINTELS FOR MASONRY OPENINGS UNLESS SHOWN ON DRAWINGS.

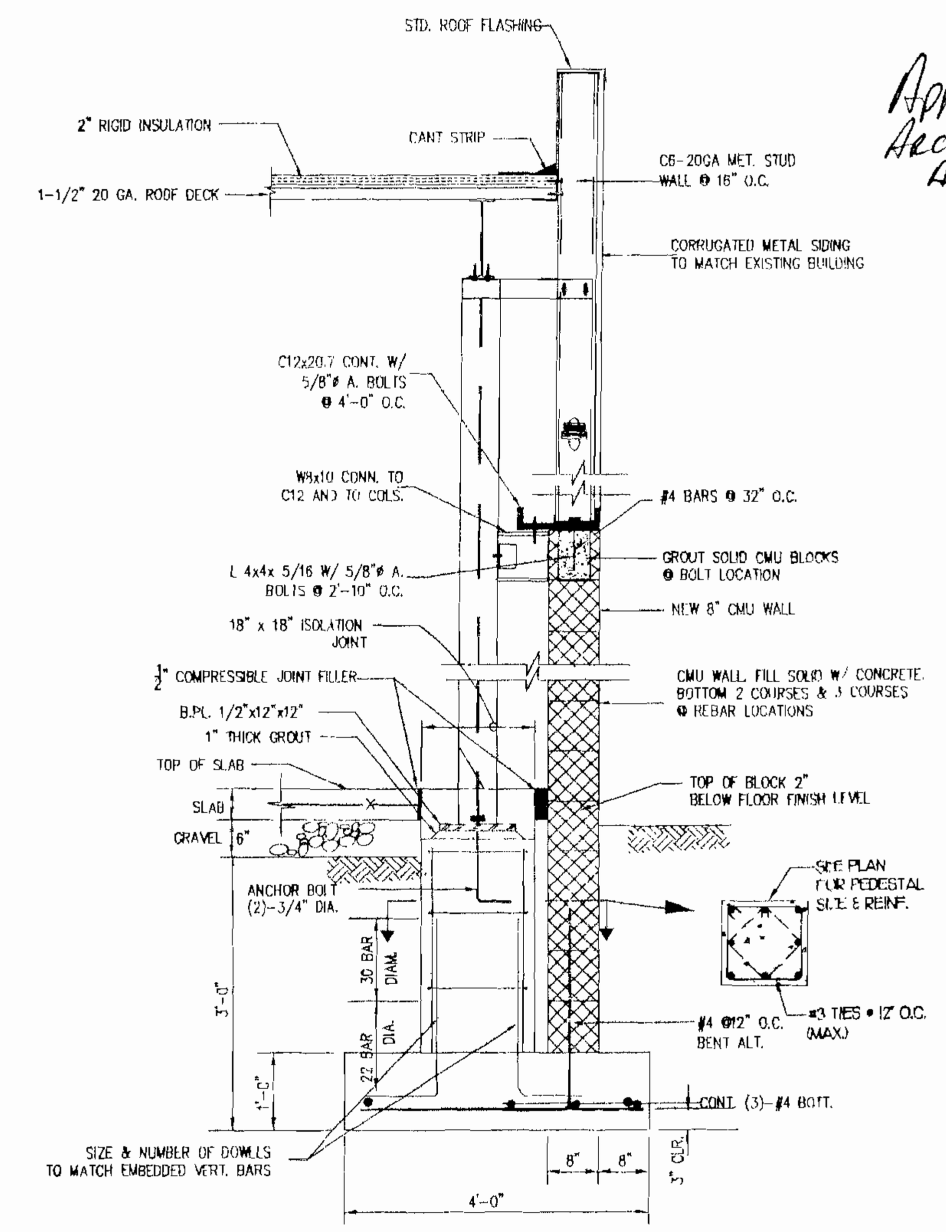
WALL THICKNESS	OPENING SIZE	
	4'-0" AND LESS	4'-0" TO 6'-0"
6" CMU WALL	(1)5x5x5/16	(1)5x5x5/16
8" CMU WALL	(2)3-1/2x3-1/2x5/1	(2)5x3-1/2x5/16

LINTELS FOR METAL STUD WALL CONSTRUCTION

OPENING	LESS THAN 4'-0"	4'-0" TO 6'-0"
LINTEL SIZE	(2) 7-1/4, 16 Ga.	(2) 9-1/4, 16 Ga.
MAXIMUM LOAD	2000 PLF	2000 PLF

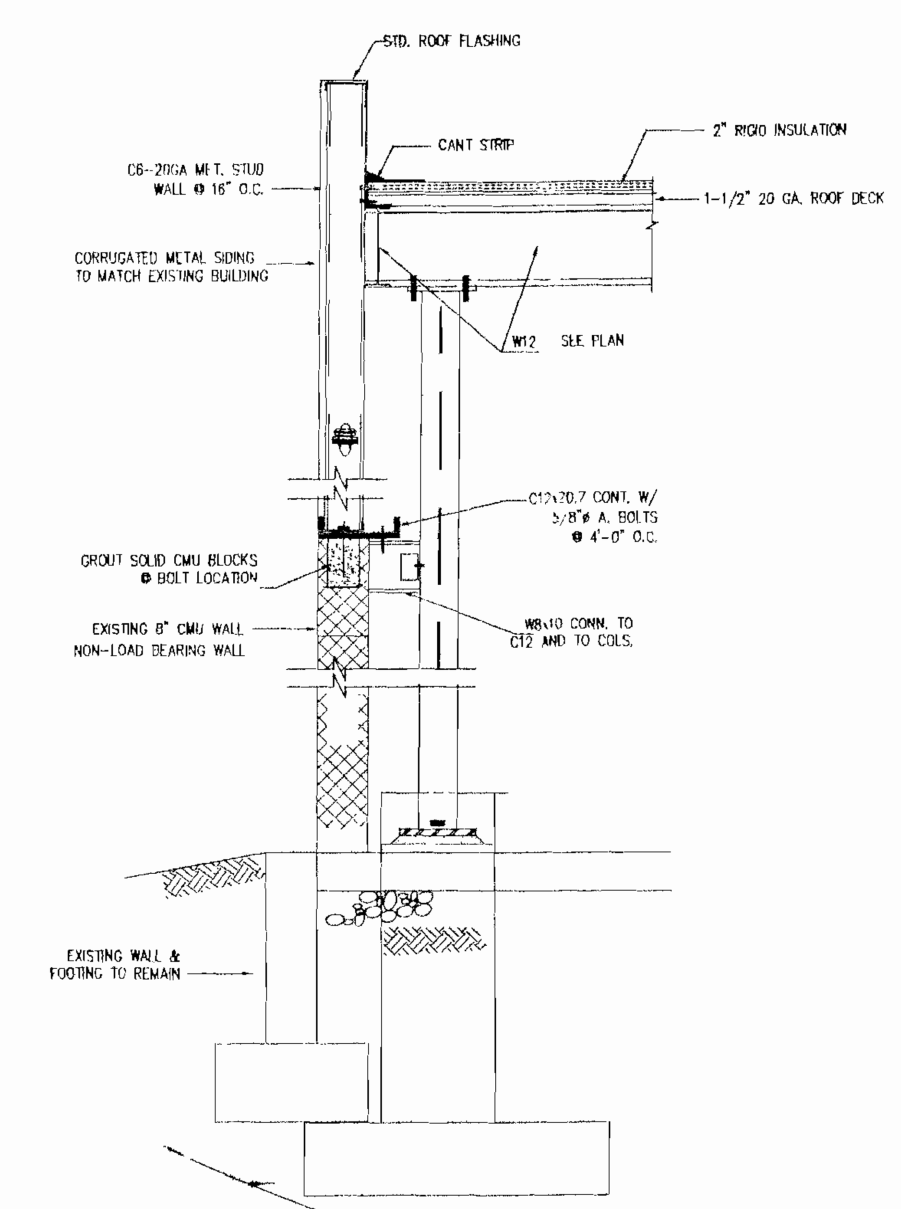
PROVIDE MINIMUM OF TWO(2) VERTICAL STUDS AT EACH END OF THE OPENING, UNLESS MORE STUDS ARE REQUIRED BY CACULATIONS.

6. EXPANSION ANCHORS:
   A. EXPANSION ANCHORS SHALL BE "HILTI KWIK" OR APPROVED EQUAL.
   B. INSTALLATION AND MINIMUM EMBEDMENT SHALL BE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS AND THE DRAWINGS, WHICHEVER IS MORE STRINGENT.
7. SHOP DRAWING SUBMITTALS :
   A. SUBMIT SHOP AND ERECTION FOR REVIEW FOR THE FOLLOWING ITEMS:
      1. STRUCTURAL STEEL
      2. STEEL JOISTS AND JOIST GIRDERS
      3. STEEL DECKING
8. CONTROLLED INSPECTIONS:
   A. FOLLOWING ITEMS REQUIRE CONTROLLED INSPECTIONS BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF NEW YORK.
      1. STRUCTURAL STEEL CONNECTIONS



D SECTION 3/4" = 1'-0"
S-1

Approved the Architectural appearance only



E SECTION 3/4" = 1'-0"
S-1

ISSUED CONSTN. TRB
APRIL 10. 2002

Structural Engineers:
BHARATI PE, P.C.
93 DEMAREST MILL ROAD
WEST NYACK, N.Y. 10994
845-623-2565
845-624-3302

Owner
PROPOSED ADDITION
169 WESTERN HIGHWAY
WEST NYACK, NEW YORK

Sheet Title
GENERAL AND STRUCTURAL NOTES

S-2

APPENDIX III

PROCESS EQUIPMENT PHOTOGRAPHS

ENVIRONMENTAL ALLIANCE

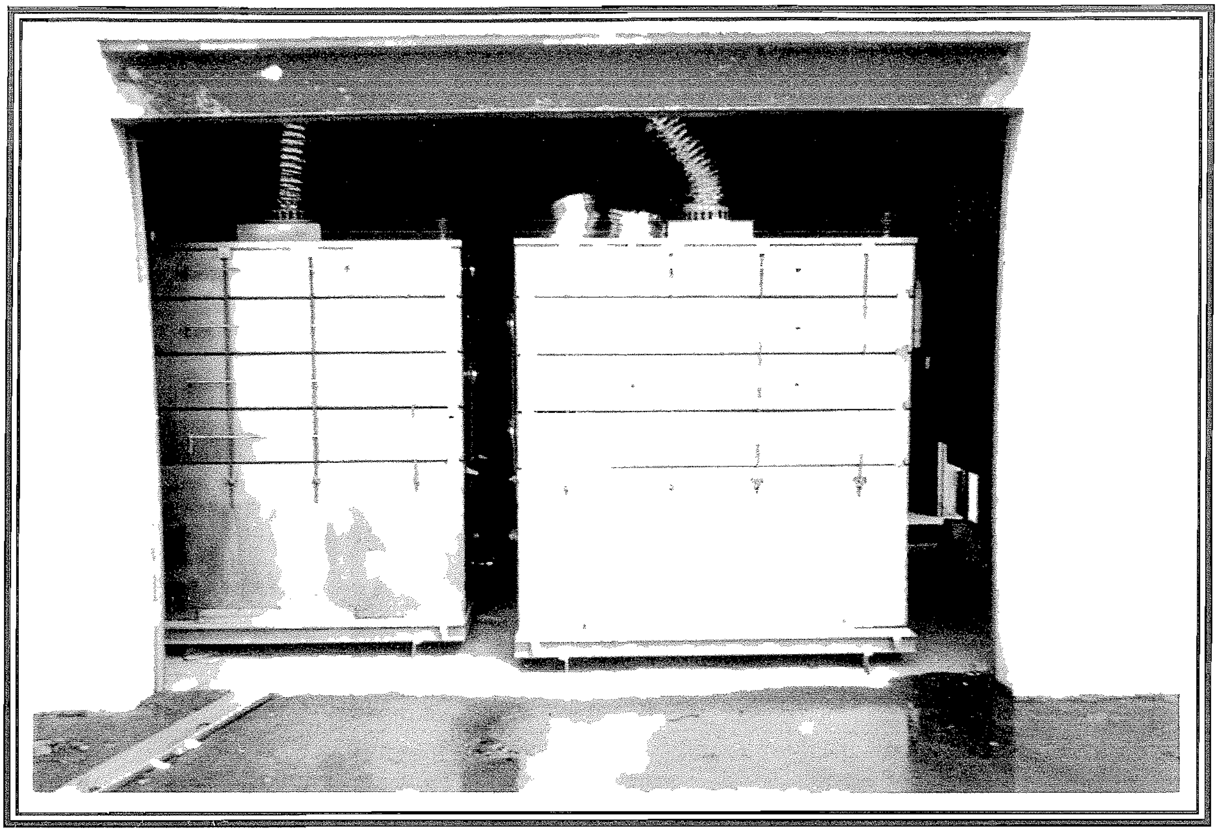


Photo # 1 – Photograph, with the garage door up, of the air stripper towers inside the treatment building.

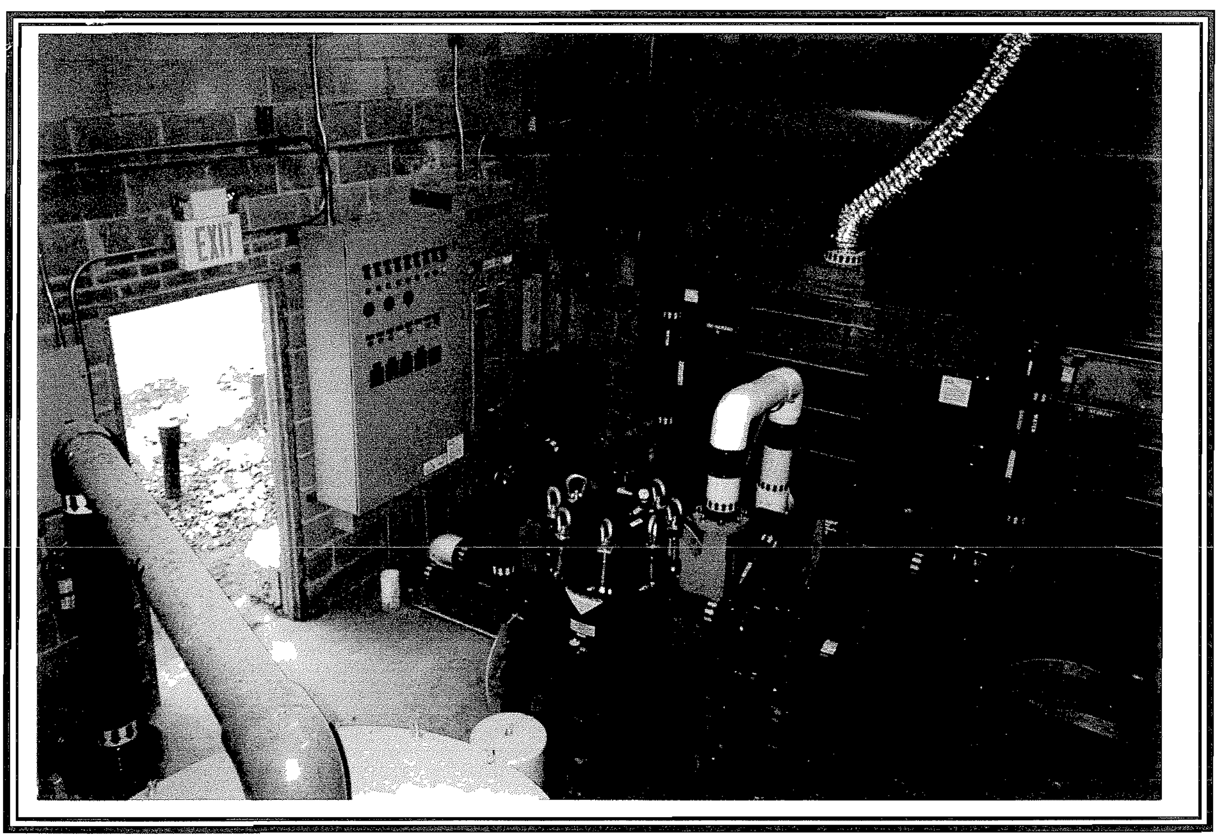


Photo # 2 – Aerial view of the system control panel, electrical panel boxes, Bag Filter #1, and Air Stripper #1.

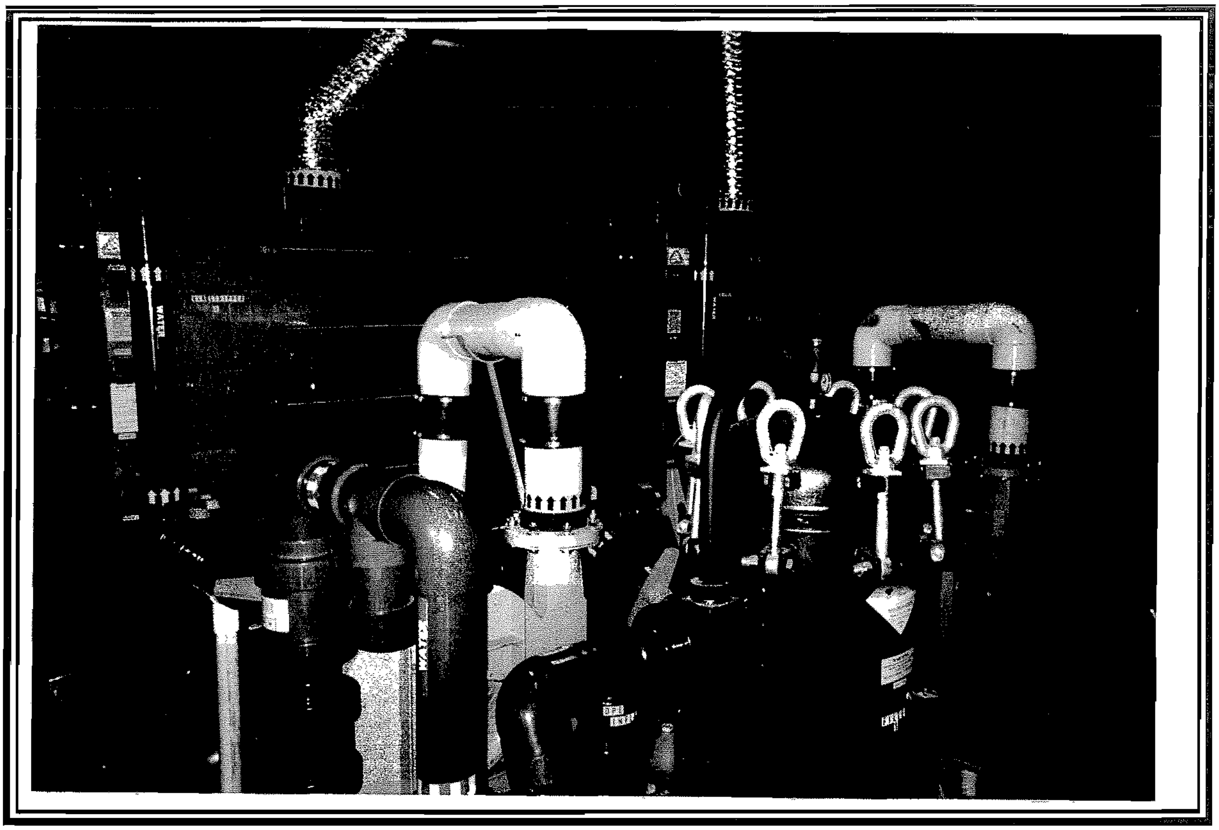


Photo # 3 – Ground-level view of Bag Filter #1 and the air strippers.

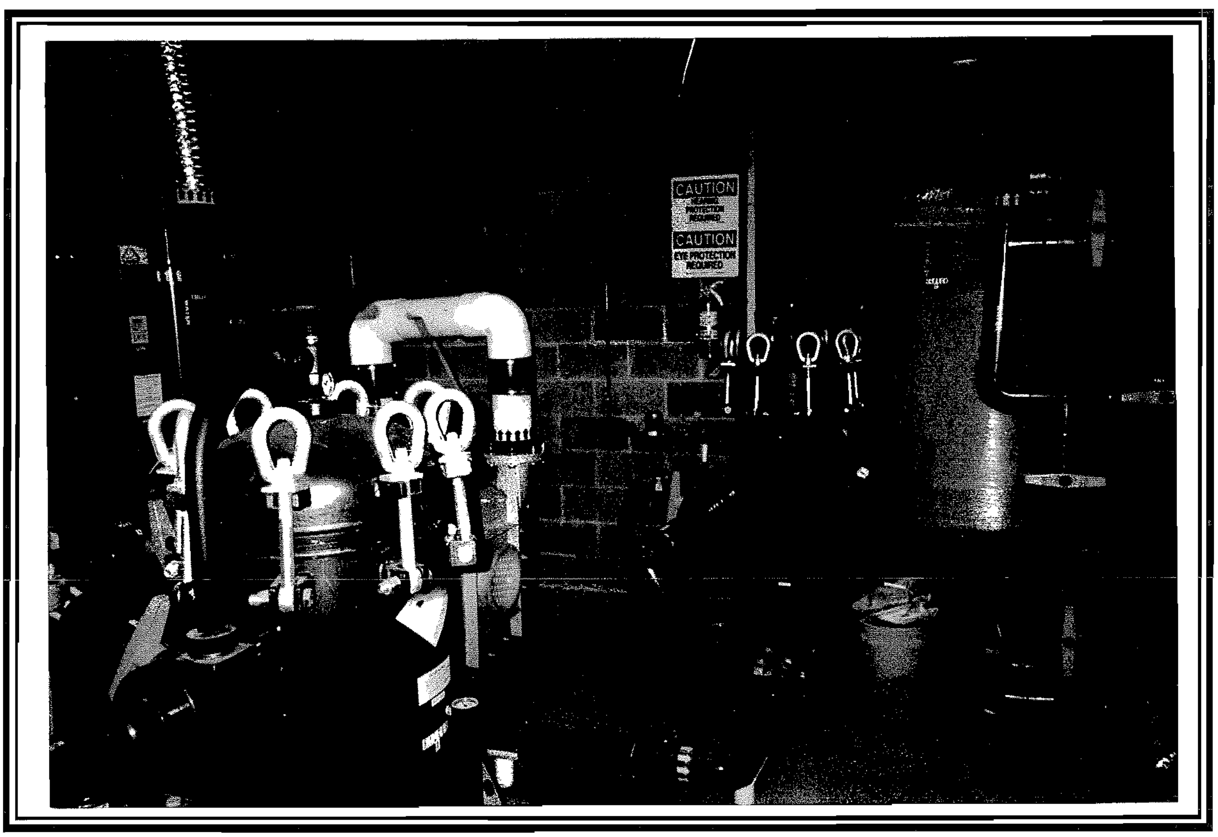


Photo # 4 – Ground-level view of Bag Filter #2 and Carbon Filter #1.

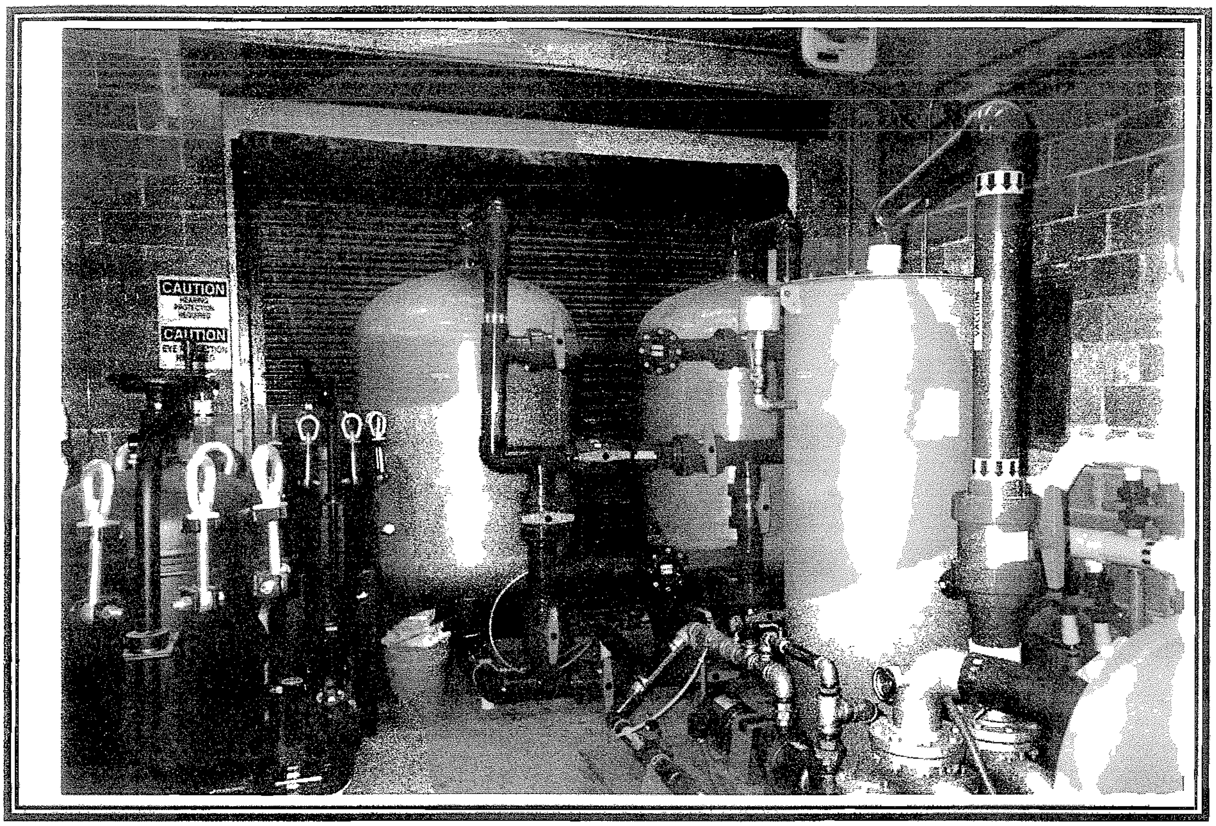


Photo # 5 - View of liquid-phase carbon filters and the separator tank for the DPE System.

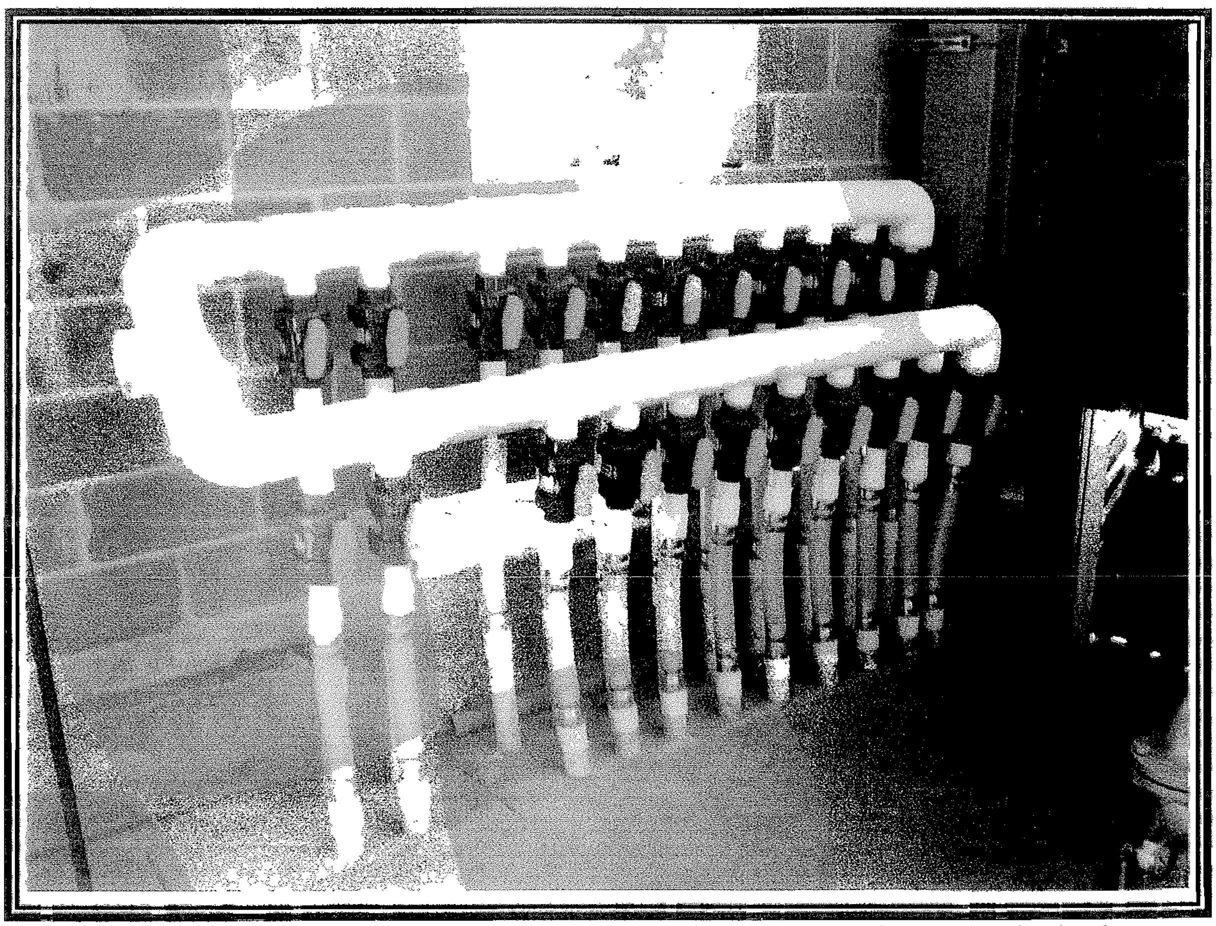


Photo # 6 – View of the completed DPE Manifold, prior to connecting to the liquid ring pump.

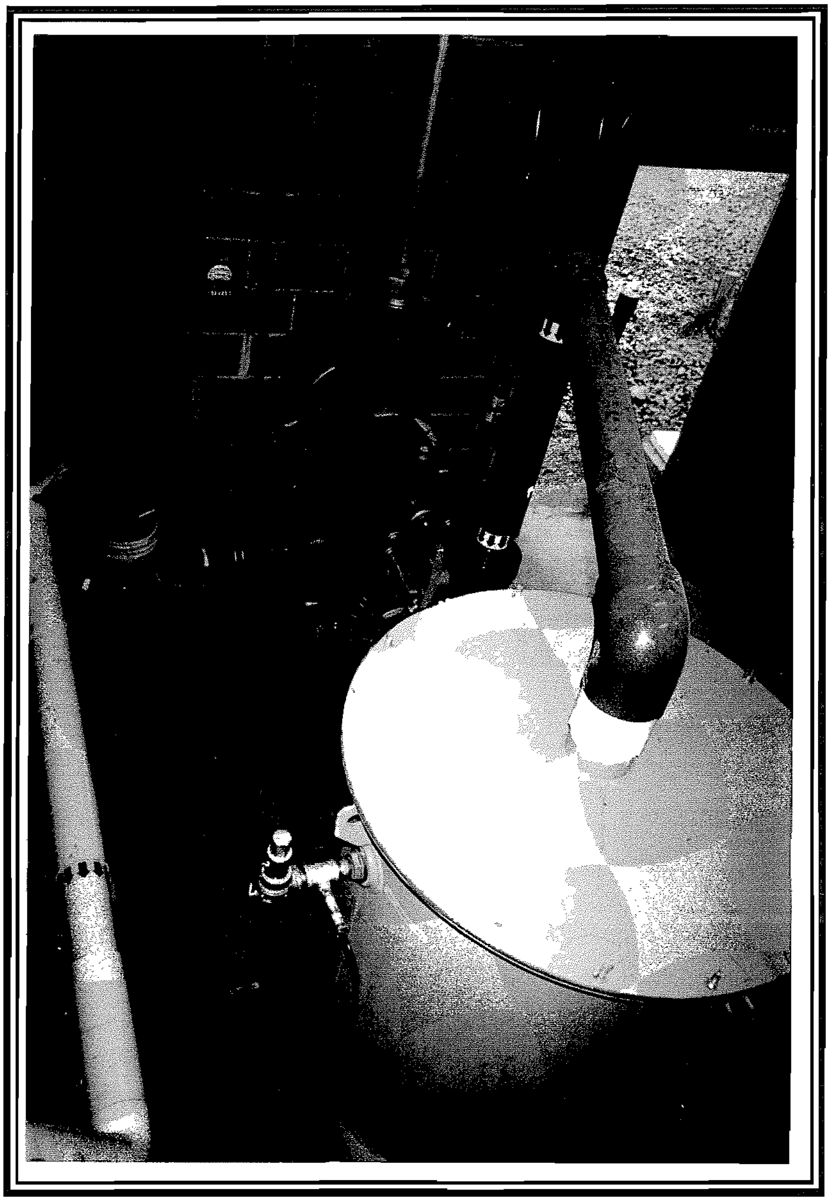


Photo # 7 – Photograph of the DPE System Liquid Ring Pump
and the Separator Tank.

APPENDIX IV

PROCESS EQUIPMENT INFORMATION

ASHLAND. Document Transmittal

Service Businesses Division
Environmental Services, Northeast Regional Office

Ashland Distribution Company
Binghamton, NY

November 22, 2002

To: Andrew Applebaum
Environmental Alliance

From: Jeffery W. Smith
Ashland Environmental Services

Subject: **Document Transmittal**

Enclosed please find several documents with regard to an outstanding request for waste management services. Please review this documentation and process as requested.

☐ Quotation for Waste Management Services
Profile(s) #

☐ Draft Profile(s) for review and approval
Profile(s) #

☐ New Customer Information Form
Please review this document and correct/provide any additional information. Please return this document to my attention for processing (this will establish your company as a new customer of Ashland ES).

☐ Ashland standard Transportation and Recycling or Disposal Agreement
One copy of the contract, which have been executed by an Ashland ES representative, is attached.
Please review this document and contact me with any questions or comments.
If you in agreement with the terms and conditions, please sign both copies and retain a copy for your files. Please forward the second copy of the signed document to the attention of:

[Please note that waste management services can not be provided until this agreement is in place.]

☒ Other Documentation
Requested copies of documentation for disposal of bulk soils from SEQUA Chromalloy site in West Nyack, NY. Please note - Certificates of Disposal are not available from Envirite for non-haz soils. The attached documentation (in the form of the non-haz manifest from Envirite to the landfill for each shipment) is provided.

Thank you for your assistance with the review and processing of the above documentation.

Should you have any questions or comments regarding this matter please call me – my office number is (610) 614-0422.

Sincerely,

Jeffery W. Smith

10H E00C+C4

MODERN LANDFILL
4400 Mt. Pisgah Rd.
York, PA 17402
(717) 246-2686

Site Permit No. 100113

Document Refer **No** 02 01954

NON-HAZARDOUS WASTE MANIFEST

1. Generator of Waste (must be filled in by producer) EPA I.D. NO.: PAD010154045

Company Name (Print or Type): Envirite of Pennsylvania, Inc.

Pick-up Address: 730 Vogelsong Road, York, PA 17404
(No.) (Street) (City) (State) (Zip Code)

Telephone Number: (717) 846-1900 SIC No.: 4953

Waste Stream Identification: This manifest represents a non-hazardous waste as per E.P.A. and PA D.E.P. regulations.

Tons: 38.21 Cubic Yards: ______ Other (Specify): ______

Special Handling Instructions, if any: ______

MODERN ID NO.: 20775-J24

This is to certify that the above named materials are properly classified, described, packaged, marked, and labeled and are in proper condition for transportation according to applicable state and federal law. The wastes were consigned to the transporter named. I certify that the foregoing is true and correct to the best of my knowledge.

Date: 9/26/02 Signature: ______ (Name and Title)

2. Contractor: ______

Address: ______

Contact: ______ Phone: ______

3. Hauler of Waste (must be filled-in by hauler) EPA I.D. No.: NJD071629975

COMPANY NAME: S-J Transportation Co. PHONE: (856) 769-2741

ADDRESS: PO Box 169, Woodstown, NJ 08098

Pick-up Date: 9/26/02 Truck No.: 36 Vehicle Lic. No.: AG234B CT

The above described waste was picked up and hauled by me to the disposal facility named below and was accepted. I certify under penalty of perjury that the foregoing is true and correct.

Signature of authorized agent and title: ______ Date: 9/26/02

4. Disposer of Waste (must be filled-in by disposer)

Company Name (Print or Type): Modern Landfill

Site Location: 4400 Mt. Pisgah Rd., York, Pennsylvania 17402

Waste subject to this manifest was delivered by the above hauler to this disposal facility and accepted on

______ (DISPOSAL DATE)

Signature of authorized agent and title: ______

White, Green, Canary - Landfill Pink - Hauler Golden Rod - Generator

Please print or type.
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. NY0013382106 Manifest Doc. No. 20533 2. Page 1 of 1

3. Generator's Name and Mailing Address
~~SEQUA CHROMALLOY~~
169 WESTERN HIGHWAY
WEST NYACK NY 10994

4. Generator's Phone (202) 995-7544

5. Transporter 1 Company Name: S-J TRANSPORTATION CO.
6. US EPA ID Number: NJD071629975
A. Transporter's Phone: (856) 769-2741

7. Transporter 2 Company Name
8. US EPA ID Number
B. Transporter's Phone

9. Designated Facility Name and Site Address
ENVIRITE OF PENNSYLVANIA INC.
730 VOGELSONG ROAD
YORK PA 17404
10. US EPA ID Number: PAD010154045
C. Facility's Phone: (717) 846-1900

11. Waste Shipping Name and Description	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol
a. ~~NON-HAZARDOUS SOIL CUTTINGS~~ RCRA AND DOT NON-REGULATED MATERIAL ASH-73-0103:	[illegible]	[illegible]	[illegible]	[illegible]
b.				
c.				
d.				

GENERATOR

D. Additional Descriptions for Materials Listed Above
A: SOIL CUTTINGS & GRAVEL 98-99%, PLASTIC SHEETING 0.5-1%

E. Handling Codes for Wastes Listed Above
S01

15. Special Handling Instructions and Additional Information
HAZARDOUS MATERIALS RESPONSE INFORMATION PRESENT "EVERY SPILL, RELEASE OR INCIDENT MUST BE REPORTED TO ASHLAND AT 1-800-ASHLAND.

16. **GENERATOR'S CERTIFICATION:** I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name	Signature	Month	Day	Year
[illegible]	[signature]	[illegible]	[illegible]	

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
[illegible]		[illegible]	[illegible]	

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year
Ben Smith	[signature]	[illegible]	[illegible]	[illegible]

Printed by J. J. KELLER & ASSOCIATES, INC.
Neenah, WI 54957-0368

T/S/D/F COPY

12-BLS-C5 Rev. 12/98

PGH EC0E725

MODERN LANDFILL
4400 Mt. Pisgah Rd.
York, PA 17402

(717) 246-2686

Site Permit No. 100113

Document Refer **No** 02 01953

NON-HAZARDOUS WASTE MANIFEST

1. Generator of Waste (must be filled in by producer) EPA I.D. NO.: PAD010154045

Company Name (Print or Type): Envirite of Pennsylvania, Inc.

Pick-up Address: 730 Vogelsong Road, York, PA 17404
(No.) (Street) (City) (State) (Zip Code)

Telephone Number: (717) 846-1900 SIC No.: 4953

Waste Stream Identification: This manifest represents a non-hazardous waste as per E.P.A. and PA D.E.P. regulations.

Tons: 32.85 Cubic Yards: ______ Other (Specify): ______

Special Handling Instructions, if any: ______

MODERN ID NO.: 20723024

This is to certify that the above named materials are properly classified, described, packaged, marked, and labeled and are in proper condition for transportation according to applicable state and federal law. The wastes were consigned to the transporter named. I certify that the foregoing is true and correct to the best of my knowledge.

Date: 9/26/02 Signature: ______ (Name and Title)

2. Contractor: ______

Address: ______

Contact: ______ Phone: ______

3. Hauler of Waste (must be filled-in by hauler) EPA I.D. No.: NJD071629976

COMPANY NAME: S-J Transportation Co. PHONE: (856) 769-2741

ADDRESS: PO Box 169, Woodstown, NJ 08098

Pick-up Date: 9-26-02 Truck No.: 779 Vehicle Lic. No.: 40945E

The above described waste was picked up and hauled by me to the disposal facility named below and was accepted. I certify under penalty of perjury that the foregoing is true and correct.

Signature of authorized agent and title: ______ Date: 9-26-02

4. Disposer of Waste (must be filled-in by disposer)

Company Name (Print or Type): Modern Landfill

Site Location: 4400 Mt. Pisgah Rd., York, Pennsylvania 17402

Waste subject to this manifest was delivered by the above hauler to this disposal facility and accepted on

______ (DISPOSAL DATE)

Signature of authorized agent and title: ______

White, Green, Canary - Landfill   Pink - Hauler   Golden Rod - Generator

Please print or type
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.	Manifest Doc. No.	2. Page 1 of
NY0013382105	E0532	1

3. Generator's Name and Mailing Address
SEGAL CARMALLOY
183 WESTERN HIGHWAY
WEST NYACK NY 10504

4. Generator's Phone (302) 9?5-7544

5. Transporter 1 Company Name: S-J TRANSPORTATION CO.
6. US EPA ID Number: NJD071629976
A. Transporter's Phone: (856) 769-2741

7. Transporter 2 Company Name:
8. US EPA ID Number:
B. Transporter's Phone:

9. Designated Facility Name and Site Address
ENVIRITE OF PENNSYLVANIA INC.
730 VOGELSONG ROAD
YORK PA 17404

10. US EPA ID Number: PAD010154045
C. Facility's Phone: (717) 846-1900

11. Waste Shipping Name and Description	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol
a. NON-HAZARDOUS SOIL CUTTINGS RCRA AND DOT NON-REGULATED MATERIAL ASH-73-0103:	[illegible]	[illegible]	[illegible]	[illegible]
b.				
c.				
d.				

D. Additional Descriptions for Materials Listed Above
A: SOIL CUTTINGS & GRAVEL 98-99%, PLASTIC SHEETING 0.5-1%

E. Handling Codes for Wastes Listed Above
501

15. Special Handling Instructions and Additional Information
HAZARDOUS MATERIALS RESPONSE INFORMATION PRESENT" "EVERY SPILL, RELEASE OR INCIDENT MUST BE REPORTED TO ASHLAND AT 1-800-ASHLAND.

16. **GENERATOR'S CERTIFICATION:** I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name	Signature	Month	Day	Year
[illegible]	[illegible]			

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year
[illegible]	[illegible]			

GENERATOR
TRANSPORTER
FACILITY

Printed by J. J. KELLER & ASSOCIATES, INC.
Neenah, WI 54957-0368

12-BLS-C5 Rev. 12/98

T/S/D/F COPY

FGH E002728

(717) 244-3134

MODERN LANDFILL
4400 Mt. Pisgah Rd.
York, PA 17402

(717) 246-2686

Site Permit No. 100113

Document Refer **No** 02 01956

NON-HAZARDOUS WASTE MANIFEST

1. Generator of Waste (must be filled in by producer) EPA I.D. NO.: [illegible]

Company Name (Print or Type): Envirite of Pennsylvania, Inc.

Pick-up Address: 730 Vogelsong Road, York, PA 17404
(No.) (Street) (City) (State) (Zip Code)

Telephone Number: (717) 846-1900 SIC No.: 4953

Waste Stream Identification: This manifest represents a non-hazardous waste as per E.P.A. and PA D.E.P. regulations.

Tons: [illegible] Cubic Yards: Other (Specify):

Special Handling Instructions, if any:

MODERN ID NO.: [illegible]

This is to certify that the above named materials are properly classified, described, packaged, marked, and labeled and are in proper condition for transportation according to applicable state and federal law. The wastes were consigned to the transporter named. I certify that the foregoing is true and correct to the best of my knowledge.

Date: Signature: See attached
(Name and Title)

2. Contractor:

Address:

Contact: Phone:

3. Hauler of Waste (must be filled-in by hauler) EPA I.D. No.: [illegible]

COMPANY NAME: [illegible] Transportation Co. PHONE: [illegible]

ADDRESS: PO Box [illegible], [illegible], NJ [illegible]

Pick-up Date: [illegible] Truck No.: [illegible] Vehicle Lic. No.: [illegible]

The above described waste was picked up and hauled by me to the disposal facility named below and was accepted. I certify under penalty of perjury that the foregoing is true and correct.

Signature of authorized agent and title: [illegible] Date: [illegible]

4. Disposer of Waste (must be filled-in by disposer)

Company Name (Print or Type): Modern Landfill

Site Location: 4400 Mt. Pisgah Rd., York, Pennsylvania 17402

Waste subject to this manifest was delivered by the above hauler to this disposal facility and accepted on

[illegible] (DISPOSAL DATE)

Signature of authorized agent and title: [illegible]

White, Green, Canary - Landfill Pink - Hauler Golden Rod - Generator

POH E00272B

(717)244-3134

MODERN LANDFILL
4400 Mt. Pisgah Rd.
York, PA 17402
(717) 246-2686

Site Permit No. 100113

Document Refer No 02 01956

NON-HAZARDOUS WASTE MANIFEST

1. Generator of Waste (must be filled in by producer) EPA I.D. NO.: PAD010154045

Company Name (Print or Type): Envirite of Pennsylvania, Inc.

Pick-up Address: 730 Vogelsong Road, York, PA 17404
(No.) (Street) (City) (State) (Zip Code)

Telephone Number: (717) 846-1900 SIC No.: 4953

Waste Stream Identification: This manifest represents a non-hazardous waste as per E.P.A. and PA D.E.P. regulations.

Tons: 26.43 Cubic Yards: Other (Specify):

Special Handling Instructions, if any:

MODERN ID NO.: 20725J2A

This is to certify that the above named materials are properly classified, described, packaged, marked, and labeled and are in proper condition for transportation according to applicable state and federal law. The wastes were consigned to the transporter named. I certify that the foregoing is true and correct to the best of my knowledge.

Date: 9/26/02 Signature: Lori Cathcart
(Name and Title)

2. Contractor:

Address:

Contact: Phone:

3. Hauler of Waste (must be filled-in by hauler) EPA I.D. No.: NJD071629976

COMPANY NAME: S-J Transportation Co. PHONE: (856) 769-2741

ADDRESS: PO Box 169, Woodstown, NJ 08098

Pick-up Date: 9-26-02 Truck No.: 2002 Vehicle Lic. No.: AB3970 NJ

The above described waste was picked up and hauled by me to the disposal facility named below and was accepted. I certify under penalty of perjury that the foregoing is true and correct.

Signature of authorized agent and title: [signature] Date: 9-26-02

4. Disposer of Waste (must be filled-in by disposer)

Company Name (Print or Type): Modern Landfill

Site Location: 4400 Mt. Pisgah Rd., York, Pennsylvania 17402

Waste subject to this manifest was delivered by the above hauler to this disposal facility and accepted on
(DISPOSAL DATE)

Signature of authorized agent and title:

White, Green, Canary - Landfill Pink - Hauler Golden Rod - Generator

Please print or type
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST	1. Generator's US EPA ID No. NY0013382106	Manifest Doc. No. 20534	2. Page 1 of 1

3. Generator's Name and Mailing Address
SEGUA CHROMALLOY
159 WESTERN HIGHWAY
WEST NYACK NY 10904

4. Generator's Phone (302) 395-7544

5. Transporter 1 Company Name: S-J TRANSPORTATION CO.
6. US EPA ID Number: NJD071629976
A. Transporter's Phone: (856) 769-2741

7. Transporter 2 Company Name
8. US EPA ID Number
B. Transporter's Phone

9. Designated Facility Name and Site Address
ENVIRITE OF PENNSYLVANIA INC.
730 VOGELSONG ROAD
YORK PA 17404
10. US EPA ID Number: PA0010154045
C. Facility's Phone: (717) 846-1900

11. Waste Shipping Name and Description	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol
a. NON-HAZARDOUS SOIL CUTTINGS RCRA AND DOT NON-REGULATED MATERIAL ASH-73-0103:	[illegible]	[illegible]	[illegible]	[illegible]
b.				
c.				
d.				

GENERATOR

D. Additional Descriptions for Materials Listed Above
A: SOIL CUTTINGS & GRAVEL 98-99%, PLASTIC SHEETING 0.5-1%

E. Handling Codes for Wastes Listed Above
501

15. Special Handling Instructions and Additional Information
"HAZARDOUS MATERIALS RESPONSE INFORMATION PRESENT" ____ "EVERY SPILL, RELEASE OR INCIDENT MUST BE REPORTED TO ASHLAND AT 1-800-ASHLAND.

16. **GENERATOR'S CERTIFICATION:** I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name [illegible] | Signature [signature] | Month Day Year

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name | Signature | Month Day Year

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name | Signature | Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name [illegible] | Signature [signature] | Month Day Year

MODERN LANDFILL
4400 Mt. Pisgah Rd.
York, PA 17402

(717) 246-2686

Site Permit No. 100113

Document Refer **No** 02 01955

NON-HAZARDOUS WASTE MANIFEST

1. Generator of Waste (must be filled in by producer) EPA I.D. NO.: PAD010154045

Company Name (Print or Type): Envirite of Pennsylvania, Inc.

Pick-up Address: 730 Vogelsong Road, York, PA 17404
(No.) (Street) (City) (State) (Zip Code)

Telephone Number: (717) 846-1900 SIC No.: 4953

Waste Stream Identification: This manifest represents a non-hazardous waste as per E.P.A. and PA D.E.P. regulations.

Tons: 20.69 Cubic Yards: Other (Specify):

Special Handling Instructions, if any:

MODERN ID NO.: 20725J2A

This is to certify that the above named materials are properly classified, described, packaged, marked, and labeled and are in proper condition for transportation according to applicable state and federal law. The wastes were consigned to the transporter named. I certify that the foregoing is true and correct to the best of my knowledge.

Date: 9/26/02 Signature: [signature]
(Name and Title)

2. Contractor:

Address:

Contact: Phone:

3. Hauler of Waste (must be filled-in by hauler) EPA I.D. No.: NJD071629976

COMPANY NAME: S-J Transportation Co. PHONE: (856) 769-2741

ADDRESS: PO Box 169, Woodstown, NJ 08098

Pick-up Date: 9-26-02 Truck No.: 239 Vehicle Lic. No.: AE 240m

The above described waste was picked up and hauled by me to the disposal facility named below and was accepted. I certify under penalty of perjury that the foregoing is true and correct.

Signature of authorized agent and title: [signature] Date: 9-26-02

4. Disposer of Waste (must be filled-in by disposer)

Company Name (Print or Type): Modern Landfill

Site Location: 4400 Mt. Pisgah Rd., York, Pennsylvania 17402

Waste subject to this manifest was delivered by the above hauler to this disposal facility and accepted on

9/26/02 (DISPOSAL DATE)

Signature of authorized agent and title: [signature]

White, Green, Canary - Landfill Pink - Hauler Golden Rod - Generator

Please print or type
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. NYU01338[illegible]106	Manifest Doc. No. 20335	2. Page 1 of 1

3. Generator's Name and Mailing Address
[illegible]
169 WESTERN HIGHWAY
WEST NYACK NY 10904

4. Generator's Phone (302) 395-7544

5. Transporter 1 Company Name S-J TRANSPORTATION CO.	6. US EPA ID Number NJD071629975	A. Transporter's Phone (856) 769-2741
7. Transporter 2 Company Name	8. US EPA ID Number	B. Transporter's Phone
9. Designated Facility Name and Site Address ENVIRITE OF PENNSYLVANIA INC. 730 VOGELSONG ROAD YORK PA 17404	10. US EPA ID Number PAD010154045	C. Facility's Phone (717) 846-1900

11. Waste Shipping Name and Description	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol
a. NON-HAZARDOUS SOIL CUTTINGS RCRA AND DOT NON-REGULATED MATERIAL ASH-73-0103:		DT		
b.			[illegible]	
c.				
d.				

D. Additional Descriptions for Materials Listed Above A: SOIL CUTTINGS & GRAVEL 98-99%, PLASTIC SHEETING 0.5-1%	E. Handling Codes for Wastes Listed Above S01

15. Special Handling Instructions and Additional Information
"HAZARDOUS MATERIALS RESPONSE INFORMATION PRESENT" ____ "EVERY SPILL, RELEASE OR INCIDENT MUST BE REPORTED TO ASHLAND AT 1-800-ASHLAND.

GENERATOR

16. **GENERATOR'S CERTIFICATION:** I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name	Signature	Month	Day	Year
[illegible]	[signature]			

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year
[illegible]	[signature]			

PCF E002722

MODERN LANDFILL
4400 Mt. Pisgah Rd.
York, PA 17402

(717) 246-2686

Site Permit No. 100113

Document Refer **No** 02 01957

NON-HAZARDOUS WASTE MANIFEST

1. Generator of Waste (must be filled in by producer) EPA I.D. NO.: PAD010154045

Company Name (Print or Type): Envirite of Pennsylvania, Inc.

Pick-up Address: 730 Vogelsong Road, York, PA 17404
(No.) (Street) (City) (State) (Zip Code)

Telephone Number: (717) 846-1900 SIC No.: 4953

Waste Stream Identification: This manifest represents a non-hazardous waste as per E.P.A. and PA D.E.P. regulations.

Tons: 23.57 Cubic Yards: ___ Other (Specify): ___

Special Handling Instructions, if any:

MODERN ID NO.: 20725J2A

This is to certify that the above named materials are properly classified, described, packaged, marked, and labeled and are in proper condition for transportation according to applicable state and federal law. The wastes were consigned to the transporter named. I certify that the foregoing is true and correct to the best of my knowledge.

Date: 9/26/02 Signature: [signature]
(Name and Title)

2. Contractor:

Address:

Contact: Phone:

3. Hauler of Waste (must be filled-in by hauler) EPA I.D. No.: NJD071629976

COMPANY NAME: S-J Transportation Co. PHONE: (856) 769-2741

ADDRESS: PO Box 169, Woodstown, NJ 08098

Pick-up Date: 9/26/02 Truck No.: 1293 Vehicle Lic. No.: AG 752 F NJ

The above described waste was picked up and hauled by me to the disposal facility named below and was accepted. I certify under penalty of perjury that the foregoing is true and correct.

Signature of authorized agent and title: [signature] Date: 9/26/02

4. Disposer of Waste (must be filled-in by disposer)

Company Name (Print or Type): Modern Landfill

Site Location: 4400 Mt. Pisgah Rd., York, Pennsylvania 17402

Waste subject to this manifest was delivered by the above hauler to this disposal facility and accepted on

(DISPOSAL DATE)

Signature of authorized agent and title: [signature]

White, Green, Canary - Landfill Pink - Hauler Golden Rod - Generator

Please print or type.
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. NYD013382106 | Manifest Doc. No. 20535 | 2. Page 1 of 1

3. Generator's Name and Mailing Address
SEQUA CHROMALLOY
169 WESTERN HIGHWAY
WEST NYACK NY 10984

4. Generator's Phone (302) 995-7544

5. Transporter 1 Company Name: S-J TRANSPORTATION CO.
6. US EPA ID Number: NJD071629375
A. Transporter's Phone: (856) 769-2741

7. Transporter 2 Company Name
8. US EPA ID Number
B. Transporter's Phone

9. Designated Facility Name and Site Address
ENVIRITE OF PENNSYLVANIA INC.
730 VOGELSONG ROAD
YORK PA 17404
10. US EPA ID Number: PAD010154045
C. Facility's Phone: (717) 846-1900

11. Waste Shipping Name and Description	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol
a. NON-HAZARDOUS SOIL CUTTINGS RCRA AND DOT NON-REGULATED MATERIAL ASH-73-0103;	[illegible]	[illegible]	[illegible]	Y
b.				
c.				
d.				

D. Additional Descriptions for Materials Listed Above
A: SOIL CUTTINGS & GRAVEL 98-99%, PLASTIC SHEETING 0.5-1%

E. Handling Codes for Wastes Listed Above
S01

15. Special Handling Instructions and Additional Information
"HAZARDOUS MATERIALS RESPONSE INFORMATION PRESENT" "EVERY SPILL, RELEASE OR INCIDENT MUST BE REPORTED TO ASHLAND AT 1-800-ASHLAND.

16. **GENERATOR'S CERTIFICATION:** I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name | Signature | Month Day Year

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name | Signature | Month Day Year

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name | Signature | Month Day Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name | Signature | Month Day Year

GENERATOR
TRANSPORTER
FACILITY

Printed by J. J. KELLER & ASSOCIATES, INC.
Neenah, WI 54957-0368

12-BLS-C5 Rev. 12/98

T/S/D/F COPY

APPENDIX V

COMMUNICATIONS

F

ENVIRONMENTAL ALLIANCE

February 22, 2002

• *Engineering*
• *Remediation*
• *Consulting*

Mr. Ramanand Pergadia, P.E.
New York State Department of Environmental Conversation (NYSDEC)
Division of Hazardous Waste Remediation, Region 3
21 South Putt Corners Road
New Palta, NY 12561-1696

Re: Transformer Excavation Soil Sample Results
Former Chromalloy Facility in West Nyack, New York – No. 344039

Dear Mr. Pergadia:

Environmental Alliance, Inc. (Alliance) has evaluated the investigation and sampling activities conducted associated with the electrical transformer pad excavation for the remediation treatment building on Friday January 18, 2002 at the Former Chromalloy Facility (Facility). Refer to Figure 1 for location. The investigation and sampling activities were conducted by Alliance in response to odors noted from the excavation and excavated soil pile. Overall, the investigation results indicated minimal detection of volatile organic compounds (VOCs) that are not associated with the main constituent of concern trichloroethene (TCE) at the Facility. A discussion of the results for the investigation activities is provided below.

Alliance initially screened the 8-feet wide by 8-feet long by 4-feet deep excavation (portion of excavation was filled with gravel, approximately 1-foot maximum in some areas) with a calibrated Flame Ionization Detector (FID). Soil from each sidewall was screened with the FID at intervals of 0.5 to 1.5 feet, 1.5 to 2.5 feet and 2.5 to 3 feet along the centerline of each sidewall. Soil from the bottom of the excavation 4-feet below grade (bg) was screened with the FID at two locations. Two locations of the excavated soil stockpile (soil pile) were also screened with a FID. Refer to Figure 2 for locations. The soil screening results indicated generally low screening results ranging from 0.1 FID units (west wall 0.5 to 1.5 feet) to 16.8 FID units at the bottom #1 location. The soil screening results showed increasing concentrations as depth increased with the two excavation bottom locations reporting the highest FID screening results of 16.8 FID units (Bottom #1) and 13.9 FID units (Bottom #2). The excavated soil pile showed overall low soil screening results of 5.7 FID units (Pile #1) and 4.9 FID units (Pile #2). Refer to Table 1 for a summary of the FID soil screening data.

During soil screening activities, the excavation and soil pile were visually inspected for visual signs of impact such as discolored soil, separate phase hydrocarbons, etc. No visual signs of contamination were evident during this inspection. Additionally, Alliance personnel noted two distinct odors to emanate from the soil pile and excavation area. The soil pile had a sweet odor and the excavation had a methane/sulfur odor.

Due to the lack of any visual signs of contamination, Alliance collected soil samples for laboratory analysis based on the reported the highest FID screening result. One soil sample from each sidewall, the excavation bottom, and the soil pile was collected and placed within laboratory supplied bottleware. A total of six soil samples were collected for laboratory analysis. The bottleware was labeled and placed within an iced cooler for transport via overnight courier to ChemTech of Mountainside, New Jersey under proper chain of custody. All soil samples were analyzed for VOCs via EPA Method 8260 + 10 tentatively identified compounds (TICs).

Alliance personnel additionally placed 3-feet of 4-inch diameter PVC well screen (0.02-inch slot) and 1-foot of 4-inch diameter casing to a depth of 4-feet bg at the middle of the east side wall. This was pre-placed during the sampling activities as a soil vapor extraction (SVE) point in the transformer excavation, should soil remedial action of the area be warranted. Further excavation activities for trenching near the transformer pad were discontinued until results of the soil analysis would be available (Monday late afternoon January 21, 2002) and could be evaluated by Alliance.

Review of the soil analytical data, indicated minimal VOC concentrations of acetone (high concentration of 11 µg/kg at SS-2), ethyl benzene (high concentration of 40 µg/kg at SS-3), and m/p xylenes (high concentration 21 µg/kg at SS-3). The reported acetone, ethyl benzene, and m/p xylene concentrations are all below their NYSDEC soil cleanup guidelines. Additionally, estimated TICs concentrations were reported at all the soil sample locations at estimated concentrations in the range of non-detect to 280 µg/kg. No TCE or associated VOC concentrations were reported. The analytical results presented do not indicate remedial action is warranted for the VOCs detected. Refer to Table 2 for a summary of the transformer excavation soil data.

Based on the investigation results, there is no strong association of the noted odor from the soil at the transformer excavation with VOC constituents indicated by the soil sample analyses. It is possible that the odors noted from the soil are associated with an anaerobic environment, based on the sulfur odor noted within the excavation and the low lying nature of the area to collect standing water. The presence of hydrogen sulfide and methane (odorless) from an anaerobic environment could also account for the FID screening results. This is consistent with the verbal information provided to you and Mr. Jim Schreyer of the NYSDEC via voice mail on January 22, 2002.

Considering the above information, Alliance feels excavation activities can proceed in the area with continued monitoring with a Photo Ionization Detector (PID) or FID and a dust monitor. Additionally, Alliance will monitor excavation activities in this area for lower explosive limit (LEL), oxygen percent (O_2), methane (CH_4), hydrogen sulfide (H_2S), and carbon monoxide (CO). As Alliance proceeds with further soil intrusive construction and drilling activities, these activities will also be monitored. Alliance does not expect the continuing site activities will be a problem.

On January 23, 2002, Alliance and NYSDEC personnel collected split soil samples from the excavated soil stockpile for laboratory analysis for EPA Method 8021B – full. The analytical analysis to be used by the NYSDEC was confirmed by Mr. Andrew Applebaum's (Alliance) in a conversation with Mr. Schreyer (NYSDEC) on January 24, 2002. When available, Alliance will provide you with a copy of the soil analytical results.

Should you have any questions regarding the transformer pad excavation, feel free to contact Andrew Applebaum or me at (302) 995-7544.

Sincerely,
ENVIRONMENTAL ALLIANCE, INC.

William Smith

William Smith, P.G.
Project Director

Attachments

c: Mark Crawford, Sequa Corporation (w/ attach)
Leonard Pasculli, Esq., Sequa Corporation (w/ attach)
Mark Pennington, Esq., Morgan, Lewis, & Bockius, LLP (w/ attach)
Rosalie Rusinko, Esq., NYSDEC (w/ attach)
Gary Litwin, NYSDOH (w/ attach)
Catherine Quinn/Daniel Miller, RCDOH (w/ attach)
John Magee, Bradley Corporate Park (w/ attach)

J:\EAI\1166\correspondence\2002 Letters and Memo's\NYSDEC Transformer Excavation Results.doc

Table 1
Transformer Excavation - Soil FID Data
Former Chromalloy Facility, West Nyack, NY

Sample Location	Depth (BG)	FID Reading (ppm)	Sample Collected
North 1	0.5-1.5 '	0.3	
North 2	1.5-2.5'	0.7	
North 3	2.5-3.0'	3.6	SS-1
East 1	0.5-1.5'	0.8	
East 2	1.5-2.5'	11.7	
East 3	2.5-3.0'	13.6	SS-2
South 1	0.5-1.5'	0.5	
South 2	2.5-2.5'	1.7	
South 3	2.5-3.0'	6.8	SS-3
West 1	0.5-1.5'	0.1	
West 2	1.5-2.5'	0.7	
West 3	2.5-3.0'	5.3	SS-4
Bottom 1	4.0'	16.8	SS-5
Bottom 2	4.0'	13.9	
Pile 1	Center (East)	5.7	Pile-1
Pile 2	Center (West)	4.9	

FID = Flame Ionization Detector
BG = Below Grade

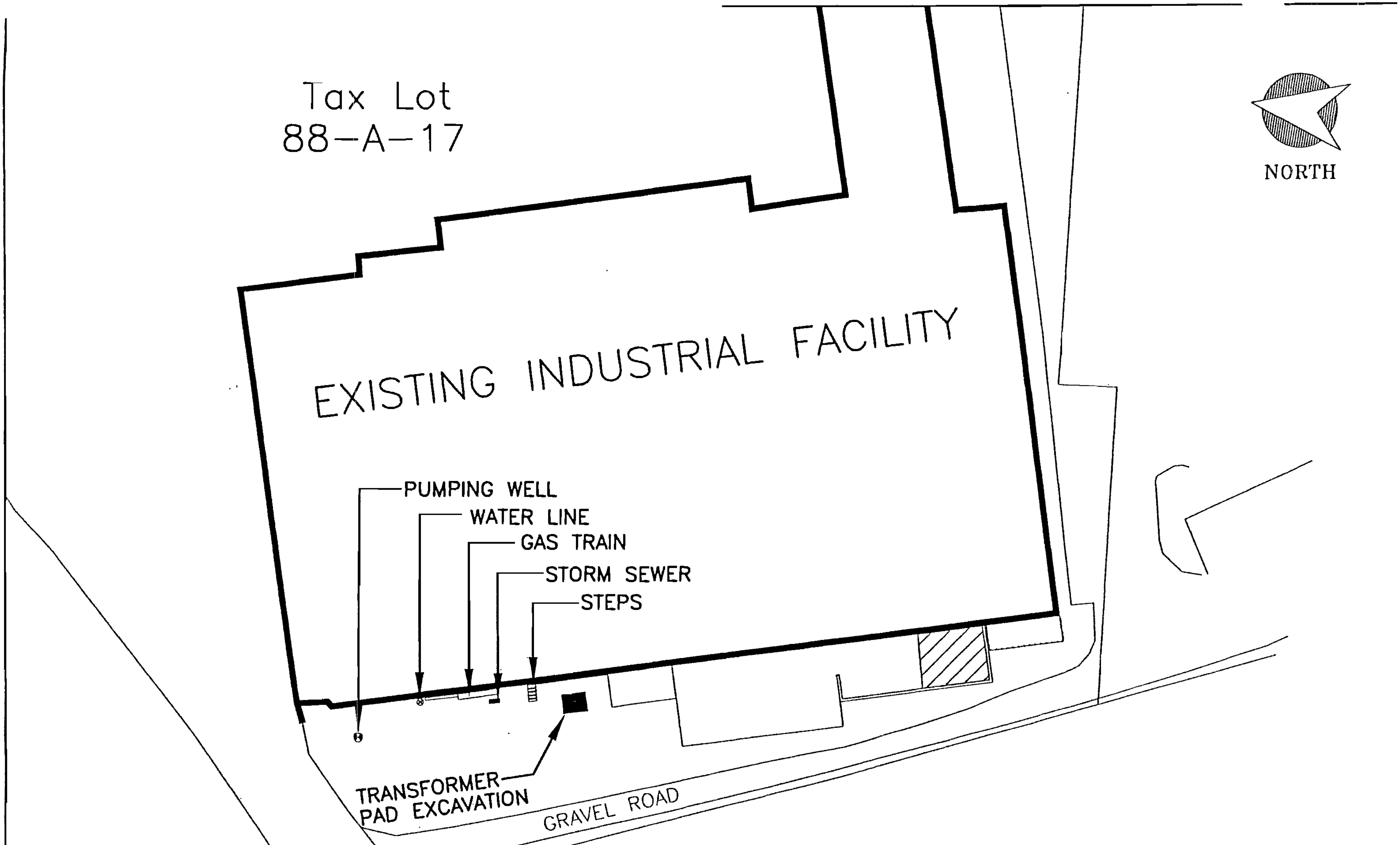
Table 2
Transformer Excavation Soil Data
Former Chomalloy Facility, West Nyack, NY

SAMPLE ID:	Soil NYSDEC	SS-1	SS-2	SS-3	SS-4	SS-5	Pile -1
DATE:	Guidelines (ug/kg)*	01/18/02	01/18/02	01/18/02	01/18/02	01/18/02	01/18/02
Analytes ug/kg							
Acetone	200	7.5	11	10	7.3	8.4	8.3
Ethyl Benzene	5,500			40		15	3.2
m/p-Xylenes	1,200			21		7.8	1.5 J
TICs							
1-Hexanol, 2-ethyl-	NA						220 J
1-Hexene, 3,3,5-trimethyl-	NA		180 J	130 J			280 J
1-Octanol, 2-butyl-	NA	140 J					
1-Undecene, 4-methyl-	NA	150 J					
2-Decene, 5-methyl-, (Z)-	NA			110 J			
2-Pentene, 2,4,4-trimethyl-	NA			180 J			
4-Octen-3-one	NA					260 J	
4-Octene, 2,6-dimethyl-, [S-	NA					150 J	
Benzene, 1-methyl-4-(1-methyl	NA				73 J		
Cyclododecene	NA		190 J				
Cycloheptane, methyl-	NA		290 J			230 J	
Cyclohexane, 1-ethyl-1-methyl	NA				120 J		
Cyclohexane, 1-ethyl-3-pent	NA				87 J		
Cyclohexane, 1-ethyl-4-methyl	NA		260 J				
Cyclohexane, 1-methyl-2-prop	NA						150 J
Cyclohexane, 1,3-dimethyl	NA			93 J			
Cyclohexane, 1,4-dimethyl-,	NA			210 J			
Cyclohexane, 2-butyl-1,1,3-t	NA	180 J					
Cyclohexane, (2-methylpropyl	NA						140 J
Cyclohexane, butyl-	NA			150 J		190 J	
Cyclohexane, propyl-	NA						140 J
Cyclopentane, 1-1'-ethyliden	NA	250 J					
Decane, 4-methyl-	NA	140 J	440 J	190 J	68 J	240 J	140 J
Di-tert-butyl disulfide	NA					190 J	
Dodecane, 6-methyl-	NA	220 J			150 J		
Heptadecane	NA				72 J		
Heptane, 3-ethyl-2-methyl-	NA		190 J				
Naphthalene, decahydro-2-met	NA	250 J			69 J	160 J	
Nonane, 4-methyl-	NA			120 J		140 J	170 J
Octane, 2,3-dimethyl-	NA					130 J	
Octane, 3,6-dimethyl-	NA						150 J
Phosphonic acid, dioctadecyl	NA		220 J				
Tridecane, 7-methyl-	NA	210 J			150 J		
Unknown	NA	190 J					
Unknown	NA	190 J					
Unknown	NA		220 J				
Unknown	NA		230 J				
Unknown	NA		190 J				
Unknown	NA			120 J			
Unknown	NA			95 J			
Unknown	NA				100 J		
Unknown	NA				77 J		
Unknown	NA					200 J	
Unknown	NA						230 J
Unknown	NA						150 J

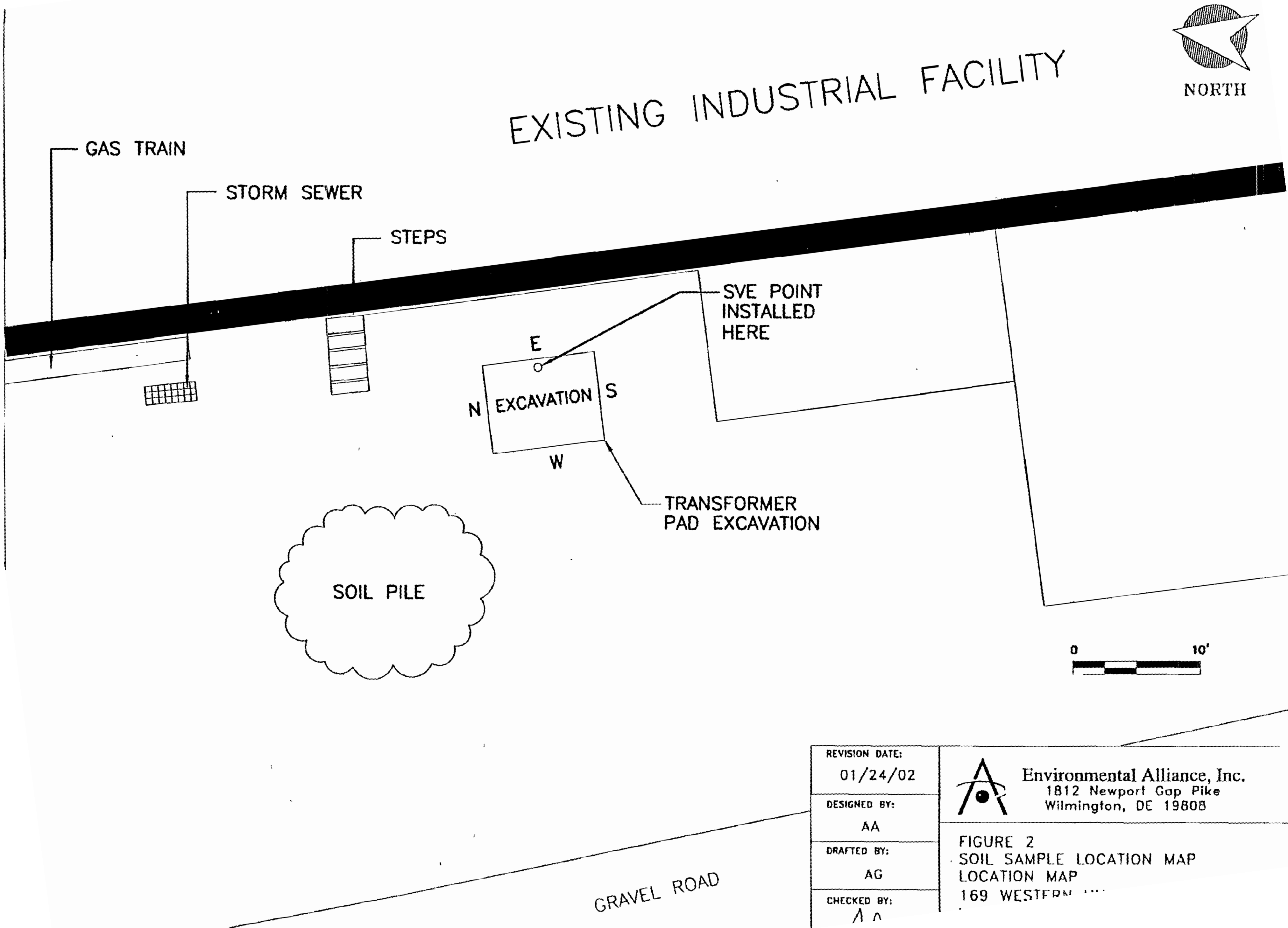
J = Estimated Value

TICs = Tentatively Identified Compounds

* New York State Department of Environmental Conservation recommended soil clean up objectives for volatile organic contaminants (January 1994).



REVISION DATE: 01/24/02	Environmental Alliance, Inc. 1812 Newport Gap Pike Wilmington, DE 19808
DESIGNED BY: AA	FIGURE 1 TRANSFORMER PAD EXCAVATION LOCATION MAP 169 WESTERN HIGHWAY WEST NYACK, NEW YORK
DRAFTED BY: AG	
CHECKED BY: AA	



REVISION DATE: 01/24/02
DESIGNED BY: AA
DRAFTED BY: AG
CHECKED BY: A A

Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808

FIGURE 2
SOIL SAMPLE LOCATION MAP
LOCATION MAP
169 WESTERN ...

May 23, 2002

ENVIRONMENTAL ALLIANCE

Mr. Ramanand Pergadia, P.E.
New York State Department of Environmental Conversation (NYSDEC)
Division of Hazardous Waste Remediation, Region 3
21 South Putt Corners Road
New Palta, NY 12561-1696

• *Engineering*
• *Remediation*
• *Consulting*

Re: Sentinel Well Soil Cuttings and Soil Stockpile Sample Results
Former Chromalloy Facility in West Nyack, New York – No. 344039

Dear Mr. Pergadia:

Environmental Alliance, Inc. (Alliance) has collected representative soil samples from sentinel well (MW-18B) soil cuttings and soil stockpile from construction excavation activities on April 23, 2002. The soil samples were collected to evaluate the analytical results to determine if the soil can be used as clean fill at off site locations. Based on the comparison of the analytical results for the separate soil origins (off site sentinel well and on site construction excavation) to NYSDEC background levels and New York State Department of Health (NYSDOH) residential values, the soil appears to be suitable for off site use. Before Alliance distributes the soil for off site use, we wish to have the NYSDEC's approval to do so. For your convenience, Alliance has prepared a discussion of the soil sampling activities conducted and a summary of the results that is provided below.

Sentinel Well (MW-18B) Soil Cuttings
On May 1, 2002, Alliance collected a composite soil sample from the soil/bedrock drill cuttings stockpile generated during installation of the bedrock well MW-18B in the Western Highway right-of-way to investigate off site groundwater quality. Alliance personnel collected the composite soil sample from several locations and depths using examination gloves as the drill cuttings were shoveled into a backhoe bucket. The drill cuttings (about 2.5 yds^3) were subsequently loaded into a dump truck and transported to an off site location where the soil has been stockpiled on and covered with plastic awaiting final disposition. The soil sample (MW-18B Cuttings) was placed within an iced cooler and submitted to ChemTech of Mountainside, NJ under proper chain-of–custody. The soil sample was analyzed for volatile organic compounds (VOCs) via EPA Method 8260+10 tentatively identified compounds (TICs), semi-volatile organic compounds (SVOCs) via EPA Method 8270+10 TICs, and priority pollutant metals (PPMetals) via various EPA Methods. Note that Photo-Ionization Detector (PID) screening of soil and ambient air during drilling activities showed non-detectable responses. The soil analytical results are summarized below and are presented in Table 1 attached.

The VOC soil analysis of the MW-18B drilling cuttings reported non-detectable VOC results, which indicates that VOCs are not a concern in the soil.

1812 Newport Gap Pike Wilmington, DE 19808
302-995-7544 302-995-0941 Fax www.EnvAlliance.com

The SVOC soil analysis reported the following non-qualified constituents chrysene, fluoranthene, phenanthene, and pyrene below their respective NYSDOH guidance levels, with only chrysene at 510 ug/kg reported above its NYSDEC guidance level of 400 ug/kg. Additionally, SVOCs benzo(a)pyrene and benzo(a)anthracene were reported at estimated concentrations of 360 ug/kg and 380 ug/kg, respectively, which are above their NYSDEC guidance levels, but below their NYSDOH guidance levels. Additionally, the reported benzo(a)pyrene concentration is below the NYSDOH non-cancer value (5,800,000 ug/kg), but slightly above the NYSDOH cancer value (250 ug/kg). However, since the benzo(a)pyrene and benzo(a)anthracene are reported as estimated concentrations for the soil sample analyzed, Alliance does not consider the reported concentrations a concern as they may not be representative of the soil. The remainder of the SVOCs and SVOC TICs were reported as estimated or otherwise qualified results below their respective NYSDEC or NYSDOH guidance levels (note that the SVOC TICs reported do not have NYSDEC or NYSDOH guidance levels). All other SVOCs reported are not considered a concern as their reported concentrations are below either below NYSDEC or NYSDOH guidance levels, they are reported at estimated concentrations, or there are no assigned NYSDEC or NYSDOH guidance levels. Based on the SVOC data results, the reported SVOCs in soil are not considered a concern.

The PPMetals soil analysis reported several constituents (arsenic, beryllium, chromium, copper, lead, nickel, and zinc) that were below their respective NYSDEC and NYSDOH guidance levels. Based on this comparison of analytical data to NYSDEC and NYSDOH guidance levels, metals in the soil are not considered a concern.

Soil Stockpile from Construction Excavation

On April 23, 2002, Alliance collected nine grab soil samples and three composite soil samples from the soil stockpile generated during on site construction excavation for the treatment building utilities, deep groundwater pump piping, and dual phase extraction point piping. Alliance personnel collected the following soil samples for analysis from the soil stockpile estimated at 100 yds^3 (refer to Figure 1). Three grab soil samples (SS-1 through SS-3) and one composite soil sample (SS-10) were collected from four different locations at variable depths for VOCs via EPA Method 8260+10 TICs. Three grab soil samples (SS-4 through SS-6) and one composite soil sample (SS-11) were collected from four different locations at variable depths for VOCs via EPA Method 8021+10 TICs. Three grab soil samples (SS-7 through SS-9) and one composite soil sample (SS-12) were collected from four different locations at variable depths for PPMetals via various EPA Methods. The soil samples were placed within an iced cooler and submitted to ChemTech of Mountainside, NJ under proper chain-of–custody. The soil analytical results are summarized below and are presented in Table 2 attached.

The VOC analysis of soil samples SS-1, SS-2, SS-3, and SS-10 from the soil stockpile reported low estimated concentrations of trichloroetene (TCE) and tetrachloroethene (PCE) below their respective NYSDEC guidance levels (no available NYSDOH guidance level). Additionally, two VOC TICs were reported at low estimated concentrations with no assigned NYSDEC and NYSDOH guidance levels. Based on the VOC analytical results reported as estimated concentrations and below NYSDEC guidance levels available, VOCs in the soil are not considered a concern.

The VOC analysis of soil samples SS-4, SS-5, SS-6, and SS-11 from the soil stockpile reported a low estimated concentration of methylene chloride below its respective NYSDEC guidance level (no available NYSDOH guidance level). Additionally, several VOC TICs were reported at low estimated concentrations with no assigned NYSDEC and NYSDOH guidance levels. Based on the VOC analytical results reported as estimated concentrations and below NYSDEC guidance levels available, the VOCs reported in the soil are not considered a concern.

The PPMetals analysis of soil samples SS-7, SS-8, SS-9, and SS-12 from the soil stockpile reported several constituents (antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc) that were all below their respective NYSDOH guidance levels. Of these constituents, only arsenic at SS-8, mercury at SS-7 and SS-12, and chromium and nickel at all metal soil sample locations were reported above their respective NYSDEC guidance levels. The remaining constituents were either below NYSDEC and NYSDOH guidance levels or were qualified by the laboratory and are not considered representative of the soil. Based on this comparison of the analytical data to NYSDEC and NYSDOH guidance levels, the presence of metals in the soil are not considered a concern.

Conclusions

Considering the above information, Alliance feels the soil generated during the sentinel well installation and the construction excavation activities is suitable for off site use since the constituents detected are all below their respective NYSDOH residential values for soil or are laboratory qualified and is not considered representative of the soil. After you have reviewed the data, let us known if you concur with the off site use of the soil by issuing a letter of acknowledgement. Alliance will await your concurrence before we proceed to ship the soil for off site use.

Should you have any questions regarding the soil data, feel free to contact Bill Smith or me at (302) 995-7544 as we would like to proceed quickly with moving the soil.

Sincerely,
ENVIRONMENTAL ALLIANCE, INC.

Andrew J. Applebaum

Andrew J. Applebaum, P.G.
Project Geologist

Attachments

c: Mark Crawford, Sequa Corporation (w/ attach)
Leonard Pasculli, Esq., Sequa Corporation (w/ attach)
Mark Pennington, Esq., Morgan, Lewis, & Bockius, LLP (w/ attach)
Rosalie Rusinko, Esq., NYSDEC (w/ attach)
Gary Litwin, NYSDOH (w/ attach)
Catherine Quinn/Daniel Miller, RCDOH (w/ attach)
John Magee, Bradley Corporate Park (w/ attach)

J:\EAI\1166\correspondence\2002 Letters and Memo's\NYSDEC MW-18 soil stockpile data.doc

Table 1
MW-18 B Cutting Analysis
Former Chomalloy Facility
West Nyack, New York

SAMPLE ID:	NYSDEC Recommended Clean-Up Levels[1]	NYSDOH Residential Values[2] Noncancer / Cancer	MW-18B Cuttings
DATE:			05/01/02
Organics (ug/kg):			
VOCs:	NA	NA	ND
SVOCs:			
Acenaphthylene	41,000	12,000,000[b] / none	130 J
Anthracene	50,000^	16,000,000[d] / none	78 J
Benzo(a)anthracene	224 or MDL	5,800,000[g] / 2,500[h]	380 J
Benzo(a)pyrene	61 or MDL	5,800,000[g] / 250[h]	360 J
Benzo(b)fluoranthene	1,100	5,800,000[g] / 2,500[h]	350 J
Benzo(g,h,I)perylene	50,000^	5,800,000[g] / none	190 J
Benzo(k)fluoranthene	1,100	5,800,000[g] / 25,000[h]	390 J
bis(2-Ethylhexyl)phthalate	50,000^	3,900,000[b] / 177,000[a]	160 J
Butylbenzylphthalate	50,000^	16,000,000[d] / none	58 J
Carbazole	NA	7,700,000[b] / 120,000[c]	50 J
Chrysene	400	5,800,000[g] / 25,000[h]	510
Fluoranthene	50,000^	7,700,000[b] / none	780
Indeno(1,2,3-cd)pyrene	3,200	5,800,000[g] / 2,500[h]	160 J
Phenanthrene	50,000^	5,800,000[g] / none	520
Pyrene	50,000^	5,800,000[b] / none	820
Total SVOCs:	NA	NA	2,630
Qualifiers:	NA	NA	2,306 J
TICs (ug/kg):			
ACP	NA	NA	1,100 A
ACP	NA	NA	12,000 A
ACP	NA	NA	1,300 A
ACP	NA	NA	820 A
Anthracene, 2-methyl-	NA	NA	360 J
Dotriacontane	NA	NA	1,000 J
Eicosane, 10-methyl-	NA	NA	1,300 J
Nonadecane	NA	NA	1,100 J
Octacosane	NA	NA	980 J
Octadecane	NA	NA	760 J
Pentatriacontane	NA	NA	1,100 J
Unknown	NA	NA	330 J
Unknown	NA	NA	300 J

Table 1
MW-18 B Cutting Analysis
Former Chomalloy Facility
West Nyack, New York

SAMPLE ID:	NYSDEC Recommended Clean-Up Levels[1]	NYSDOH Residential Values[2] Noncancer / Cancer	MW-18B Cuttings
DATE:			05/01/02
Inorganics (mg/kg):			
Antimony	SB (NA)	77[b] / none	
Arsenic	7.5 or SB (3-12 NY State)	58[b] / 1.65[a]	2.3*
Beryllium	0.16 or SB (0-1.75 E. USA)	390[b] /none	0.70
Cadmium	1.0 or SB (0.1-1 E. USA)	140[e] / none	
Chromium	10.0 or SB (1.5-40 NY State)	580[b] / none	18.5 N*
Copper	25.0 or SB (1-50 E. USA)	7,700[c] / none	4.3 N*E
Lead	SB (200-500 E. USA)	400[e] / none	3.1*
Mercury	0.1	58[b] / none	
Nickel	13.0 or SB (0.5-25 E. USA)	3,900[b] / none	13.7*
Selenium	2.0 or SB (0.1-3.9 E. USA)	970[b] / none	
Silver	SB (NA)	970[b] / none	
Thallium	SB (NA)	14[f] / none	
Zinc	20.0 or SB (9-50 E. USA)	16,000[d] / none	26.1 N*

Table 1
MW-18 B Cutting Analysis
Former Chomalloy Facility
West Nyack, New York

Notes:

Non-reported constituents were not detected above the analysis method detection limit (MDL).

Blank spaces for reported constituents indicate non-detectable results for the sample analyzed.

1. New York State Department of Environmental Conservation (NYSDEC) Recommended Soil Cleanup Objectives from NYSDEC January 1994 memorandum: Determination Of Soil Cleanup Objectives And Cleanup Levels.

^ = As per TAGM #4046, Total Pesticide <10ppm

SB = Site Background

NA = Not Available/Applicable

2. New York State Department of Health (NYSDOH) Residential Comparison Values (noncancer / cancer) used by NYSDOH in Table 1 and 2 attached to Pine View Road Residents' communications regarding soil sampling results (September 2001).

[a] = US EPA Cancer Potency Factor

[b] = US EPA Reference Dose Value - noncancer

[c] = US EPA Health Effects Assesment Summary Table Value - noncancer

[d] = Recommended default skin irritation threshold level - noncancer

[e] = New York State Reference Guideline Value - noncancer

[f] = Provisional value from US EPA Superfund Technical Support Center; National Center for Environmental Assessment - noncancer

[g] = Based upon reference dose of structurally or otherwise similar compounds - noncancer

[h] = New York State Dept. of Health cancer potency factor; values for carcinogenic PAHs derived from relative potency factors and NYS CPF for benzo(a)pyrene - cancer

TICs = Tentatively Identified Compounds

B = If the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).

J = Estimated concentration.

A = TIC is a suspected aldol-condensation product.

* = Duplicate analysis not within control limits.

N = Spiked sample recovery not within control limits.

E = The reported value is estimated due to presence of interference.

MDL = Method Detection Limit

Table 2
Soil Stockpile - Volatile Organic Compound Analysis
Former Chomalloy Facility
West Nyack, New York

SAMPLE ID: Method 8260	Soil NYSDEC Guidelines (ug/kg)[1]	NYSDOH Res. Values[2]	SS-1 1-2'	SS-2 2-3'	SS-3 3-4'	SS-10 0-4'
DATE:			04/23/02	04/23/02	04/23/02	04/23/02
Analytes ug/kg						
Trichloroethene	700	NA	2.4 J		2.3 J	1.6 J
Tetrachloroethene	1,400	NA		1.2 J		
TICs						
Benzene, 1,2-dichloro-	NA	NA			17 J	
Unknown	NA	NA			7.8 J	

SAMPLE ID: Method 8021	Soil NYSDEC Guidelines (ug/kg)[1]	NYSDOH Res. Values[2]	SS-4 1.5-2.5'	SS-5 0-1'	SS-6 3-4'	SS-11 0-4'
DATE:			04/23/02	04/23/02	04/23/02	04/23/02
Analytes ug/kg						
Methylene Chloride	100	NA			1.2 J	1.1 J
TICs						
Column Bleed	NA	NA			7 J	
Cyclohexane, 1,1,3,5-tetrame	NA	NA	6.7 J			
Cyclohexane, 2-ethyl-1,3-dim	NA	NA	13 J			
Decane, 4-methyl-	NA	NA	54 J			
Naphthalene, decahydro-	NA	NA	14 J			
Unknown	NA	NA	16 J			

Notes:

1. New York State Department of Environmental Conservation recommended soil clean up objectives for volatile organic contaminants (January 1994).
2. New York State Department of Health (NYSDOH) Residential Comparison Values (noncancer / cancer) used by NYSDOH in Table 1 and 2 attached to Pine View Road Residents' communications regarding soil sampling results (September 2001).

J = Estimated Value

TICs = Tentatively Identified Compounds

NA = Not Available/Applicable

Non-reported constituents were not detected above the analysis method detection limit.

Blank spaces for reported constituents indicate non-detectable results for the sample analyzed.

Table 2
Soil Stockpile - Inorganic Analysis
Former Chromalloy Facility
West Nyack, New York

Sample ID:	NYSDEC	NYSDOH	SS-7		SS-8		SS-9		SS-12	
Depth:	Recommended	Res. Values[2]	0-1'		2-3'		1.5-2.5'		0-4'	
Date Sampled:	Clean-Up Levels[1]	Noncancer / Cancer	04/23/2002		04/23/2002		04/23/2002		04/23/2002	
Inorganics (mg/kg)										
Antimony	SB (NA)	77[b] / none	2.5	BN	1.1	BN	1.0	BN	1.7	BN
Arsenic	7.5 or SB (3-12 NY State)	58[b] / 1.65[a]	4.3		14.1		3.8		4.4	
Beryllium	0.16 or SB (0-1.75 E. USA)	390[b] /none	0.36	BE	0.39	BE	0.42	BE	0.38	BE
Cadmium	1.0 or SB (0.1-1 E. USA)	140[e] / none	0.65		0.33	B	0.10	B	0.18	B
Chromium	10.0 or SB (1.5-40 NY State)	580[b] / none	302		41.0		80.7		159	
Copper	25.0 or SB (1-50 E. USA)	7,700[c] / none	74.2		64.2		79.2		89.3	
Lead	SB (200-500 E. USA)	400[e] / none	26.2		20.4		14.7		25.2	
Mercury	0.1 / (0.001-0.2 E USA)	58[b] / none	0.64		0.08		0.15		0.46	
Nickel	13.0 or SB (0.5-25 E. USA)	3,900[b] / none	92.8		31.1		36.5		61.2	
Selenium	2.0 or SB (0.1-3.9 E. USA)	970[b] / none								
Silver	SB (NA)	970[b] / none	0.92	B	0.47	B			0.77	B
Thallium	SB (NA)	14[f] / none								
Zinc	20.0 or SB (9-50 E. USA)	16,000[d] / none	106	N	84.2	N	75.6	N	70.7	N

Notes:

1. New York State Department of Environmental Conservation Recommended Soil Cleanup Objectives in ppm from NYSDEC January 1994 Memorandum: Determination Of Soil Cleanup Objectives And Cleanup Levels

SB = Site Background

NA = Not Available/Applicable

2. New York State Department of Health (NYSDOH) Residential Comparison Values (noncancer / cancer) in ppm used by NYSDOH in Table 1 and 2 attached to Pine View Road Residents' communications regarding soil sampling results (September 2001).

[a] = US EPA Cancer Potency Factor

[b] = US EPA Reference Dose Value - noncancer

[c] = US EPA Health Effects Assesment Summary Table Value - noncancer

[d] = Recommended default skin irritation threshold level - noncancer

[e] = New York State Reference Guideline Value - noncancer

[f] = Provisional value from US EPA Superfund Technical Support Center; National Center for Environmental Assessment - noncancer

B = If the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).

J = Estimated concentration

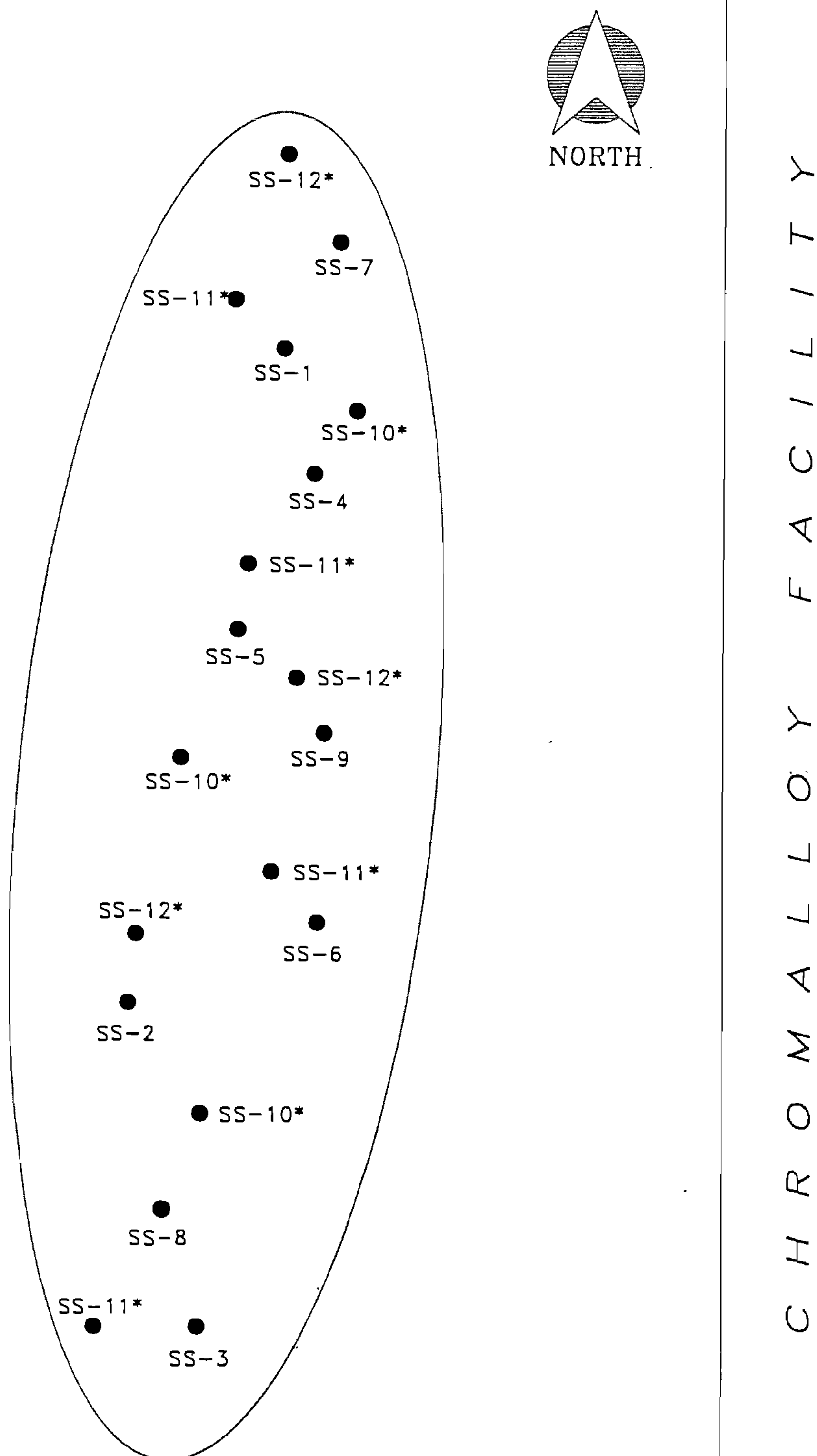
E = The reported value is estimated because of the presence of interference.

N = Spiked sample recovery not within control limits.

Non-reported constituents were not detected above their analysis method detection limit.

Blank spaces for reported constituents indicated non-detectable results for the sample analyzed.

J:\EAI\1166\SOIL SAMP



NOT TO SCALE

* COMPOSITE SAMPLE LOCATIONS

REVISION DATE: 05/22/02	Environmental Alliance, Inc. 1812 Newport Gap Pike Wilmington, DE 19808
DESIGNED BY: SU	FIGURE 1 CONSTRUCTION EXCAVATION SOIL STOCKPILE SAMPLE LOCATION MAP FORMER CHROMALLOY FACILTY WEST NYACK, NEW YORK
DRAFTED BY: AG	
CHECKED BY:	

B/o 1105 ½ C

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 3
21South Putt Corners Road, New Paltz, New York 12561-1696
Phone: (845) 256-3146 FAX: (845) 255-3414

Erin M. Crotty
Commissioner

ANDREW J. APPLEBAUM, P. G.
ENVIRONMENTAL ALLIANCE, INC.
1812 NEWPORT GAP PIKE
WILMINGTON
DELAWARE 19808

June 20, 2002

Sub: Chromalloy - Site ID No. 344039
Disposal of Construction Generated Soils

Dear Mr. Applebaum:

This is in response to your May 23, 2002 letter requesting guidance on the disposal of soils generated during the construction of sentinel well MW-18B and the treatment system building.

Sentinel Well (MW-18B) Soil Cuttings
The results as submitted by you indicate that the soil can either be spread around the well or taken to a waste disposal facility.

Treatment Building Soils
The results indicate high metal contents. The soil should be disposed of at an appropriate waste disposal facility. Waste characterization requirements for disposal are to be found in 6 NYCRR Part 371.

The concentrations of metals in the soil samples heighten the sense of urgency for proceeding with Operable Unit II (OU-II). Please commence developing a work plan for OU-II.

If you have any questions, please call me at (845) 256-3146.

Sincerely,

Pergadia

Ramanand R. Pergadia, P.E.
Regional Hazardous Waste Remediation Engineer
Region 3

cc:

Gary Litwin, Rockland County Health Dept.
Krista Anders, NYS DOH
Rosalie Rusinko, DEE

ENVIRONMENTAL ALLIANCE

October 3, 2002

- *Engineering*
- *Remediation*
- *Consulting*

Mr. Ramanand Pergadia, P.E.
New York State Department of Environmental Conversation (NYSDEC)
Division of Hazardous Waste Remediation, Region 3
21 South Putt Corners Road
New Palta, NY 12561-1696

Re: Remediation System Startup – Non-Containment of Treated Groundwater Former Chromalloy Facility in West Nyack, New York – No. 344039

Dear Mr. Pergadia:

Environmental Alliance, Inc. (Alliance) is proposing for NYSDEC approval to modify the current start up plan to allow for non-containment of treated groundwater during remediation startup activities. Containment of the treated groundwater was originally proposed in the Pump and Treat Remedial Design Report (P&T-RD) – Alliance, June 1, 2001. Alliance has since reevaluated the installed treatment system package, which consists of two air stripper systems and two granular activated carbon units. The systems treatment capabilities were then compared to existing groundwater quality conditions. The following is a summary of our considerations for proposing the non-containment of treated groundwater.

For initial startup testing, Alliance proposes operating the deep groundwater P&T system pump at approximately 50 gallons per minute (gpm) to test process equipment, connections, and discharge to erosion control structure. Alliance also has over estimated the groundwater to be removed from pumping well MW-15B to have a total VOC concentration of 30,000 ppb constant throughout startup testing. Historic MW-15B VOC concentrations have ranged from 3,314.9 to 16,445.2 μg/L. The over estimate was to account for the highest total VOC concentrations at the closest bedrock well PW, which has shown historic total VOC concentrations to range from 5,100 to 29,436.1 μg/L.

Based on the planned P&T startup operation at about 50gpm and constant total VOC concentration of 30,000 μg/L, the remediation system would pump 0.75 pounds of VOCs per hour (see below calculation).

50 gpm x 30,000 μg/1 L x 1 L/10^{-9}μg x 8.34 lbs./1 gal. x 60 mins./hr. = 0.75 lbs./hr.

1812 Newport Gap Pike Wilmington, DE 19808
302-995-7544 302-995-0941 Fax www.EnvAlliance.com

Stepping up the pump rate to 150 gpm and maintaining the constant concentration of total VOCs at 30,000 μg/L, would accumulate 2.25 pounds of total VOCs per hour.

Currently, the two carbon units contain a total of 3,000 pounds of carbon (1,500 each). The adsorption capability for VOCs is 20 percent of the carbon weight or 600 pounds for both units. Considering the remedial startup of the P&T system is anticipated to run for an approximate maximum of eight hours, the carbon units alone should be able to handle the maximum of 18 pounds of total VOC mass generated. Startup operation of the air stripper units in series once balanced for efficient operation should reduce all VOC concentrations to non-detect and eliminate further VOC loading during startup testing.

The revised plan is to treat the pumped water with the two air strippers then process the water through the two carbon units, which will be operated in series. This design will provide for four units of treatment with each unit having the potential to provide 100% treatment capacity. Therefore, the original plan of containing the treated water is redundant based on the quadruple unit treatment train.

Once the P&T system is operational and the treatment equipment is running smooth, DPE system testing will begin. As the DPE system is brought online, the combined P&T and DPE systems will be evaluated. Once the DPE system monitoring shows the process equipment has stabilized the P&T system will be gradually turned off. The DPE system will then be evaluated with the air strippers and carbon units fully engaged for operation with the DPE system. Considering the DPE system is designed for maximum groundwater removal of about 20 gpm, the VOC mass generated for an estimated maximum groundwater concentration of 40,000 μg/L of total VOCs should be about 0.4 pounds per hour. Testing of the DPE system should last for a maximum of four hours, this would generate only 1.6 pounds of VOC mass over the four hours of testing. With the air strippers now operational after P&T system testing, the amount of VOC mass generated would be eliminated. Any remaining VOC mass after treatment by the air strippers would be addressed by the carbon.

Overall, the treatment system is perfectly capable of addressing VOCs for startup testing, the main constituent of concern identified for the site. The other State Pollution Discharge Elimination System (SPDES) permit criteria constituents such as select metals, pH, etc. will also be addressed by the supporting process equipment. This would exclude the use of containment vessels that would provide difficulties, potential hazards, and additional unnecessary costs if used.

Another concern of Alliance is securing access for temporarily storing the tanker truck at the Bradley Corporate Park. If temporary access is not given, then additional costs would be incurred to transport the water off site, store it, then transport the tanker back to the site for discharge through the system. Additionally, this situation could provide more opportunities for problems to occur. Since the remedial system provides redundant treatment and is capable of treating groundwater during startup testing based on our reasoning present in this document, containment of groundwater is not necessary.

As part of the start up testing, VOC water samples will be secured for analysis from the influent, after the air strippers, and effluent after the carbon units. Additionally, water samples from the effluent after the carbon units will be collected for the other parameters as specified by the NYSDEC in the SPDES permit. The data from the start up testing will aid in determining the final operation plan of the remedial system. However, based on the volume of groundwater and mass loading rates anticipated during startup testing, the process equipment is expected to be sufficient to address constituents of concern with the carbon units being a redundant treatment during start up testing.

Should you have any questions regarding the startup testing, feel free to contact Bill Smith or myself at (302) 995-7544.

Sincerely,
ENVIRONMENTAL ALLIANCE, INC.

Andrew J. Applebaum
Project Geologist

c: Mark Crawford, Sequa Corporation
Leonard Pasculli, Esq., Sequa Corporation
Mark Pennington, Esq., Morgan, Lewis, & Bockius, LLP
Rosalie Rusinko, Esq., NYSDEC
Angus Eaton, NYSDEC
Gary Litwin, NYSDOH
Catherine Quinn / Daniel Miller, Rockland County Health Department

J:\EAI\1166\correspondence\2002 Letters and Memo's\NYSDEC notification - noncontainment of startup treat GW.doc

F/165

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 3
21South Putt Corners Road, New Paltz, New York 12561-1696
Phone: (845) 256-3146 FAX: (845) 255-3414

Erin M. Crotty
Commissioner

ANDREW APPLEBAUM, P.G.
ENVIRONMENTAL ALLIANCE
1812 NEWPORT GAP PIKE
WILMINGTON
DELAWARE 19808

October 8, 2002

Sub: Chromalloy - Site ID No. 344039

Dear Mr. Applebaum:

This is in response to your October 3, 2002 letter requesting permission to discharge treated groundwater into the Hackensack River without analysis during the startup activities. Your request is approved, subject to the following proviso:

1) The pumping at 50 gpm shall not extend for more than 9 hours.
2) The pumping at 150 gpm shall not extend for more than 1 hours.
3) The testing of the DPE system, when combined with the P&T system, shall not extend for more than 1/2 hour, and should not generate more than 70 gpm of recovered water.
4) Effluent sample will be collected at each of the above 3 stages and analyzed for VOCs and metals.
5) The treatment train for the pumped water during the startup period shall consist of two air-strippers and two carbon units as described in your October 3, 2002 letter.

There is an inaccuracy in the fourth paragraph on page 2 of your letter. The treatment systems have not been designed to remove metals. However, the metals concentrations in the groundwater have historically been low, and for the purpose of system startup the above proviso are sufficient.

If you have any questions, please call me at (845) 256-3146

Sincerely,

Pergadia

Ramanand R. Pergadia, P.E.
Regional Hazardous Waste Remediation Engineer
Region 3

cc:

Gary Litwin, NYSDOH
Catherine Quinn/Daniel Miller, Rockland CountyHealth Dept.

R. Rusinko
A. Eaton
J. Schreyer

APPENDIX VI

SOIL DISPOSAL DOCUMENTATION

TABLE OF CONTENTS

FIGURES

APPENDICES

1.0 SYSTEM OVERVIEW

A Licensed electrical contractor must be used to connect power to the system. Please tell the electrical contractor to contact PRM corporate office (919) 957-8890 with any questions about connecting power to the system. Failure to use a licensed electrician will void the warranty.

The treatment system consists of multiple skids and equipment that make up the remediation system. There are two air stripper skids, one dual phase unit skid, one moisture separator skid, two liquid phase carbons and bag filters, groundwater pumps, and a control panel. The area where the skids are to be located is classified as a Class 1, Div II hazardous location. All motors and electrical equipment below 18" above grade is explosion proof. Electric motors for a Class 1, Div II area can be TEFC instead of XP if they are 3 phase.

The treatment system consists of a 40 Hp oil sealed liquid ring vacuum pump which extracts groundwater from recovery wells. A 120-gallon moisture separator and Moyno pump transfers recovered liquids to the air strippers. Water gravity flows through the air strippers, which is supplied air by a 7.5 Hp blower. The air stripper sump is fitted with pump down and high level floats. The pump down floats operates a 10 Hp AMT transfer pump that moves water from the stripper sump though the bag filters and carbons.

The system control panel is a UL Listed Industrial Control Panel in a NEMA 4 enclosure. This panel controls all aspects of the system via hand-off-auto switches. The panel shows the system status via red and green status lights.

2.0 DESIGN SPECIFICATIONS

Multi Phase Extraction Section

- Dekker Model VMX550, oil sealed liquid ring vacuum pump, 40 hp., 460 volt, three phase, TEFC motor and the system is capable of 450 acfm @ 22" Hg with the following components;
  - Coupling guard
  - Separator/reservoir with a (5) stage separation arrangement
  - Back pressure gauge
  - Oil level gauge
  - Sealant isolation valve and wye strainer
  - NEMA 7 solenoid valve
  - Separator drain
  - Temperature and vacuum gauge
  - Air-cooled heat exchanger package
  - Automatic temperature control valve.
  - NEMA 7 high temperature switch
  - Inlet check valve
  - Full charge of *food grade, synthetic oil*
  - Low oil level switch
- MS-120-500, carbon steel air water separator tank with (3) level (h-h/level alarm interlock, high/pump on, low/pump off), sensors mounted in a clear 2" sight tube and a drain port.
- 4", replaceable, inline particulate filter.
- Manual dilution valve with filter.
- Vacuum relief valve.
- Moyno model # 367 pump, coupled to a 2 hp. 460 volt, three phase, TEFC motor for pumping out of the MS-120 separation tank.
- 1" totalizing flow meter for output to the telemetry system.
- Temperature gauge.
- (2) Vacuum gauge, 0-30" Hg.
- Pressure gauge, 0-50 psi.
- 4-20 ma air flow transmitter and vacuum transmitter for output to the telemetry system.
- Magnehelic gauge with conversion chart for instant on-site cfm reading.
- Totalizing flow-meter with pulse output.
- Mounted on a pre-plumbed, wired and tested skid assembly.
- Model 1818, dual bag filter assemblies, shipped loose for on-site plumbing.

PRM Air Stripper Model 634 Dual

- (2) Sump tanks, cover and (4) stainless steel trays each.
- (2) 7.5 hp. 460 volt, 3 phase, TEFC blower/motor.
- Air flow damper.
- Low air pressure switch.
- Spray nozzles, sight tube, and drain valve.

- (2) Price pumps, Model XT-150 centrifugal discharge pump with Teflon shaft seal close coupled to a 10 hp., 460 volt, three phase, TEFC motor.
- 2" PVC flow sensor and tee for connection to panel mounted meter and telemetry.
- (2) H-h/h/l level sensors mounted in a clear 2" sight tube to operate the transfer pump.
- Blower air pressure gauge.
- (2) Sample ports.
- Each blower will be mounted on an individual skid.
- (2) Air stripper skids, pre-plumbed and tested.

Control Panel

- NEMA 4, **UL listed,** control panel to operate the entire system, mounted pre-wired on the MPES skid.
- Master control panel includes 250 amp distribution with breakers for field connection to the main disconnect protection, which is supplied by others.
- Motor starters with thermal overloads and a surge suppressor.
- Panel heater and thermostat.
- (8) HOA switches for all processes, including an additional groundwater pump.
- Series/parallel HOA switch to deactivate the first transfer pump when running in parallel and activate the pump when running the air strippers in series.
- (9) Green run lights for all motors.
- (10) Red alarm lights for override conditions including LRP low oil, low air flow, h-h in the MS-200, and high temperature. Air stripper low air flow and high-high in the sump, and low override for the submersible pumps.
- Vacuum meter display, and a flow meter display.
- Proview telemetry system by EOS for monitoring the system and remote start/stop.
- Alarm status will contact a pager or fax, and capable of automated daily, weekly or monthly fax reports.
- Control panel set up for an additional groundwater pump with the HOA, starter and lights.

Groundwater Pump

- 150S150–7 Grundfos submersible pump retrofitted with Teflon.
- 15 hp. 460 volt, pollution recovery motor and 250' of Teflon jacketed power cable.
- 3 position, down well level sensor with 250' of Tefzel cable.
- 3" totalizing flow-meter with a pulse output.

Carbon & Accessaries

- (2) 2,000 lb liquid carbon vessels with re-activated carbon.
- Carbon piping system for liquid phase carbon with unions.

3.0 SYSTEM OPERATION

The system consists of a dual phase vapor extraction system utilizing a Dekker VMX0550KA1-20 oil sealed liquid ring vacuum pump is driven by a 40 Hp XP motor. Extracted air and water enters a 120-gallon moisture separator tank where the air velocity is reduced and liquids are dropped out. This tank has a set of pump down floats, which activate a Moyno pump when the water level rises. A high level float will shut down the vacuum pump if a high water condition exists until the tank is drained.

Vapors, after leaving the moisture separator, pass through an integrated inline filter and then through the vacuum pump (see section 4 for the replacement filter). An auto vacuum relief valve and manual bleed valve are installed prior to the air filter. The auto relief valve should be adjusted to actuate 1-2 in-Hg above the maximum vacuum required by the system and is installed strictly as a safety device to allow some air to pass through the blower if the vacuum becomes too high. The 1.5" manual bleed in valve should be used to temper the system vacuum to the required level. High temperature and low oil level switches will shut down the vacuum extraction pump if operating conditions exceed their factory set points.

Both air strippers are PRM 634, four tray, diffused aerator. Water enters the top chamber through spray nozzles. Influent water travels through four separate chambers, and then drops to the next lower tray. After the fourth tray the treated water drops into the sump. A 7.5 Hp American Fan supplies air to the stripper sump. The air then passes up through each tray through a series of small holes. The effluent air is exhausted and can be directed to the vapor treatment system if required. The air stripper sump is fitted with pump down and high level floats. The pump down floats operate a 10 Hp AMT transfer pump that moves water from the stripper sump though the bag filters and carbons. The high-level override float will shut down the system when it is triggered. A low-pressure switch has been installed to prevent water from entering the stripper (See 3.2 Control Logic) if the blower fails or is shut down. This ensures that all water flowing through the stripper is fully treated.

3.1 Startup

1. Remove shipping board from beneath vacuum Extraction Pump Motor (if installed).
2. Be sure all valves are in their proper open or closed positions.
3. Be sure all breakers and switches are off.
4. Check for proper voltage at disconnect.
5. Place disconnect in the on position.
6. Place all breakers in the on position.
7. Check for proper rotation of motors by momentarily bumping with hand switch, if this is the very first time system has been started. **DO NOT RUN**

ANY MOTOR BACKWARDS OR DAMAGE MAY OCCUR. Correct the problem by changing power leads

8. After the rotation is checked on the Moyno, recouple the love-Joy connection between the pump and motor.
9. Push reset button.
10. Be sure all valves at extraction wells are open.
11. Place all HOA switches in the AUTO position.
12. Regulate flow from the extraction wells with valves at the wells.
13. Adjust automatic vacuum relief valves to open at vacuum levels greater than the normal operating vacuum of the system but less than the maximum vacuum rating of the equipment. Adjust operating vacuum using the manual bleed in valve.
14. Throttle stripper transfer pump, if necessary, for discharge option.
15. Follow instructions in Appendix B for startup of the air stripper.

The system should now operate properly.

3.2 Control Logic

HOA - for Dekker LRP	GREEN LIGHT - Turns on LRP pump
Dekker Low oil switch	RED LIGHT If Low oil shut off LRP
Dekker Temp switch	RED LIGHT If high temp Dekker Shut off LRP
Sol activates when pump is on	5 sec delay on start no delay for off
HOA - for MS transfer pump	GREEN LIGHT - Turns on MS X-fer pump
3 stem float (pump on-off / High level)	RED LIGHT - High level MS -turns off LRP
HOA - Air Stripper Blower - activates blower	GREEN LIGHT - Turns on AST blower
low pressure AST blower	RED LIGHT - Turn off MS X-Fer pump
HOA - for AST transfer pump	GREEN LIGHT - Turns on AST X-fer pump
3 stem float (pump on-off / High level)	RED LIGHT - High level AST -turns off MS xfer pump

4.0 MAINTENANCE

Model Numbers, Serial Numbers, Replacement Part Numbers:

COMPONENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	REPLACEMENT ELEMENT P/N
Treatment System				
Air Stripper #1	PRM	PRM 634	N/A	
AST Blower	American Fan	BC3-C6V-20A	016599-2	
7.5 Hp Motor	Baldor		F0111086796	
Pressure Switch	Dwyer	1950-20-2F		
Flow Sensor	Signet			
Paddlewheel	Signet	P51530-PO	60111161279	
Tube	Signet	PV8T020	60110233859	
Transfer Pump	AMT	4250-98		
10Hp Pump Motor	US Electric	G70403A		
Air Stripper #2	PRM	PRM 634	N/A	
AST Blower	American Fan	BC3-C6V-20A	016569-1	
7.5 Hp Motor	Baldor		F0111086556	
Pressure Switch	Dwyer	1950-20-2F		
Flow Sensor	Signet			
Paddlewheel	Signet	P51530-PO	60111161279	
Tube	Signet	PV8T020	60110233859	
Transfer Pump	AMT	4250-98		
10Hp Pump Motor	US Electric	G70403A		
Dual Phase system				
Dual Phase Unit	Dekker	Client has info		
Vac Switch	Ashcroft	K17m0242f20	10700330	
Auto vac relief valve	Kunkle	912BDCM01	319190101	
Inline Filter	Solberg	FT-235-400		235
Moisture Separator	PRM	MS-120		
MS Pump	Moyno	36701 zm48208	02/01	
Pump Motor	Dayton	3KW97	005-T979A-M	

All replacement parts and materials are available from Product Recovery Management as well as the manufacturer or manufacturers' representative.

Air Stripper

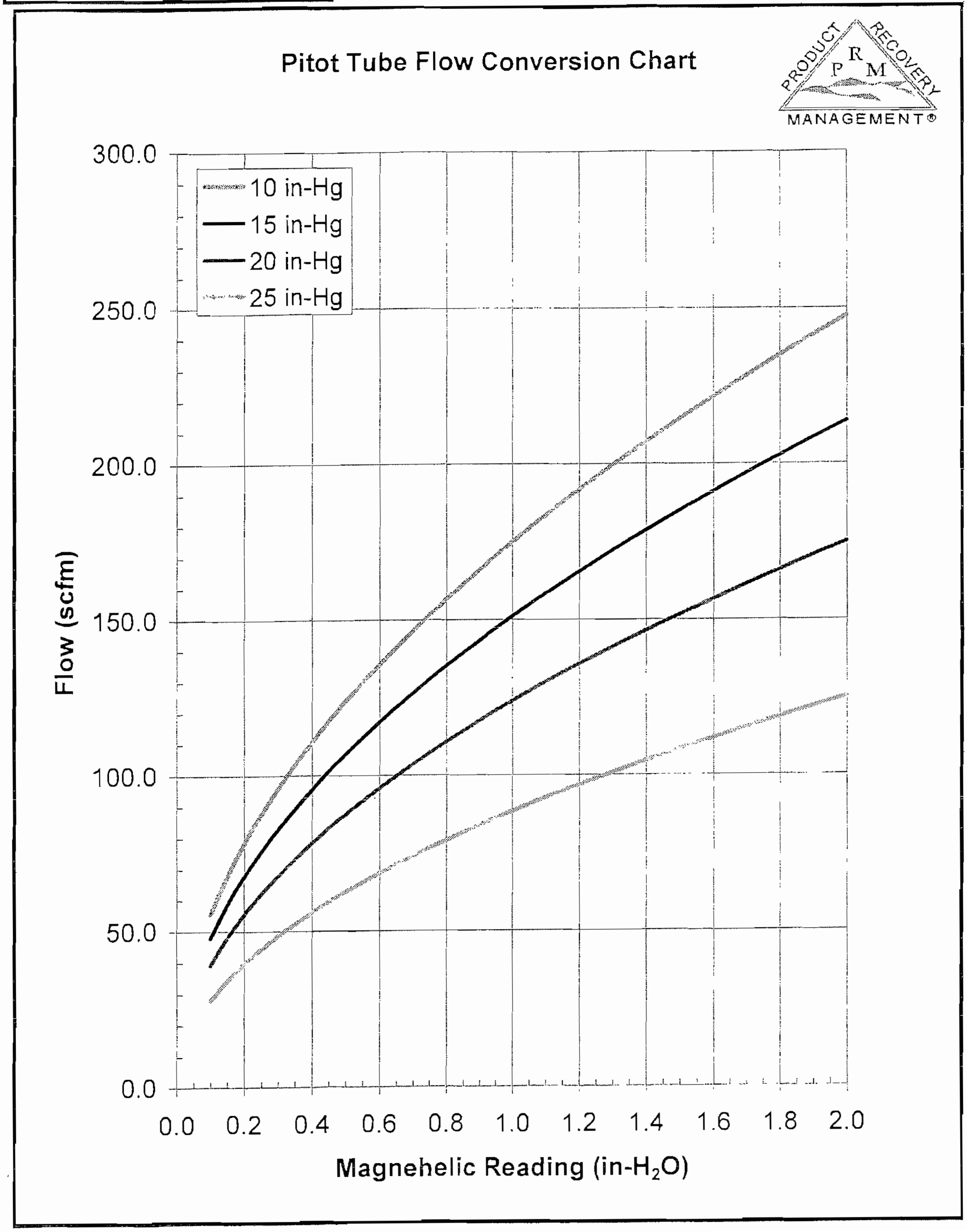
- Quarterly, shut down system and allow stripper trays to drain into sump. Remove 4" rubber covers and using flashlight, inspect tray internals. Check for fouling of the aeration holes in the bottom of the trays in particular.
- If air distributor fouling occurs, the stripper must be drained and disassembled using the following procedure.
    1. Loosen and remove the four clamping rods.
    2. Remove the stripper lid noting the orientation of the nozzle with respect to the downcomer in the first tray.
    3. Again noting orientation, remove the top tray, followed by the next two. The last tray does not need to be removed unless the sump needs inspection.

4. Clean the trays using pressurized water or acid if necessary.
5. If gasket material between trays was damaged during disassembly, it should be replaced. Any 3/8" thick by 2" wide closed cell foam weather-stripping will be sufficient. Can also be purchased from PRM.
6. Reassemble trays using lineup arrows and numbers to get correct orientation. Reinstall top and clamp rods. Tighten clamp rods just enough to create seal between trays, but do not distort tabs.
7. Re-start stripper blower, groundwater pumps, and OWS transfer pump.
8. After stripper has filled, re-tighten the clamp rods as the weight of the water will have settled the trays somewhat. Lock the rods in place using the top nut.

Vacuum Extraction Pump

- After first 8 hours of operation:
  Shut down and check oil level.
  Clean all strainers.
- After every 1000 hours of operation:
  Check backpressure on separator element, should be less than 4 psi.
  Change separator element if backpressure exceeds 4 psi.
- After every 3000 hours of operation grease bearings using high temperature #2 lithium based grease, 3-4 pumps of standard grease gun.
- After every 10,000 hours of operation or once per year, change the oil using Dekker synthetic oil as recommended.
- Monthly, check oil level when blower is not running. Level should be at the middle of the site glass. If level increases with time, water may be accumulating in the bottom of the reservoir. This will need to be drained.
- Monthly check inline Solberg air filter. Replace element if dirty or at least twice a year

Size of Pipe (In.):	4
Temperature (Deg F):	150
Kfactor	0.67



APPENDIX A

Dual Phase System

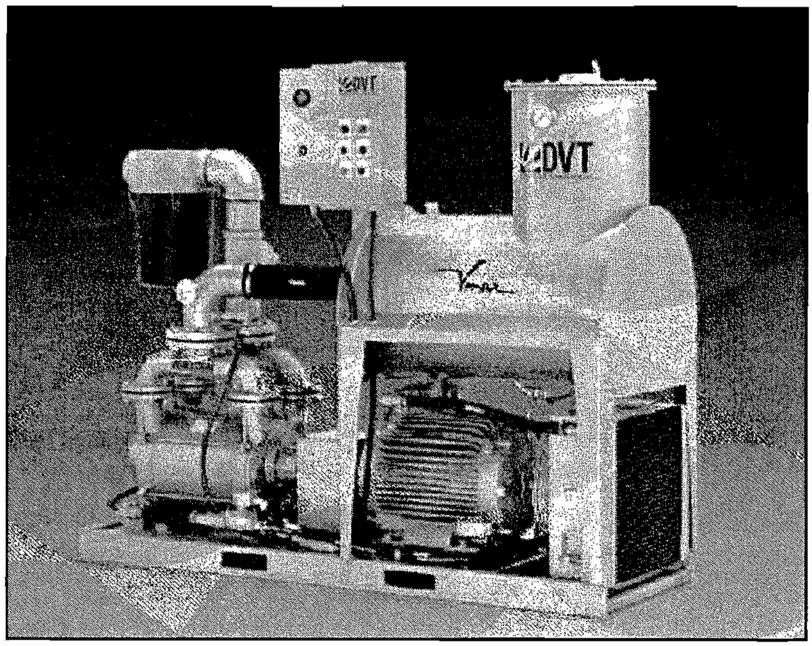
DEKKER VACUUM TECHNOLOGIES, INC.

10. VMAX SYSTEMS

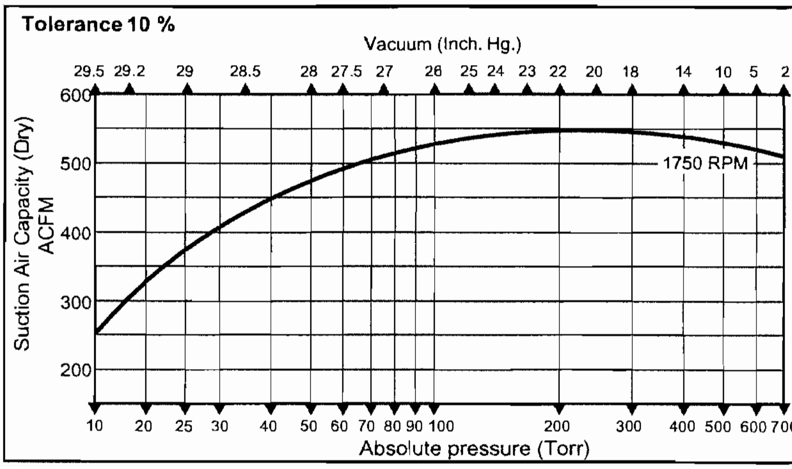
Vmax oil-sealed vacuum pump system VMX0550K

Why more and more customers are switching to the Vmax system:

- The only system on the market with a **full 3-year warranty!**
- New, patented **high-efficiency DX-5 separator** eliminates oil carry-over concerns.
- Rugged, **high-quality, industrial system**, offering years of **trouble free operation**.
- **Extended-life seal-fluid** is not used as a lubricant. Change interval is not critical, resulting in a minimum of **10,000 hours of continuous operation.**
- **Direct drive at low speed** (1750RPM) eliminates the use of V-belts, resulting in very **low maintenance and zero downtime.**
- **Extremely low operating noise** level makes this system desirable in today's workplace.
- **Continuous operation over the full vacuum range** without overheating.
- **Carry-over** of soft solids and/or minimal amounts of liquid **does not cause damage** to the internal parts of the pump.
- **Electrical control panel** is **standard**.
- **Air-cooled design** is **standard** with water-cooling available at no extra charge.

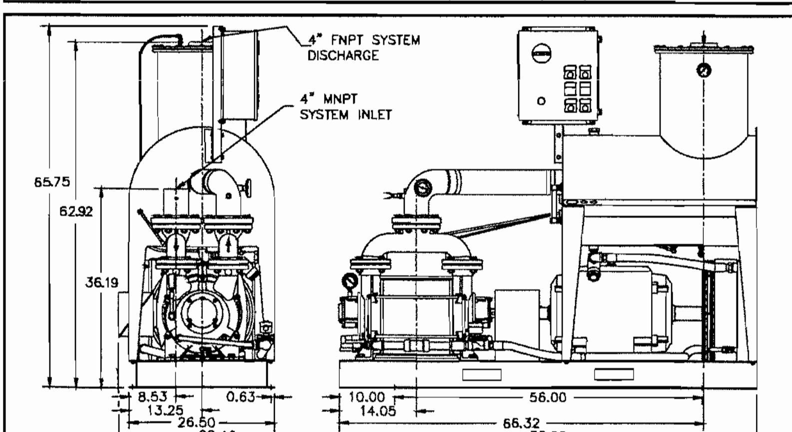


Tolerance 10 %



Performance Characteristics	
Nominal capacity:	550CFM
Motor:	40HP
Speed:	1750RPM
Maximum vacuum:	29.5"Hg
Weight (approximate):	1850Lbs
Maximum gas inlet temperature:	212°F/100°C
Maximum noise level (at 3 feet):	78dBA
Oil capacity (approximate):	17 GAL

Performance based on atmospheric pressure equal to 29.92"Hg



Information contained in this document is for reference only. Subject to change without notice.

Features and Benefits

- **PVC construction** — provides durability. 6" ID hose has convoluted cover for greater flexibility . . . all other sizes have smooth exterior.
  - Series H is clear with white helix.
  - Series J is solid olive green.
  - Series K is clear with dark green helix.
- **Smooth bore construction** — allows full flow.

General Applications

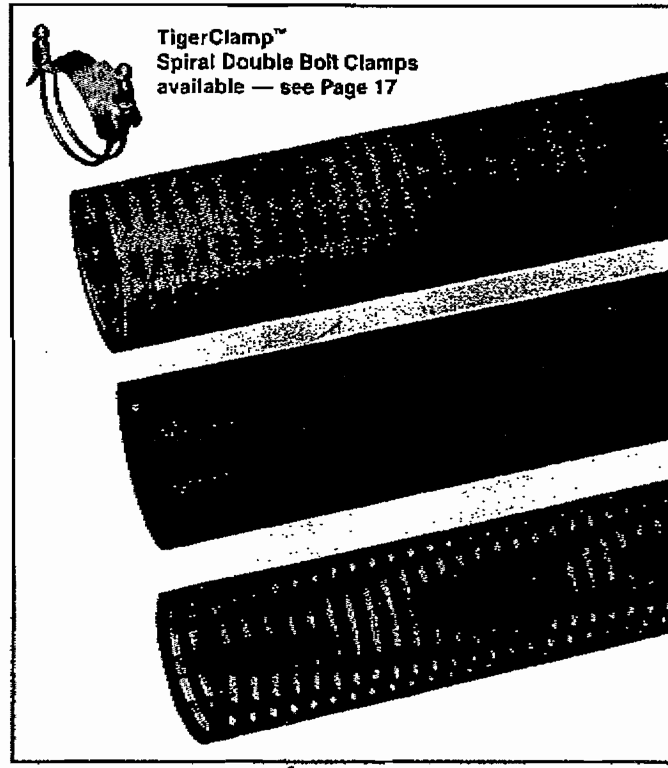
- Construction and mining.
- Irrigation lines.
- Rock dusting.
- Wellpoint systems.
- Agri-foam systems.
- Miscellaneous agricultural applications.
- Liquid fertilizer transfer.

NOTE: Service life may vary depending on operating conditions and type of material being conveyed.

Service Temperature Range

-4° F to 150° F

Actual service temperature range is application-dependent.



2"

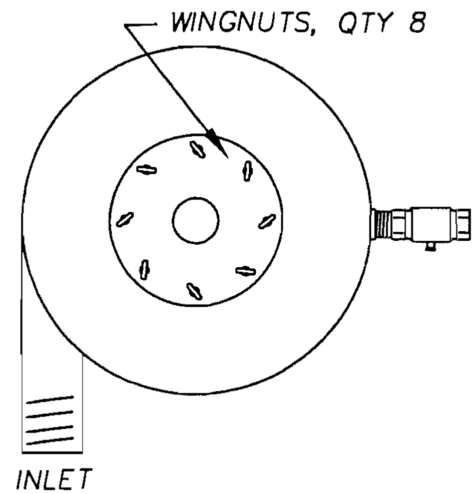
Series	ID (In.)	Nominal ID (mm)	OD (In.)	OD (mm)	Working Pressure (PSI) 68°F	104°F	Vacuum Rating (Inches Hg) 68°F	104°F	Min. Bending Radius (In.) @ 68 F	Standard Length (Ft)	Approx. Wt. (lbs/ft.)
H/J/K075	¾"	19.0	0.94	23.9	110	70	28	26	3	100	.17
H/J/K100	1"	25.4	1.26	32.0	85	60	28	26	3	100	.22
H/J/K125	1¼"	31.7	1.51	38.3	85	60	28	24	4	100	.32
H/J/K150	1½"	38.1	1.76	44.7	70	50	28	24	5	100	.36
H/J/K200	2"	50.8	2.32	58.9	65	45	28	24	7	100	.61
H/J/K250	2½"	63.5	2.87	72.9	65	45	28	24	8	100	.82
H/J/K300	3"	76.2	3.41	86.6	65	40	28	22	10	100	1.09
H/J/K400	4"	101.6	4.55	115.6	55	35	28	22	15	100	1.91
H/J/K600	6"	152.4	6.75	171.4	40	25	28	20	30	100/20	3.35
H/J/K800	8"	204.0	8.86	225.0	30	20	26	20	35	20	5.63

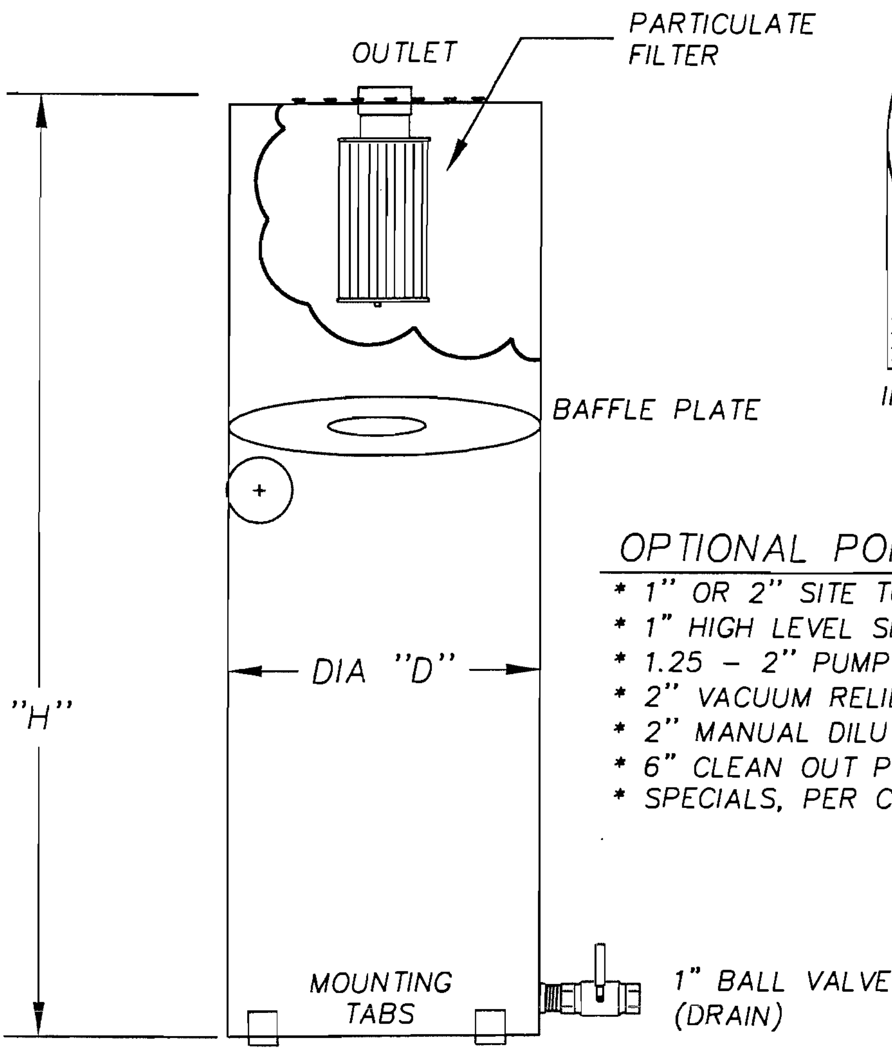
~~#~~ $133.65

Model #	Max Air Flow (scfm)	"D" (in)	"H" (in)	Liquid Capacity (gal)	Repl. Filter Element
MS30	300	14	48	30	851
MS60	400	18	60	60	FT-235P-400
MS80	500	20	60	80	FT-235P-400
MS120	750	24	60	120	FT-275P-600
MS200	1100	32	60	200	FT-275P-600

1 MS30 tanks utilize an exterior filter due to the reduced tank height.

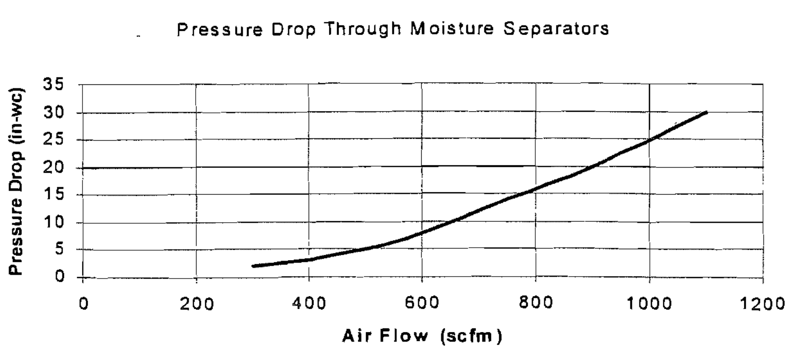
2 Inlet and outlet piping will be custom sized for each job to minimize losses.





OPTIONAL PORTS

* 1" OR 2" SITE TUBE PORTS
* 1" HIGH LEVEL SENSOR PORT
* 1.25 – 2" PUMP SUCTION PORT
* 2" VACUUM RELIEF VALVE PORT
* 2" MANUAL DILUTION VALVE PORT
* 6" CLEAN OUT PORT
* SPECIALS, PER CUSTOMER REQUEST



P.R.M. PRODUCT RECOVERY MANAGEMENT

1705 NEW RALEIGH RD.
DURHAM, NORTH CAROLINA 27703
TEL: (919) 957-8890

MOISTURE SEPARATORS

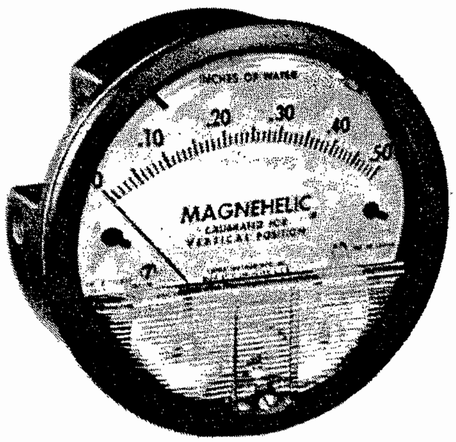
DWG. NO.: 10E REV. 0

BULLETIN NO. **A-27**

OPERATING INSTRUCTIONS and PARTS LIST

Magnehelic® Differential Pressure Gage

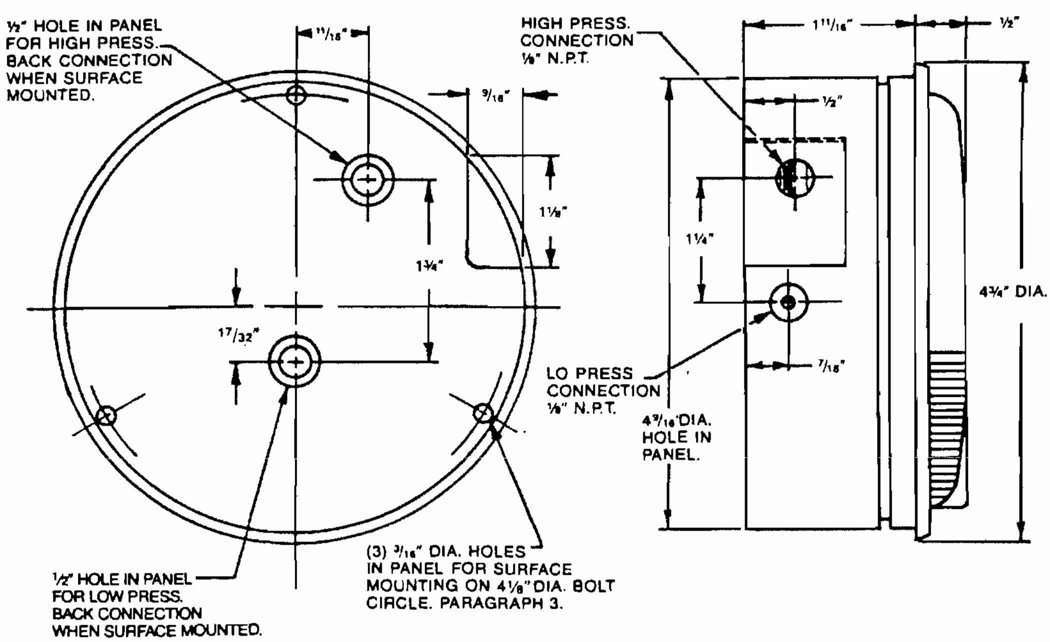
Dwyer.



SPECIFICATIONS

Dimensions: 4-3/4" dia. X 2-3/16" deep.
Weight: 1 lb. 2 oz.
Finish: Baked dark gray enamel.
Connections: 1/8 N.P.T high and low pressure taps, duplicated, one pair side and one pair back.
Accuracy: Plus or minus 2% of full scale, at 70°F. (Model 2000-0, 3%; 2000-00, 4%).
Pressure Rating: 15 PSI.
Ambient Temperature Range: 20° to 140° F
Standard gage accessories include two 1/8" N.P.T. plugs for duplicate pressure taps, two 1/8" pipe thread to rubber tubing adapters, and three flush mounting adapters with screws.

Caution: For use with air or compatible gases only.
For repeated over-ranging or high cycle rates, contact factory.
Hydrogen Gas Precautionary Note: The rectangular rare earth magnet used in the standard gage may not be suitable for use with hydrogen gas since a toxic and explosive gas may form. For hydrogen service, consult the factory for an alternate gage construction.



DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, INDIANA 46360, U.S.A.
Telephone 219/879-8000
Fax 219/872-9057
Lit-by-fax: 888/891-4963
www.dwyer-inst.com
e-mail: info@dwyer-inst.com

COMPACT EXPOSED ELEMENT FILTERS
"FT" Series 3"-6"MPT

®

APPLICATIONS

- Blowers-Side Channel
- Compressor-Screw
- Engines
- Industrial & Severe Duty
- Power Plants
- Cement
- Compressors-Factory Air
- Fans
- Medical
- Sparging
- Compressor-Piston
- Construction\Contractor Industry
- Hydraulic Breathers - fine filtration
- Pneumatic Conveying Systems
- Waste Water Aeration

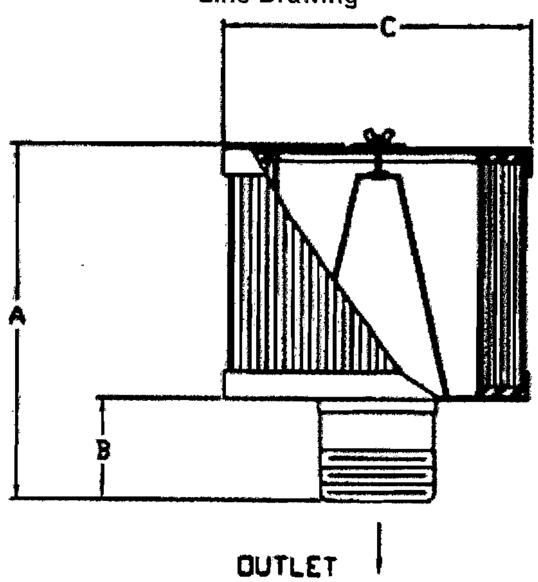
FEATURES & SPECIFICATIONS

- ;99%+ removal efficiency standard: Paper = 2 micron, Polyester = 5 micron
- Exposed element for optimal air flow
- Interchangeable elements: Polyester, Paper, HEPA
- Several elements available at a given connection size providing a choice according to the severity of your application
- Durable heavy gauge base with low pressure drop bracket and pipe design
- Filter change out differential: 10"-15" in. H_2O above initial Delta P
- Pressure drop graphs available upon request
- Temp (continuous): min -15° F (-26° C) max 220° F (104° C)

OPTIONS

- 1/8" &1/4" tap holes for differential pressure gauges
- Special connections, BSPT/Metric
- Available in Stainless Steel
- Various elements available
- Epoxy coated housings

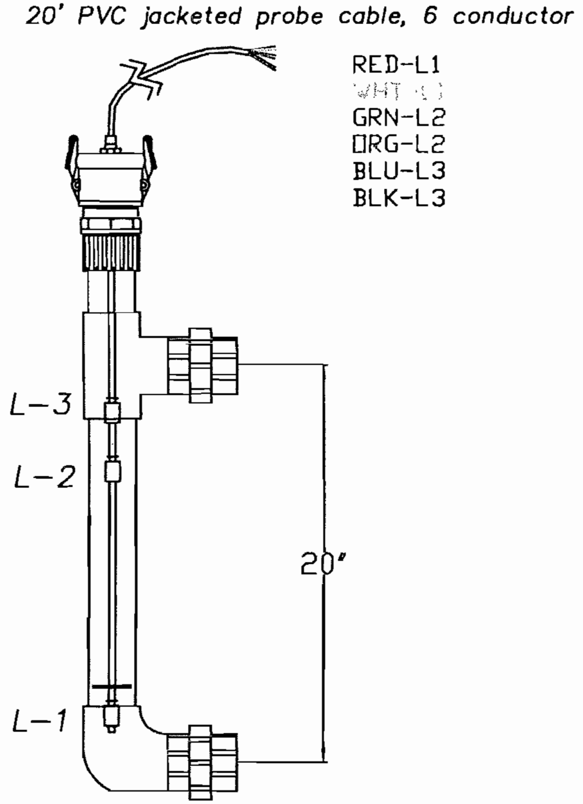
Line Drawing

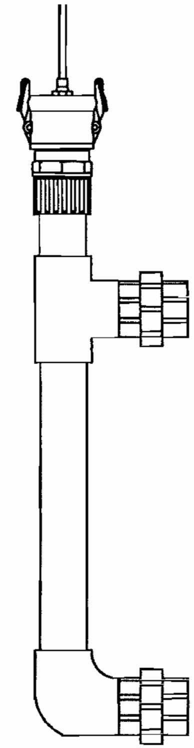


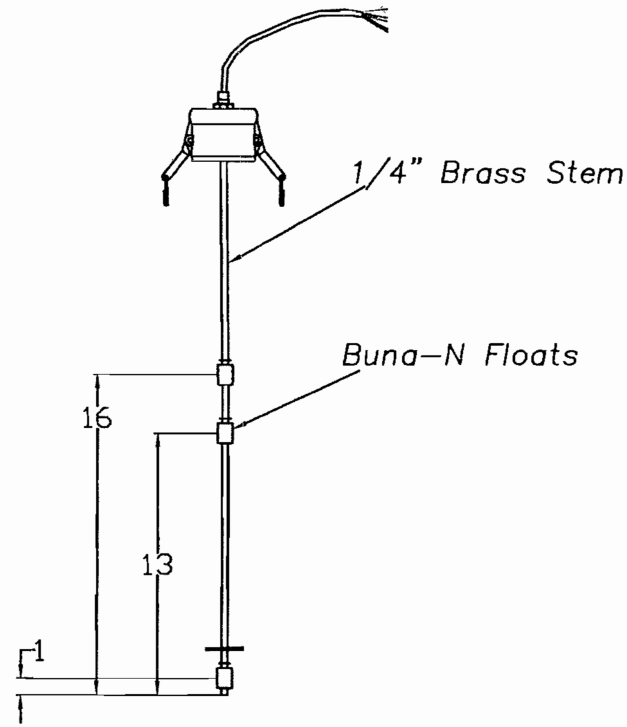
***All measurements are shown in American standards.**

ADD - typically in stock
Add - part normally requires lead time

Add To Order	Model Number	Element Type	Outlet in. NPT or FLG	Dim A in.	Dim B in.	Dim C in.	Rated Flow Piston SCFM	Rated Flow Screw Blower Fan SCFM	Element Parent Flow SCFM	Approx. Weight lbs.
ADD	FT-235P-300	Polyester	3	13	3	8	300	300	570	13
ADD	FT-245P-300	Polyester	3	13	3	10	300	300	880	19
ADD	FT-275P-300	Polyester	3	13	3	12	300	300	1100	22
ADD	FT-235P-400	Polyester	4	14	4	8	300	520	570	17
ADD	FT-245P-400	Polyester	4	14	4	10	450	520	880	20
ADD	FT-275P-400	Polyester	4	14	4	12	450	520	1100	24





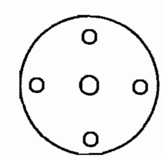


PRM float assemblies use the following arrangement for 3 float assemblies:
Hi level – (NC)
Pump on – (NO)
Pump off – (NO)

All float assemblies are made with isoloted switches. There are no common wires between floats.

These Float assemblies are typically housing in a 2" sight tube assembly with a clear sight inspection tuve.

FLOW EQUALIZER



Flow Equalizer contains one 3/8" center hole to ride the float stem and (4) equally spaced x 1/4" flow equalization holes. These holes distribute water flow at a regulated pace to elininate sloshing action.

P.R.M.
PRODUCT RECOVERY MANAGEMENT

205 BROADWAY STREET
DURHAM, NORTH CAROLINA 27701
TEL: (919) 682-2054

FLOAT STEM ASSEMBLY	SCALE: 10 SCALE
REV.:	DRAWN BY GAC
	DRAWING No.: 1

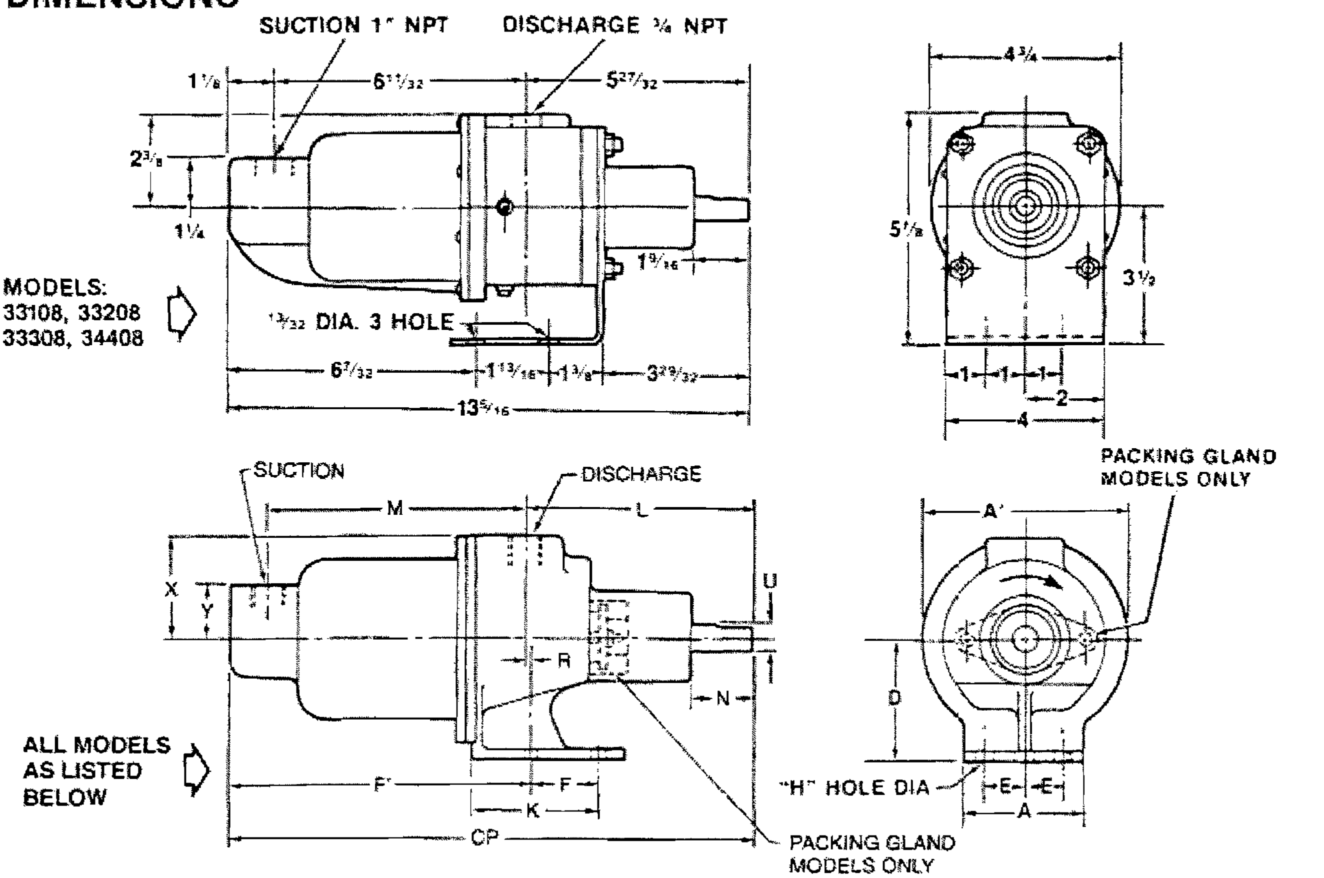
SPECIFICATION DATA

MOYNO® 500 PUMPS

300 SERIES

331, 332, 333, 344, 356 AND 367 MODELS

DIMENSIONS

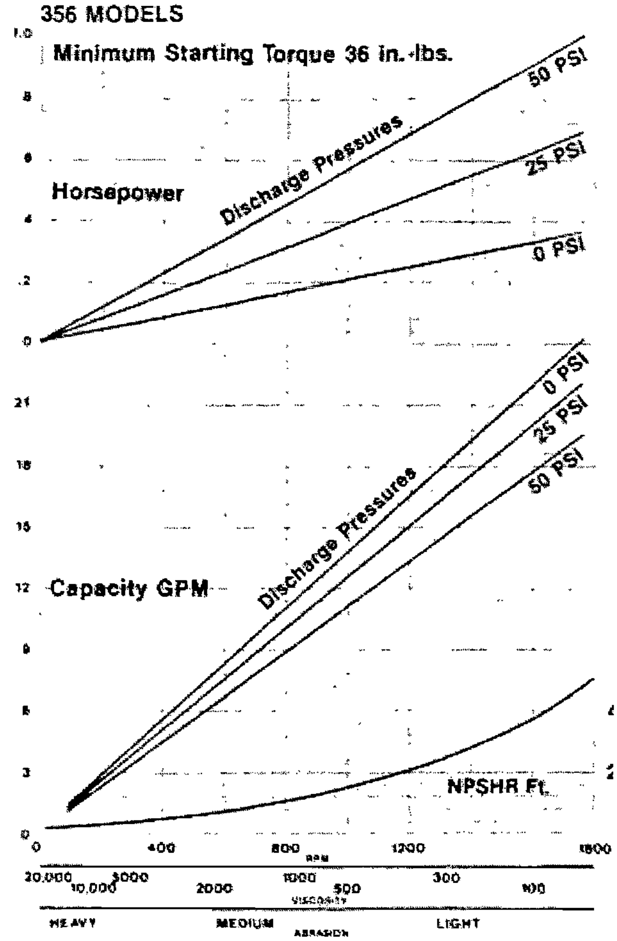


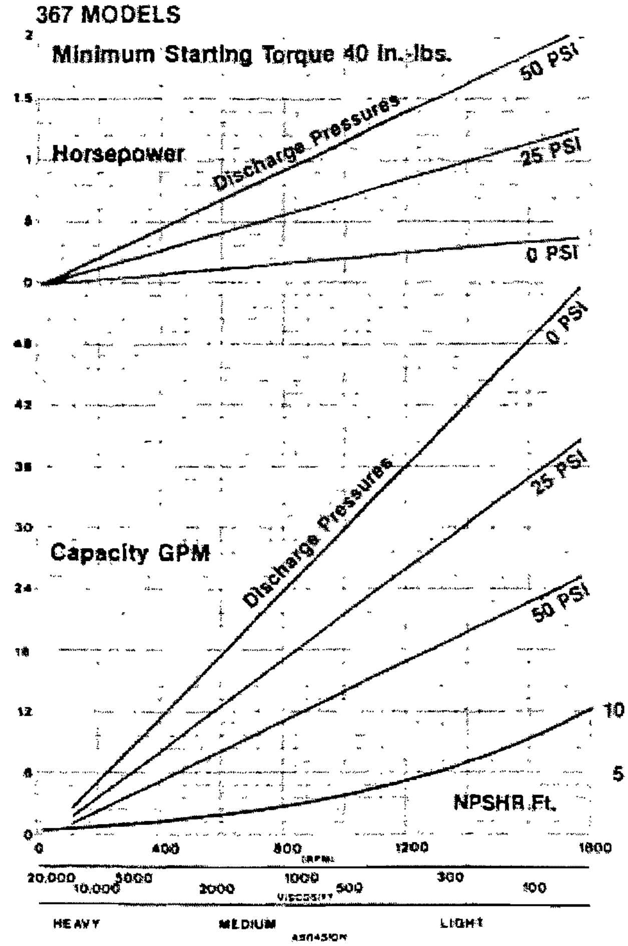
MODELS	CP	A	A¹	D	E	F	F¹	H	K	L	M	N	R	U	X	Y	SUCT (NPT)	DISCH (NPT)
33101, 33201 33301, 33104 33204, 33304 34401, 34404	12 5/8	3 1/8	4 3/4	2 3/4	1	1 13/16	6 15/16	13/32	3 1/32	5 11/16	6 1/16	1 7/16	—	5/8	2 3/8	1 1/4	3/4	3/4
*34411	13 15/16	3 1/4	4 3/4	2 3/4	1 1/8	—	7 3/16	13/32	2 7/8	7	6 1/16	1 3/8	1/4	5/8	2 5/16	1 1/4	3/4	3/4
35601, 35604	17 1/2	6 1/2	7 9/16	4 9/32	1 3/4	2	10 19/32	13/32	4 1/2	7 3/8	8 5/8	2 3/8	15/32	3/4	3 25/32	2 1/8	1 1/2	1 1/4
*35611, *35613	19 3/8	6 1/2	7 9/16	4 9/32	1 3/4	2 1/2	10 19/32	13/32	4	9 11/32	8 5/8	2 13/32	9/16	3/4	3 25/32	2 1/8	1 1/2	1 1/4
36701, 36704	20 15/16	5 1/4	8	4 1/2	2	2 5/16	13	9/16	4 1/16	7 15/16	11 3/16	2 1/8	—	1	4	2 1/2	2	2

*Packing Gland Model

All dimensions are in inches. Specifications subject to change without notice.

356 and 367 MODELS PERFORMANCE (water at 70°F)





NOTE: For fluids with viscosity over 200 CP (1,000 SSU), pump capacity is reduced by 20%.

MATERIALS OF CONSTRUCTION

COMPONENT	MODELS					
	35601, 35611		35604, 35613		36701	36704
Housing	Cast iron		316 SS		Cast iron	316 SS
Rotor	416 SS/CP		316 SS/CP		416 SS/CP	316 SS/CP
Stator	NBR (Nitrile)		NBR (Nitrile)		NBR (Nitrile)	NBR (Nitrile)
Weight (lbs)	37	40	37	40	54	54

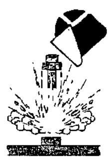
CP=Chrome plated

Printed in U.S.A.

+GF+ SIGNET PVC/CPVC TEE Fitting Instructions

ENGLISH

PV8T090-1
A-4/96



CAUTION!

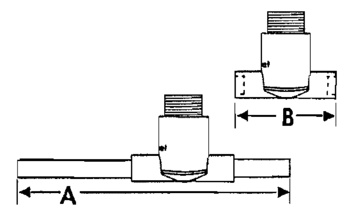
- Improper pipe fitting installation may result in pressure failure, personal injury, and/or property damage.
- Always match fitting and pipeline materials.
- Always use piping cement designed for your specific fitting and pipeline material.

1. +GF+ SIGNET PVC/CPVC Tee Fittings

PVC TEE Fittings, 0.5 - 1.5 in.

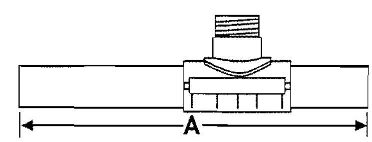
Fitting Number	Fitting Size	Fitting Type	Fitting Material	Male fitting Dimension "A"	Female fitting Dimension "B"
PV8T005	0.5 in.	Male pipe ends	PVC, SCH 80	356 mm (14 in.)	95 mm (3.75 in.)
PV8T007	0.75 in.	Male pipe ends	PVC, SCH 80	356 mm (14 in.)	95 mm (3.75 in.)
PV8T010	1.0 in.	Male pipe ends	PVC, SCH 80	432 mm (17 in.)	109 mm (4.3 in.)
PV8T012	1.25 in.	Male pipe ends	PVC, SCH 80	508 mm (20 in.)	108 mm (4.25 in.)
PV8T015	1.5 in.	Male pipe ends	PVC, SCH 80	610 mm (24 in.)	119 mm (4.7 in.)

Add "F" for Female socket type fitting (illustration B)



PVC TEE Fittings, 2 - 4 in.

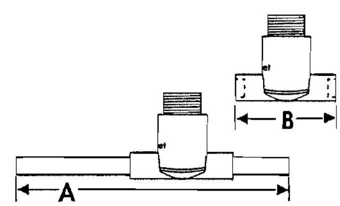
Fitting Number	Fitting Size	Fitting Type	Fitting Material	Male fitting Dimension "A"
PV8T020	2.0 in.	Male pipe ends	PVC, SCH 80	610 mm (24 in.)
PV8T025	2.5 in.	Male pipe ends	PVC, SCH 80	610 mm (24 in.)
PV8T030	3.0 in.	Male pipe ends	PVC, SCH 80	610 mm (24 in.)
PV8T040	4.0 in.	Male pipe ends	PVC, SCH 80	610 mm (24 in.)



CPVC TEE Fittings, 0.5 - 1.5 in.

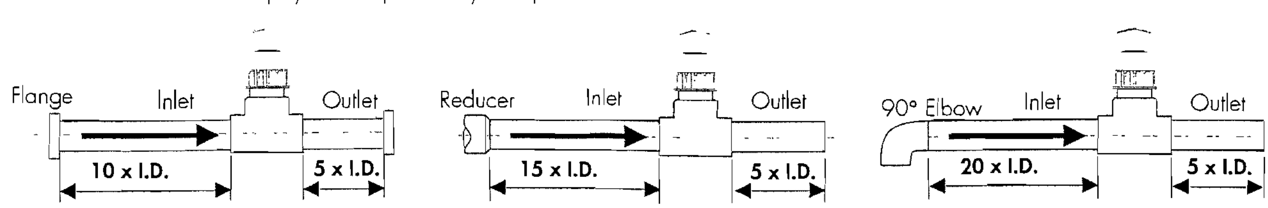
Fitting Number	Fitting Size	Fitting Type	Fitting Material	Male fitting Dimension "A"	Female fitting Dimension "B"
CPV8T005	0.5 in.	Male pipe ends	CPVC, SCH 80	356 mm (14 in.)	95 mm (3.75 in.)
CPV8T007	0.75 in.	Male pipe ends	CPVC, SCH 80	356 mm (14 in.)	95 mm (3.75 in.)
CPV8T010	1.0 in.	Male pipe ends	CPVC, SCH 80	432 mm (17 in.)	109 mm (4.3 in.)
CPV8T012	1.25 in.	Male pipe ends	CPVC, SCH 80	508 mm (20 in.)	108 mm (4.25 in.)
CPV8T015	1.5 in.	Male pipe ends	CPVC, SCH 80	610 mm (24 in.)	119 mm (4.7 in.)

Add "F" for Female socket type fitting (illustration B)



2. Recommended Fitting Location

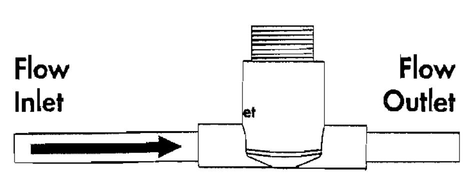
Always locate the fitting in a spot where you have the longest upstream straight run. This allows the flow profile plenty of time to settle into the fully developed, turbulent range. Industry standards usually require a minimum of 10 pipe diameters upstream and 5 pipe diameters downstream. Major obstructions that interrupt the flow such as pumps, valves, etc. require considerably longer straight runs for the flow profile to recover. Careful selection of this location will pay off in optimum system performance.



3. Fitting Direction

Observe markings on fitting for proper inlet orientation (some models):

- Male Tee fittings (All): Always install longer pipe end pointing upstream.
- Female Tee fittings: Always place end marked "Inlet" upstream. Unmarked Tee fittings are bidirectional and can be installed in either direction.



+GF+ SIGNET 515/3-8510-XX Rotor-X Paddlewheel Flow Sensor

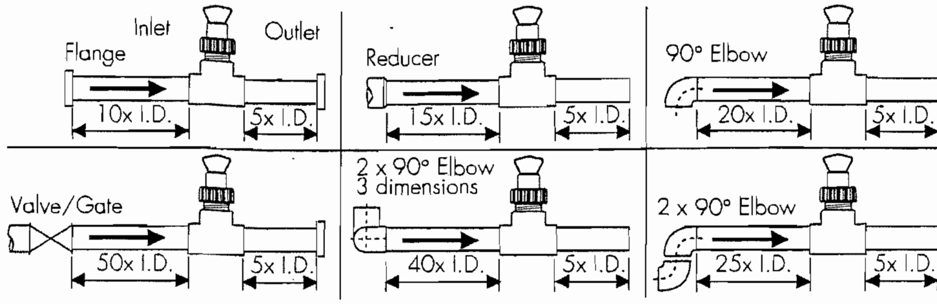
ENGLISH

P51590-1
J-5/97

SAFETY INSTRUCTIONS
1. Do not remove from pressurized lines.
2. Do not exceed maximum temperature/pressure specifications.
3. Do not install/service without following installation instructions (see sensor manual).
4. Wear safety goggles and faceshield during installation/service.
5. Do not alter product construction.
6. Failure to follow safety instructions could result in severe personal injury!

1. Location of Fitting

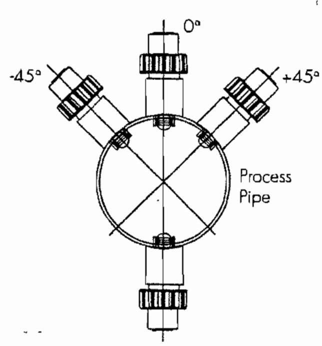
Recommended sensor upstream/downstream mounting requirements



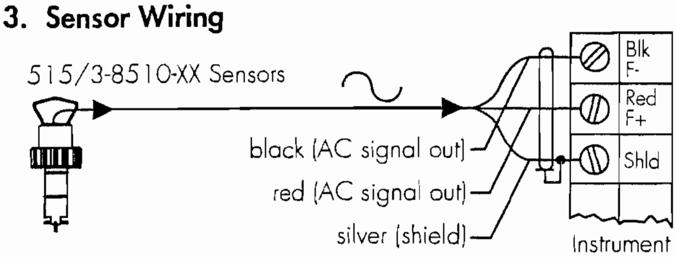
2. Sensor Mounting Position

• Horizontal pipe runs: Mount sensor in the upright (0°) position for best overall performance. Mount at a maximum of 45° when air bubbles are present. Do not mount on the bottom of the pipe when sediments are present.

• Vertical pipe runs: Sensor must be mounted in lines with UPWARD flow only.

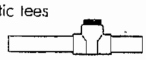
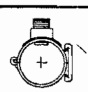
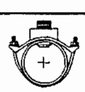


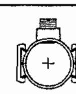
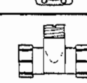
3. Sensor Wiring



Technical Notes
- Use 2-conductor shielded cable for cable extensions up to 60 m (200 ft).
- Cable shield must be maintained through cable splice.
- Refer to your instrument manual for specific wiring details.

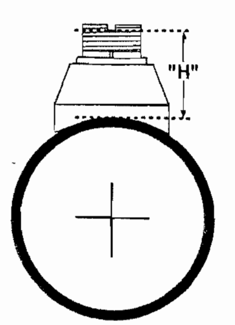
4. +GF+ SIGNET Fittings

Type	Description
Plastic tees 	• 0.5 to 4 in. versions • PVC or CPVC • Mounts via glue-on fittings
PVC glue-on saddles (O-ring not required) 	• 2 to 4 in., cut 1-7/16 in. hole in pipe • 6 to 8 in., cut 2-1/4 in. hole in pipe • Align wedge arrows with saddle arrows during assembly. • Pipes over 8 in., use iron saddle
Iron strap-on saddles 	• 2 to 4 in., cut 1-7/16 in. hole in pipe • Over 4 in., cut 2-1/4 in. hole in pipe • Special order over 12 in.
Carbon steel weld-on weldolets 	• 2 to 4 in., cut 1-7/16 in. hole in pipe • Over 4 in., cut 2-1/4 in. hole in pipe • Remove insert before welding • Installed by certified welder only • Special order over 12 in.
Carbon steel threaded tees 	• 0.5 to 2 in. versions • Mounts on threaded pipe ends

Type	Description
	**Metric plastic saddle** • For pipes DN 65 to 200 mm • Requires a 30 mm diam. hole in the pipe • Wedge and saddle arrows must match
	**Metric wafer fitting** • For pipes DN 65 to 200 mm • Follow the recommended installation guidelines
	**Metric union fitting** • For pipes from DN 15 to 50 mm • PP or PVDF • Follow the recommended installation guidelines

5. H-Dimensions

The plastic sensor insert in the Weldolet fitting MUST be removed during the welding process. When reinstalled, it is important that the insert be threaded to the proper height ("H" dimension).



Weldolet part number	"H" dimension inches	mm	Weldolet part number	"H" dimension inches	mm
CS4W020	2.38	60.45	CS4W240	4.16	105.66
CS4W025	2.33	59.18	CS4W360	4.10	104.14
CS4W030	2.32	58.92			
CS4W040	2.30	58.42	CR4W020	2.38	60.45
CS4W050	3.09	78.48	CR4W025	2.33	59.18
CS4W060	2.96	75.18	CR4W030	2.32	58.92
CS4W080	2.73	69.34	CR4W040	2.30	58.42
CS4W100	5.48	139.19	CR4W050	3.09	78.48
CS4W120	5.25	133.35	CR4W060	2.96	75.18
CS4W140	5.10	129.54	CS4W080	2.73	69.34
CS4W160	4.85	123.19	CR4W100	5.48	139.19
CS4W180	4.60	116.84	CR4W120	5.25	133.35
CS4W200	4.38	111.25			

APPENDIX B

Treatment System

PRODUCT RECOVERY
P R M
MANAGEMENT®

PRM AST SERIES AIR STRIPPER OPERATION INSTRUCTIONS

All PRM Lo Profile air strippers require approximately 4" to 6" of static pressure per tray to operate properly. Higher static pressures may occur if the stripper is fouled due to precipitated iron, calcium, or sediment.

All stripper systems are designed such that the air stripper blower must be running prior to operating recovery pumps or transfer pumps feeding the air stripper. A low pressure switch on the stripper blower discharge will prevent pumps from feeding water to the stripper if the blower is not operating.

OPERATION

1. Start air stripper blower with unit dry. It is best to have the blower discharge damper open only 50%.
2. Begin pumping water into the air stripper at a regulated rate. For maximum efficiency, be sure to throttle the flow of water into the stripper to only slightly exceed the rate at which water is entering the treatment system. Try to avoid batching large slugs of influent into the air stripper.
3. When water can be seen in the sump site glass, then the air stripper is fully primed.
4. If a transfer pump is connected to the discharge of the stripper, make sure that the influent and effluent pumps are tuned in to allow for the effluent flow to slightly exceed the influent flow. This will maintain efficiency downstream of the air stripper as well as prevent H/L alarms at the stripper sump.
5. Once the system is started and operational, check and tighten the tension rods so that none of the stripper trays leak. It is only necessary to tighten the trays until the ½" gasket is compressed to approximately ¼" on the upper trays. Further compression can cause gasket failure. (Note that on some of the lower trays, the gasket will compress more than ¼" due to the weight of trays and water above.)
6. Adjust the airflow damper to ensure that the stripper is getting the proper air-flow. (See table 1). For maximum efficiency, the damper can be opened to the point that the stripper exhausts water droplets through the stack and then adjusted slightly back from this point.

TIPS

1. System logic should always dictate that the pump(s) feeding the air stripper will not run unless the air stripper blower is operational. This is generally achieved with a low pressure switch that is set to detect blower operation.
2. When tightening tension rods, tighten in a slow, progressive diagonal pattern approximately ¼ - ½ turn at a time. Do not overtighten rods as gasket failure will occur. The weight of the water for the most part will generate the proper compression of the gaskets. The tension rod nuts need only to be tightened at most 2-3 turns more than this natural compression.
3. Before shutting down the air stripper blower, make sure that the blower runs for at least 5 minutes after any influent has entered the unit.
4. Keep in mind that when the blower is de-energized, suspended water in the trays will fall to the sump of the stripper. Be sure there is at least 12" of capacity in the sump beneath the H/L alarm float.

AIR STRIPPER OPERATIONAL FLOWS

AST STRIPPER SERIES	OPERATIONAL FLOW
130 Series	150cfm
230 Series	300cfm
620 Series	600cfm
630 Series	900cfm
640 Series	1200cfm

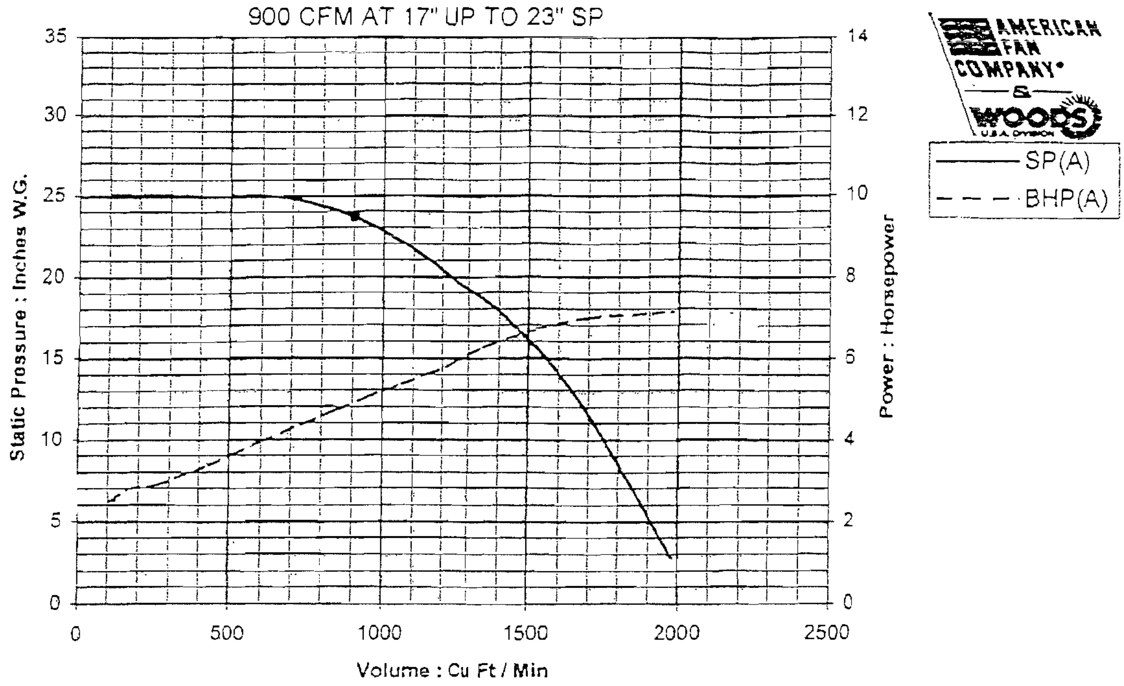
OPERATIONAL PARAMETERS

AIR STRIPPER OPERATIONAL PRESSURES

Number of Trays	Operational Pressure
1 Tray	4-6"WC
2 Trays	8-10"WC
3 Trays	12-16"WC
4 Trays	16-20"WC
5 Trays	20-25"WC

POSSIBLE PROBLEMS & REMEDIIES

PROBLEM	POSSIBLE REASON	REMEDY
Air Stripper gasket leaks	Gaskets are not sufficiently tightened	Tightened until approximately ¼" compression or leaks stop
	Gaskets have been overtightened	Replace with new gaskets. Call PRM for materials
Low air flow from exhaust of stripper	Trays fouled with scale or bacteria	Break down unit and clean with mild acid solution
	Demistor element fouled	Remove lid, clean or replace element.
	Air damper restricted	Open air damper to achieve proper air flow
Water coming from exhaust stack	Air flow is too high	Adjust airflow with the airflow damper
	Water influent rate exceeding rated capacity of stripper	Reduce/throttle influent flow rate
Pumps feeding air stripper are backing up	Nozzles clogged	Open top tray, remove nozzles and clean or replace
Pumps feeding stripper will not activate	Low pressure switch not detecting blower operation	Check pressure switch. Adjust or replace if defective
Contaminants not sufficiently removed as modeled	Surfactants in water (Check for foam in stripper)	Analyze for potential constituents. Re-evaluate the situation and consult with PRM
	Low air flow	Open air damper to achieve proper/maximum air flow
	Slugging influent	Adjust influent flow to stripper to an equalized flow rate within the specified operating parameters
	Influent concentrations exceeding modeling	Sample influent. Consult PRM with result.



AMERICAN FAN COMPANY & WOODS U.S.A. DIVISION

PRM PRESSURE BLOWERS
900 CFM SYSTEMS
SPECIFICATION #PRM02250.C

A SIZE = BC-3-06-20A ; RPM = 3450 ; Density = 0.0750 Lb/CF ; Width = 100.00%

CV-00009

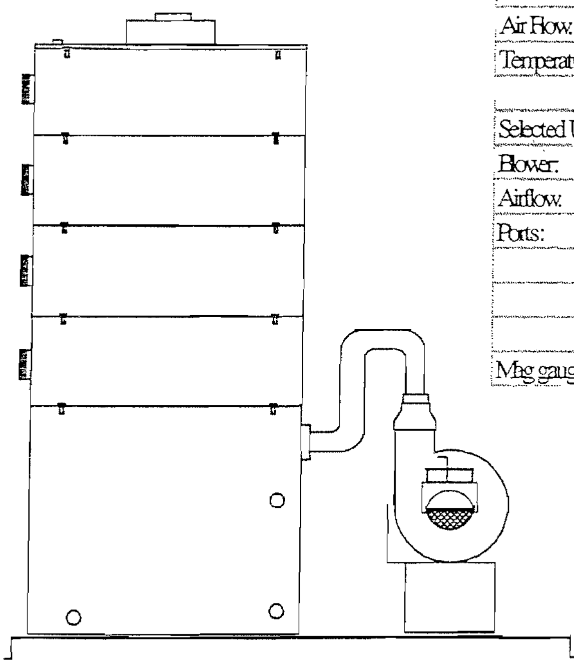
AST blower

PRM AST SERIES LO-PROFILE AIR STRIPPERS								
MODEL No.	No. Trays	Inlet	Outlet	Stack	Dimensions (WxLxH)	Flow (GPM)	Motor HP	CFM
AST622	2	2"	4"	6"	72"x24"x62"	90	7.5	600
AST623	3	2"	4"	6"	72"x24"x72"	90	7.5	600
AST624	4	2"	4"	6"	72"x24"x82"	90	7.5	600
AST632	2	2"	4"	8"	72"x36"x62"	135	7.5	900
AST633	3	2"	4"	8"	72"x36"x72"	135	7.5	900
AST634	**4**	**2"**	**4"**	**8"**	**72"x36"x82"**	**135**	**7.5**	**900**
AST635	5	2"	4"	8"	72"x36"x92"	135	7.5	900

* Influent water pressure size at 10psig

* Gravity discharge requires use of P-Trap and Vacuum breaker

SITENAME	Environmental Alliance	
	Sequa Nyack	
Stripper Selection:	600 series	
Source:	groundwater	
Water Flow:	135 gpm series performance stripper 1	
Air Flow:	900 cfm	
Temperature	60F	
Selected Unit:	Model 634	
Blower:	7.5 HP	
Airflow:	Adj. 0-900 cfm	
Ports:	Water In:	2" FPT
	Water Out:	4" SS, FPT
	Air Inlet:	8" manifold,
	Air Discharge:	Single 8" center port
Mag gauge:	0-30"W.C	



Contaminant	Influent(ppb)	1 tray	2 tray	3 tray	4 tray
	SEE ATTACHED REFERENCE SHEET				

PRM AST Series Air Strippers are constructed of Type [illegible] Stainless Steel. Tension latches between trays are Stainless Steel.
Units are standard skid mounted on a painted steel skid with forklift provisions.

P.R.M.
PRODUCT RECOVERY MANAGEMENT
1705 New Raleigh Road
DURHAM, NORTH CAROLINA 27703
TEL: (919) 957-8890

ITEM DRAWING
PRM LO-PRO STRIPPERS

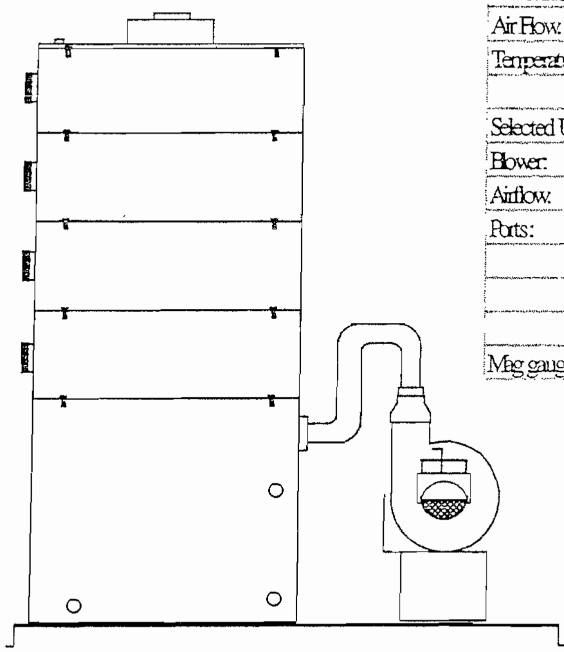
DWG. NO.: xxxxxxx | REV. 0

PRM AST SERIES LO-PROFILE AIR STRIPPERS								
MODEL No.	No. Trays	Inlet	Outlet	Stack	Dimensions (WxLxH)	Flow (GPM)	Motor HP	CFM
AST622	2	2"	4"	6"	72"x24"x62"	90	7.5	600
AST623	3	2"	4"	6"	72"x24"x72"	90	7.5	600
AST624	4	2"	4"	6"	72"x24"x82"	90	7.5	600
AST632	2	2"	4"	8"	72"x36"x62"	135	7.5	900
AST633	3	2"	4"	8"	72"x36"x72"	135	7.5	900
AST634	**4**	**2"**	**4"**	**8"**	**72"x36"x82"**	**135**	**7.5**	**900**
AST635	5	2"	4"	8"	72"x36"x92"	135	7.5	900

* Influent water pressure size at 10psig

* Gravity discharge requires use of P-Trap and Vacuum breaker

SITENAME	Environmental Alliance	
	Sequa Nyack	
Stripper Selection:	600 series	
Source:	groundwater	
Water Flow:	135 gpm series performance stripper 2	
Air Flow:	900 cfm	
Temperature	60F	
Selected Unit:	Model 634	
Blower:	7.5 HP	
Airflow:	Adj. 0-900 cfm	
Ports:	Water In:	2" FPT
	Water Out:	4" SS, FPT
	Air Inlet:	8" manifold,
	Air Discharge:	Single 8" center port
Mag gauge:	0-30"W.C	



Contaminant	Influent(ppb)	1 tray	2 tray	3 tray	4 tray
	SEE ATTACHED REFERENCE SHEET				

PRM AST Series Air Strippers are constructed of Type 304 Stainless Steel. Tension latches between trays are Stainless Steel.
Units are standard skid mounted on a painted steel skid with forklift provisions.

P.R.M. PRODUCT RECOVERY MANAGEMENT
1705 New Raleigh Road
DURHAM, NORTH CAROLINA 27703
TEL: (919) 957-8890

ITEM DRAWING
PRM LO-PRO STRIPPERS

DWG. NO.: xxxxxxx REV. 0

Dwyer

SERIES 1950

INTEGRAL EXPLOSION-PROOF PRESSURE SWITCHES

Specifications - Installation and Operating Instructions

The New Model 1950 Explosion-Proof Switch combines the best features of the popular Dwyer Series 1900 Pressure Switch with a compact explosion-proof housing.

The unit is U.L. and CSA listed, FM approved for use in Class I, Groups C & D, Class II, Groups E, F, & G and Class III atmospheres. It is also totally rain-tight for outdoor installations. Twelve models allow set-points from .03 to 20 inches W.C. and from .5 to 50 PSI.

Easy access to the SPDT switch for electrical hook-up is provided by removing the top plate of the three-part aluminum housing. Adjustment to the set point of the switch can be made without disassembly of the housing. The unit is very compact, about half the weight and bulk of equivalent conventional explosion-proof switches.

CAUTION: For use only with air or compatible gases. Use of the Model 1950 switch with explosive media connected to the **Low** pressure port (including differential pressure applications in such media) is not recommended. Switch contact arcing can cause an explosion inside the switch housing which, while contained, may render the switch inoperative. If switch is being used to sense a single positive pressure relative to atmosphere, run a line from the low pressure port to a non-hazardous area free of combustible gases. This may increase response time on -0 and -00 models.

UL and CSA Listed, FM Approved For
CL. I GR. C,D – CL. II GR. E,F,G – CL. III

Model 1950 Switches: Operating ranges and dead bands.

To order specify Model Number	Operating Range Inches, W.C.	Approximate Dead Band	
		At Min. Set Point	At Max. Set Point
1950-02	0.03 to 0.10	0.025	0.05
1950-00	0.07 to 0.15	0.04	0.05
1950-0	0.15 to 0.5	0.10	0.15
1950-1	0.4 to 1.6	0.15	0.20
1950-5	1.4 to 5.5	0.3	0.4
1950-10	3.0 to 11.0	0.4	0.5
1950-20	4.0 to 20.0	0.4	0.8
Model Number	**Operating Range PSI**	**Approximate Dead Band**	
		Min. Set Point	**Max. Set Point**
1950P-2	.5 to 2.0	0.3 PSI	0.3 PSI
1950P-8	1.5 to 8.0	1.0 PSI	1.0 PSI
1950P-15	3.0 to 15.0	0.9 PSI	0.9 PSI
1950P-25	4.0 to 25.0	0.7 PSI	0.7 PSI
1950P-50	15.0 to 50	1.0 PSI	1.5 PSI

PHYSICAL DATA

Temperature Limits: −40° to 140°F (−40° to 60°C), 1950P-8, 15, 25 & 50 0° to 140°F (−17.8° to 60°C), 1950-02 −30° to 130°F (−34.4° to 54.4°C).

Rated Pressure: 1950 — 45 IN. W.C., 1950P — 35 PSI, 1950P-50 only — 70 PSI.

Maximum surge pressure: 1950 — 10 PSI, 1950P — 50 PSI, 1950P-50 only — 90 PSI

Pressure Connections: ⅛" NPT

Electrical Rating: 15 amps, 125, 250,480 volts, 60 Hz. A.C. Resistive ⅛ H.P. @ 125 volts, ¼ H.P. @ 250 volts, 60 Hz. A.C.

Wiring connections: 3 screw type common, norm. open and norm. closed

Conduit connections: ½" NPT

Set point adjustment: Screw type on top of housing. Field adjustable.

Housing: Anodized cast aluminum

Diaphragm: Molded fluorosilicone rubber 02 model, silicone on nylon

Calibration Spring: Stainless Steel.

Installation: Mount with diaphragm in vertical position

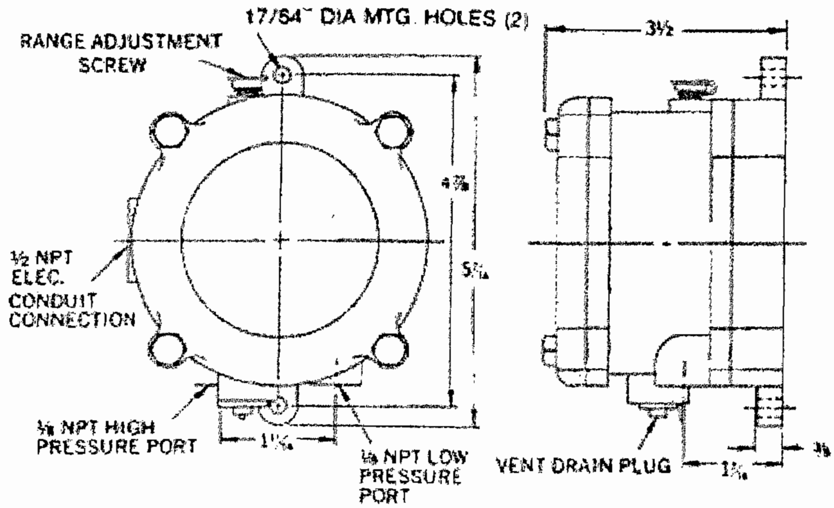
Weight: 3¼ lbs. 02 model, 4 lbs. 7 oz.

Response Time: Because of restrictive effect of flame arrestors, switch response time may be as much as 10-15 seconds where applied pressures are near set point.

NOTE: The last number-letter combination in the 1950 model number identifies the switch electrical rating (number) and diaphragm material (letter). The 2F combination is standard as described in the physical data above. In the case of special models, a number 1 rating is the same as 2; a number 3 or 4 rating is 10A 125, 250, 480 VAC - ⅛ HP 125 VAC, ¼ HP 250 VAC; and a number 5 or 6 rating is 1A 125 VAC. A letter B indicates a Buna-N diaphragm, N. Neoprene, S; Silicone, and V, Viton.

DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, INDIANA 46360, U.S.A.
Telephone 219/879-8000
Fax 219/872-9057

SERIES 1950
INTEGRAL EXPLOSION-PROOF PRESSURE SWITCHES
Installation and Operating Instructions



1950-02: 7-3/4" dia. × 4-11/32" depth. For complete dimensions request drawing 28-700175-00 from our Customer Service Department.

1950 SWITCH OUTLINE DIMENSIONS

INSTALLATION

1. Select a location free from excess vibration and corrosive atmospheres where temperatures will be within the limits noted under Physical Data on page 1. Switch may be installed outdoors or in areas where the hazard of explosion exists. See page 1 for specific types of hazardous service.

2. Mount standard switches with the diaphragm in a vertical plane and with switch lettering and Dwyer nameplate in an upright position. Some switches are position sensitive and may not reset properly unless they are mounted with the diaphragm vertical. Special units can be furnished for other than vertical mounting arrangements if required.

3. Connect switch to source of pressure, vacuum or differential pressure. Metal tubing with 1/4" O.D. is recommended, but any tubing which will not restrict the air flow can be used. Connect to the two 1/8" NPT female pressure ports as noted below:

   A. Differential pressures - connect pipes or tubes from source of greater pressure to high pressure port marked HIGH PRESS. and from source of lower pressure to low pressure port marked LOW PRESS.

   B. Pressure only (above atmospheric) - connect tube from source of pressure to high pressure port. The low pressure port is left open to atmosphere. See CAUTION on page 1.

   C. Vacuum only (below atmospheric pressure) - connect tube from source of vacuum to low pressure port. The high pressure port is left open to atmosphere.

4. To make electrical connections, remove the three hex head screws from the cover and after loosening the fourth captive screw, swing the cover aside. Electrical connections to the standard single pole, double throw snap switch are provided by means of screw terminals marked "common," "norm open," and "norm closed." The normally open contacts close and the normally closed contacts open when pressure increases beyond the setpoint. Switch leads for standard models should not exceed the maximum specified current rating of 15 amps resistive. Switch capabilities decrease with an increase in ambient temperature, load inductance, or cycling rate. Whenever an application involves one or more of these factors, the user may find it desirable to limit the switched current to 10 amps or less in the interest of prolonging switch life.

ADJUSTMENT

To change the setpoint:

A. Remove the plastic cap and turn the slotted Adjustment Screw at the top of the housing clockwise to raise the setpoint pressure and counter-clockwise to lower the setpoint. After calibration, replace the plastic cap and re-check the setpoint.

B. The recommended procedure for calibrating or checking calibration is to use a "T" assembly with three rubber tubing leads, all as short as possible and the entire assembly offering minimum flow restriction. Run one lead to the pressure switch, another to a manometer of known accuracy and appropriate range, and apply pressure through the third tube. Make final approach to the setpoint very slowly. Note that manometer and pressure switch will have different response times due to different internal volumes, lengths of tubing, fluid drainage, etc. Be certain the switch is checked in the position it will assume in use, i.e. with diaphragm in a vertical plane and switch lettering and Dwyer nameplate in an upright position.

C. For highly critical applications check the setpoint adjustment and if necessary, reset it as noted in step A.

MAINTENANCE

The moving parts of these switches need no maintenance or lubrication. The only adjustment is that of the setpoint. Care should be taken to keep the switch reasonably clean. Periodically the vent drain plug should be rotated then returned to its original position. This will dislodge deposits which could accumulate in applications where there is excessive condensation within the switch.

Printed in U.S.A. 4/97

FR28-440332-00

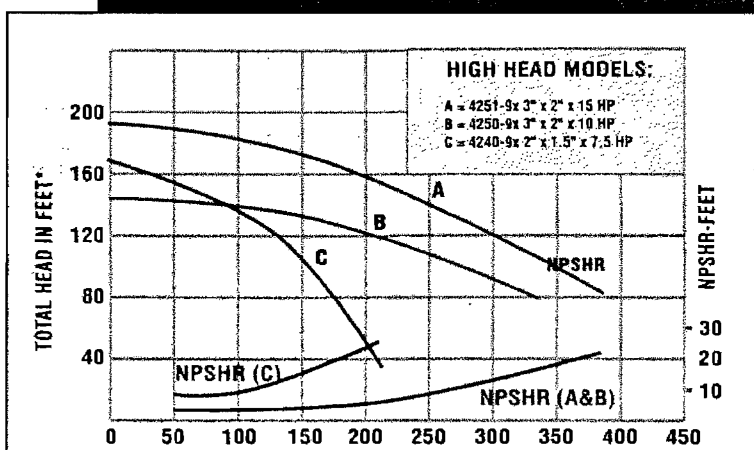
DWYER INSTRUMENTS, INC.
P.O. Box 373, Michigan City, Indiana 46360, U.S.A.
Phone: 219/879-8000 Fax: 219/872-9057

Heavy Duty Straight Centrifugal Pumps

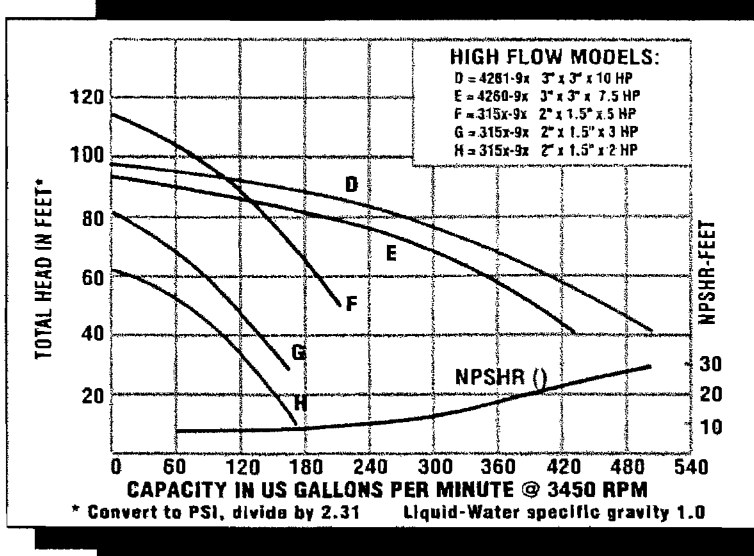
- *Available in: Investment Cast 316 Stainless Steel, Cast Naval Bronze and Cast Iron with Bronze impeller construction*
- *2 HP - 15 HP NEMA Motors, Single and Three phase*
- *Type 21 Buna N Mechanical Seal and O-ring on Naval Bronze & Cast Iron Models*
- *Type 21 Viton® Mechanical Seal and O-ring on Stainless Steel Models*
- *Optional Silicon Carbide Seals available*
- *High Flow and High Head Designs*
- *Flanged or NPT Connections*
- *Temperature Range*
  Viton®: 40° to 200° F
  Buna N: 40° to 180° F
- *Front drain plugs located 90° apart*
- *Maximum Head 194 Ft. (100 PSI)*
- *Maximum Flow 500 GPM*
- *Maximum Working pressure 150 PSI*

AMT Industrial Straight Centrifugal pumps are suited for liquid and chemical transfer, heating and cooling, recirculation, booster service and other industrial applications. Stainless Steel units are especially effective in applications where rust and/or corrosion can develop in systems. Semi-open impeller features self-cleaning ability that makes the unit useful in applications involving muddy or dirty liquids, as well as clean, clear fluids. Discharge position can be adjusted in 90° increments, with vent and drain plugs for all positions. Type 21 mechanical seal and O-ring casing seal. Naval Bronze models feature a seal wash to rinse salt water from seal cavity. Pumps are closed coupled to Totally Enclosed Fan Cooled motors (TEFC) or Open Drip-Proof (ODP) depending on the models. Pumps are not self-priming and require flooded suction.

AMT Centrifugal pumps are reliable, cost effective and low maintenance. Many are readily available **"Off-the-Shelf"** for fast, same day delivery. For use with nonflammable liquids compatible with pump component materials.



CAPACITY IN US GALLONS PER MINUTE @ 3450 RPM
* Convert to PSI, divide by 2.31 Liquid-Water specific gravity 1.0



CAPACITY IN US GALLONS PER MINUTE @ 3450 RPM
* Convert to PSI, divide by 2.31 Liquid-Water specific gravity 1.0

Heavy Duty Centrifugal Pumps

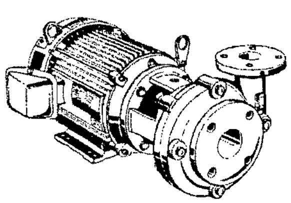
PUMP DIMENSIONAL AND SPECIFICATION DATA

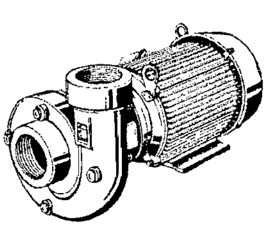
MODEL #	HP	PH	Frame	ENC	Voltage @ 60 Hz +	Full Load Amps	SUC*	DIS*	AB**	CP**	D	E	F	H1	H2	L	LP	MP	O	X	Y	Z	ZZ	Shipping Weight XNB (-94)	XCI (-95)	XSS (-98)
3150-9x	2	3	145JM	TEFC	230/460	6 / 3	2"	1½"	6.1	17.6	3.5	2.8	5.0	0.3	0.3	10.4	4.1	4.0	7.1	4.8	2.5	4.0	N/A	N/A	69 lbs.	69 lbs.
3151-9x	3	3	182JM	TEFC	230/460	8 / 4	2"	1½"	7.5	21.6	4.5	3.8	4.5	0.4	0.4	12.7	4.1	4.0	9.3	4.8	2.5	4.0	N/A	N/A	83 lbs.	83 lbs.
3152-9x	5	3	184JM	TEFC	230/460	17 / 9	2"	1½"	7.5	21.6	4.5	3.8	5.5	0.4	0.4	11.8	4.1	4.0	9.3	4.8	2.5	4.0	N/A	107 lbs.	100 lbs.	100 lbs.
3154-9x	3	3	182JM	TEFC	230/460	8 / 4	2"	1½"	7.5	21.6	4.5	3.8	4.5	0.4	0.4	12.7	4.1	4.0	9.3	4.8	2.5	4.0	6.5	N/A	91 lbs.	91 lbs.
3155-9x	5	3	184JM	TEFC	230/460	17 / 9	2"	1½"	7.5	21.6	4.5	3.8	5.5	0.4	0.4	11.8	4.1	4.0	9.3	4.8	2.5	4.0	6.5	N/A	108 lbs.	108 lbs.
3156-9x	2	1	56J	TEFC	115/230	22 / 11	2"	1½"	N / A	10.1	3.5	2.4	3.0	0.9	0.3	8.6	2.0	4.0	8.1	4.8	2.5	4.0	N/A	N/A	65 lbs.	65 lbs.
3157-9x	2	3	56J	TEFC	230/460	6 / 3	2"	1½"	N / A	10.3	3.5	2.4	3.0	0.9	0.3	8.6	2.0	4.0	6.6	4.8	2.5	4.0	N/A	N/A	64 lbs.	64 lbs.
3158-9x	2	1	56J	ODP	115/230	28 / 14	2"	1½"	4.6	11.7	3.5	2.4	3.0	0.9	0.3	8.6	2.0	4.0	8.7	4.8	2.5	4.0	N/A	N/A	62 lbs.	62 lbs.
3159-9x	2	3	56J	ODP	230/460	7 / 4	2"	1½"	4.9	10.6	3.5	2.4	3.0	0.9	0.3	8.6	2.0	4.0	7.1	4.8	2.5	4.0	N/A	N/A	61 lbs.	61 lbs.
315A-9x	3	1	56J	TEFC	230	16	2"	1½"	N / A	11.4	3.5	2.4	3.0	0.9	0.3	8.6	2.0	4.0	8.1	4.8	2.5	4.0	N/A	N/A	75 lbs.	75 lbs.
315B-9x	3	3	56J	TEFC	230/460	8 / 4	2"	1½"	N / A	11.1	3.5	2.4	3.0	0.9	0.3	8.6	2.0	4.0	6.6	4.8	2.5	4.0	N/A	N/A	74 lbs.	74 lbs.
315C-9x	3	1	56J	ODP	230	18	2"	1½"	4.9	12.6	3.5	2.4	3.0	0.9	0.3	8.6	2.0	4.0	8.8	4.8	2.5	4.0	N/A	N/A	72 lbs.	72 lbs.
315D-9x	3	3	56J	ODP	230/460	9 / 5	2"	1½"	4.9	12.1	3.5	2.4	3.0	0.9	0.3	8.6	2.0	4.0	7.1	4.8	2.5	4.0	N/A	N/A	71 lbs.	71 lbs.
4240-9x	7½	3	184JM	TEFC	230/460	22 / 11	2"	1½"	7.5	21.4	4.5	3.8	5.5	0.4	0.4	11.5	3.5	4.4	9.3	5.9	2.4	3.8	N/A	N/A	108 lbs.	108 lbs.
4250-9x	10	3	184JM	TEFC	230/460	26 / 13	3"	2"	7.5	21.5	4.5	3.8	5.5	0.4	0.4	11.7	3.5	4.4	9.3	5.0	2.8	4.8	N/A	N/A	120 lbs.	120 lbs.
4251-9x	15	3	215JM	TEFC	230/460	47 / 24	3"	2"	8.3	26.0	5.3	4.3	7.0	0.4	0.4	12.5	3.5	4.5	10.9	5.0	2.8	4.8	N/A	N/A	195 lbs.	195 lbs.
4260-9x	7½	3	184JM	TEFC	230/460	22 / 11	3"	3"	7.5	22.4	4.5	3.8	5.5	0.4	0.4	12.5	4.1	4.8	9.3	6.5	2.8	4.5	N/A	125 lbs.	117 lbs.	117 lbs.
4261-9x	10	3	184JM	TEFC	230/460	26 / 13	3"	3"	7.5	22.4	4.5	3.8	5.5	0.4	0.4	12.5	4.1	4.8	9.3	6.5	2.8	4.5	N/A	131 lbs	124 lbs.	124 lbs.

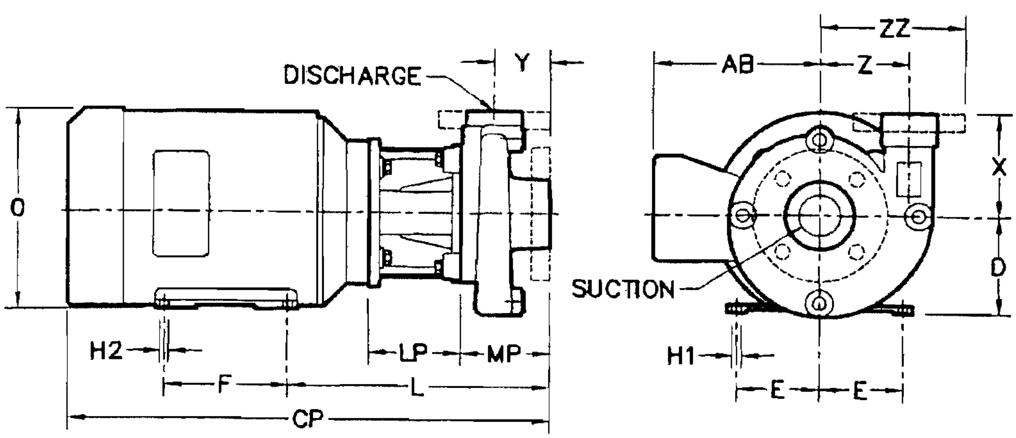
NOTE: All dimensions have a tolerance of +/- 1/8"
* Standard NPT (female) pipe thread
**Dimensions may vary due to motor manufacturer specifications
(+) 3 Phase models operate on 208VAC@50Hz. This will change Full Load Amps and Service Factor.
Models 3154 and 3155 have 125 lb. Flange connection

When ordering add the correct-9x suffix to model number indicating material selection

XNB (-94)=Naval Bronze construction with Buna N seals, Max. Temperature 180° F *(Models 3152, 4260 & 4261 only)*
XCI (-95)=Cast Iron construction with Bronze impeller and Buna N seals, Max. Temperature 180° F
XSS (-98)=All 316 Stainless Steel construction with Viton® seals, Max. Temperature 200°F







Standard Features

- **Stainless Steel**, Naval Bronze & Cast Iron Construction
- Buna N or Viton® Mechanical Seal and O-rings depended on models, optional Silicon Carbide available
- **Stainless Steel** Hardware
- NEMA ODP & TEFC Single and Three phase motors depending on the model.
- **Stainless Steel** motor shaft
- Self-cleaning impeller
- Discharge rotates in 90° increments
- Maximum working pressure to 150 PSI
- Max. Temperature 200° F (Viton), 180° F (Buna N)
- Seal wash on Naval Bronze models
- **"Off-the-Shelf"** availablity for many models

American Machine & Tool Co.
400 Spring Street, Royersford, PA 19468
(610) 948-3800 Fax (610) 948-5300
E-mail: amt@fast.net
www.amtpump.com

Please read and save this Repair Parts Manual. Read this manual and the General Operating Instructions carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. The Safety Instructions are contained in the General Operating Instructions. Failure to comply with the safety instructions accompanying this product could result in personal injury and/or property damage! Retain instructions for future reference.

Centrifugal Pumps
Stainless Steel Models

Description

These non self-priming centrifugal pumps are intended for liquid transfer, heating and cooling circulation, booster service and other industrial applications where no suction lift is required.

All models feature 316 stainless steel construction, a semi-open clog-resistant impeller, and a 3450 RPM motor. A dual volute casing is used on all models except 4240-98. A mechanical seal (comprised of carbon, ceramic, Viton elastomer, and stainless steel components) isolates motor from liquid being pumped. Discharge port on pump casing can be rotated in 90° increments, with vent and drain plugs for all positions. Pumps handle liquids from 40° to 200° F (40° to 180° F with optional Buna N seals). Maximum ambient temperature 104° F. Casing working pressure to 100 psi. These are manual units, no controls are supplied. For use with nonflammable, non-abrasive liquids, compatible with pump component materials.

Specifications

Model	DRIVER HP	Enclosure	NEMA Frame	Power Supply @60 Hz	PUMP Port Size (Inches)*	Weight (Lbs.)
3150-98	2	TEFC	145JM	230/460 VAC, 3-phase	2 x 1½	53
3151-98	3	TEFC	182JM	230/460 VAC, 3phase	2 x 1½	69
3152-98	5	TEFC	184JM	230/460 VAC, 3-phase	2 x 1½	90
3156-98	2	TEFC	56J	115/230 VAC, 1-phase	2 x 1½	65
3157-98	2	TEFC	56J	230/460 VAC, 3-phase	2 x 1½	64
3158-98	2	ODP	56J	115/230 VAC, 1-phase	2 x 1½	62
3159-98	2	ODP	56J	230/460 VAC, 3-phase	2 x 1½	61
315A-98	3	TEFC	56J	230 VAC, 1-phase	2 x 1½	71
315B-98	3	TEFC	56J	230/460 VAC, 3-phase	2 x 1½	74
315C-98	3	ODP	56J	230 VAC, 1-phase	2 x 1½	72
315D-98	3	ODP	56J	230/460 VAC, 3-phase	2 x 1½	71
315E-98	3	TEFC	184JM	230 VAC, 1-phase	2 x 1½	121
4240-98	7½	TEFC	184JM	230/460 VAC, 3-phase	2 x 1½	105
4250-98	10	TEFC	184JM	230/460 VAC, 3-phase	3 x 2	117
4251-98	15	TEFC	215JM	230/460 VAC, 3-phase	3 x 2	180
4260-98	7½	TEFC	184JM	230/460 VAC, 3-phase	3 x 3	104
4261-98	10	TEFC	184JM	230/460 VAC, 3-phase	3 x 3	110

NOTE: Driver data is subject to change without notice, see label on driver for actual specifications.
(*) Standard NPT (female) pipe thread.
(ODP) Open Drip Proof
(TEFC) Totally Enclosed Fan Cooled

Centrifugal Pumps

Stainless Steel Models

Performance Chart

Model	GPM of Water at Total Head in Feet 10'	20'	30'	40'	50'	60'	70'	80'	90'	100'	110'	Max. Head†
315 (2HP)	170 gpm	150	130	100	65	25	–	–	–	–	–	62 ft.
NPSHR‡	23 ft.	20	18	15	14	14	*	*	*	*	*	
315 (3HP)	–	–	165	145	125	95	60	15	–	–	–	82
NPSHR‡	*	*	22	20	18	15	14	14	*	*	*	
315 (5HP)	–	–	–	–	200	185	165	145	120	90	50	115
NPSHR‡	*	*	*	*	25	25	23	20	17	15	14	
426 (7½HP)	–	–	–	425	385	340	285	200	75	–	–	94
NPSHR‡	*	*	*	23	19	15	12	10	7	*	*	
426 (10HP)	–	–	–	500	450	395	340	270	165	–	–	98
NPSHR‡	*	*	*	25	25	19	15	12	9	*	*	

Model	GPM of Water at Total Head in Feet 80'	90'	100'	110'	120'	130'	140'	150'	160'	170'	180'	Max. Head†
424 (7½HP)	178 gpm	170	158	145	130	110	92	70	40	0	–	170 ft.
NPSHR‡	19 ft.	18	17	15	13	11	9	*	*	*	*	
425 (10HP)	333	300	280	250	210	170	100	–	–	–	–	145
NPSHR‡	16	14	12	10	7	4	*	*	*	*	*	
425 (15HP)	385	365	345	325	305	280	255	225	196	160	115	194
NPSHR‡	22	20	18	16	14	12	10	8	6	4	*	

(*) Operation of pumps beyond range indicated will result in reduced pump life, pump damage and/or motor damage.
(†) Shut–off; to convert psi, multiply by specific gravity and divide by 2.31.
(‡) NPSHR: Net Positive Suction Head Required by pump in feet of water at GPM indicated, under flooded suction conditions. Insufficient NPSH can cause pump cavitation, resulting in a noisy pump and reduced pump life.

Installation

Check Performance Chart for recommended NPSHR. Problems will arise in operation of this pump unless recommended NPSHR is supplied to pump (see "Troubleshooting").

Maintenance

⚠WARNING ***Make certain that unit is disconnected from power source before attempting to service or remove any component.***

REMOVAL OF OLD SEAL

Refer to Figure 2 and 3.

IMPORTANT: Always replace both seal seat (Ref. No. 9) and seal head (Ref. No. 10) to insure proper mating of components! Also, impeller seal (Ref. No. 16) (where applicable) should be replaced anytime impeller fastener (Ref. No. 13) has been removed.

1. Remove four fastener and washers (Ref. Nos. 6 & 7) that connect casing (Ref. No. 14) to adapter (Ref. No. 3).
2. Remove casing and casing seal (Ref. No. 8).

⚠ CAUTION ***Care should be taken not to pinch or "shave" casing seal between casing cover/adapter and casing.***

3. Remove impeller fastener, impeller seal (where applicable), and impeller (Ref. No. 12).

IMPORTANT: Care should be taken to insure that same number of shim washers (Ref. No. 11) are replaced behind impeller as were removed. These shim washers are located directly behind impeller.

4. Seal head and shaft sleeve (Ref. No. 17) (where applicable) can now be pulled from shaft.
5. Pry seal seat from casing cover/adapter.
6. Push seal head from shaft sleeve (where applicable).

INSTALLATION OF NEW SEAL

⚠ CAUTION ***The precision lapped faces on mechanical seal are easily damaged. Handle replacement seal carefully.***

1. Thoroughly clean all surfaces of seal seat cavity.
2. Using a clean cloth, wipe shaft and shaft sleeve (where applicable) and make certain that they are perfectly clean.

Models 3150-98 thru 315E-98 and 4240-98 thru 4261-98

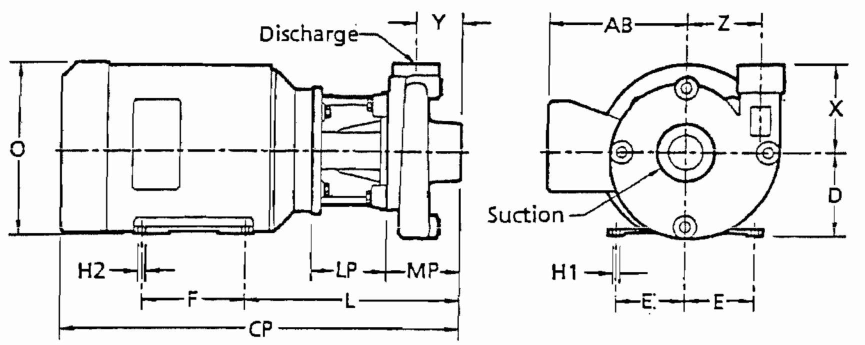


Figure 1 – Dimensions

Dimensions (Inches)

Model	SUC*	DIS*	AB†	CP†	D	E	F	H1
3150-98	2	1½	6.13	17.57	3.50	2.75	5.00	0.34
3151-98	2	1½	7.50	21.63	4.50	3.75	4.50	0.41
3152-98	2	1½	7.50	21.63	4.50	3.75	5.50	0.41
3156-98	2	1½	4.56	17.70	3.50	2.44	3.00	0.88
3157-98	2	1½	4.90	16.60	3.50	2.44	3.00	0.88
3158-98	2	1½	—	17.20	3.50	2.44	3.00	0.88
3159-98	2	1½	—	16.30	3.50	2.44	3.00	0.88
315A-98	2	1½	4.90	18.60	3.50	2.44	3.00	0.88
315B-98	2	1½	4.90	18.10	3.50	2.44	3.00	0.88
315C-98	2	1½	—	17.40	3.50	2.44	3.00	0.88
315D-98	2	1½	—	17.20	3.50	2.44	3.00	0.88
315E-98	2	1½	8.63	24.16	3.50	2.44	3.00	0.88
4240-98	2	1½	7.50	21.38	4.50	3.75	5.50	0.41
4250-98	3	2	7.50	21.53	4.50	3.75	5.50	0.41
4251-98	3	2	8.25	26.03	5.25	4.25	7.00	0.44
4260-98	3	3	7.50	22.38	4.50	3.75	5.50	0.41
4261-98	3	3	7.50	22.38	4.50	3.75	5.50	0.41

Model	H2	L	LP	MP	O†	X	Y	Z
3150-98	0.34	10.38	4.13	4.00	7.14	4.75	2.50	4.00
3151-98	0.41	12.69	4.13	4.00	9.28	4.75	2.50	4.00
3152-98	0.41	11.76	4.13	4.00	9.28	4.75	2.50	4.00
3156-98	0.34	8.59	2.03	4.00	8.70	4.75	2.50	4.00
3157-98	0.34	8.59	2.03	4.00	7.10	4.75	2.50	4.00
3158-98	0.34	8.59	2.03	4.00	8.10	4.75	2.50	4.00
3159-98	0.34	8.59	2.03	4.00	6.60	4.75	2.50	4.00
315A-98	0.34	8.59	2.03	4.00	8.80	4.75	2.50	4.00
315B-98	0.34	8.59	2.03	4.00	7.10	4.75	2.50	4.00
315C-98	0.34	8.59	2.03	4.00	8.10	4.75	2.50	4.00
315D-98	0.34	8.59	2.03	4.00	6.60	4.75	2.50	4.00
315E-98	0.34	8.59	2.03	4.00	9.28	4.75	2.50	4.00
4240-98	0.41	11.51	3.50	4.38	9.28	5.88	2.44	3.84
4250-98	0.41	11.66	3.50	4.53	9.28	5.00	2.78	4.75
4251-98	0.44	12.53	3.50	4.53	10.88	5.00	2.78	4.75
4260-98	0.41	12.51	4.13	4.75	9.28	6.50	2.75	4.50
4261-98	0.41	12.51	4.13	4.75	9.28	6.50	2.75	4.50

NOTE: All dimensions have a tolerance of ± 1/8".
(*) Standard NPT (Female) Pipe Thread.
(†) This dimension may vary due to motor manufacturer's specifications.

For Repair Parts, contact dealer where pump was purchased.

Please provide following information:
- Model number
- Serial number (if any)
- Part description and number as shown in parts list

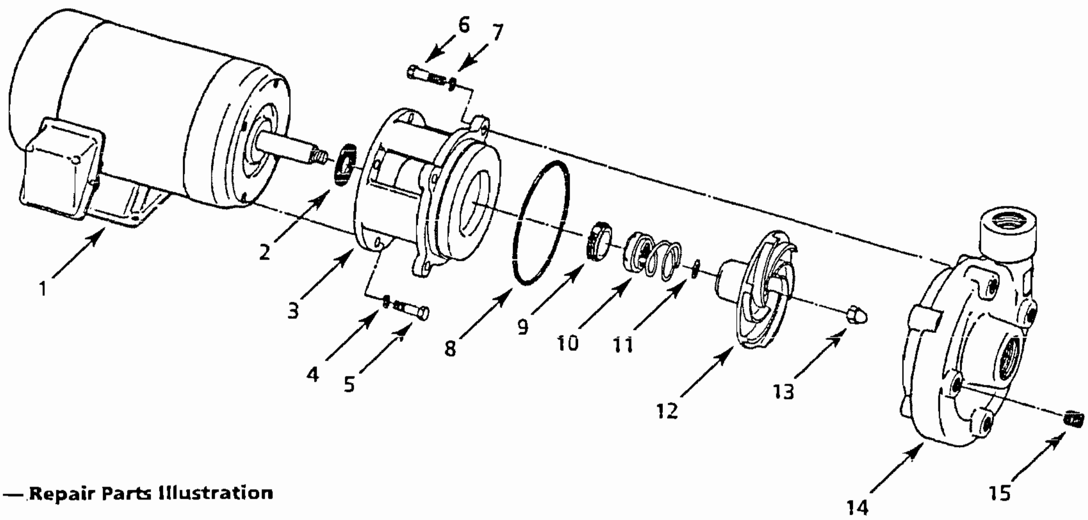


Figure 2 — Repair Parts Illustration

Repair Parts List

Ref. No.	Description	Part Number For Models: 3158-98 *(2HP)* 3159-98 *(2HP)* 3156-98 *(2HP)* 3157-98 *(2HP)*	315C-98 *(3HP)* 315D-98 *(3HP)* 315A-98 *(3HP)* 315B-98 *(3HP)*	Qty.
1	Motor -1 Phase ODP	♦ 1626-024-00	♦ 1626-026-00	1
	-3 Phase ODP	♦ 1626-025-00	♦ 1626-027-00	
	-1 Phase TEFC	♦ 1626-070-00	♦ 1626-071-00	
	-3 Phase TEFC	♦ 1626-054-00	♦ 1626-072-00	
2	Slinger washer	1534-000-00	1534-000-00	1
3	Adapter	4890-031-01	4890-031-01	1
4	Washer	*	*	4
5	Fastener	*	*	4
6	Fastener	*	*	4
7	Washer	*	*	4
8	Casing seal -Viton	*	*	1
9, 10 †	Shaft seal assembly -Viton.	1640-161-97	1640-161-97	1
11	Impeller shim set, includes (1) 0.005", (1) 0.020", (1) 0.030"	1806-044-90	1806-044-90	1
12	Impeller	3156-010-01	3156-010-02	1
13	Impeller fastener	1784-001-00	1784-001-00	1
14	Casing	3150-003-09	3150-003-09	1
15	Pipe plug	*	*	4
Δ ‡	Seal kit -Viton (standard)	3156-300-91	3156-300-91	1
Δ ‡	Seal kit -Viton & silicon carbide (optional)	3156-300-92	3156-300-92	1
Δ ‡	Seal kit -Buna N & silicon carbide (optional)	3156-300-93	3156-300-93	1

(Δ) Not shown.
(*) Standard hardware item, available locally.
(‡) Includes all required seals, Ref. Nos. 8, 9, 10.
(†) Seal head and seat available as set only.
(♦) Requires foot 1626-040-90.

For Repair Parts, contact dealer where pump was purchased.

Please provide following information:
-Model number
-Serial number (if any)
-Part description and number as shown in parts list

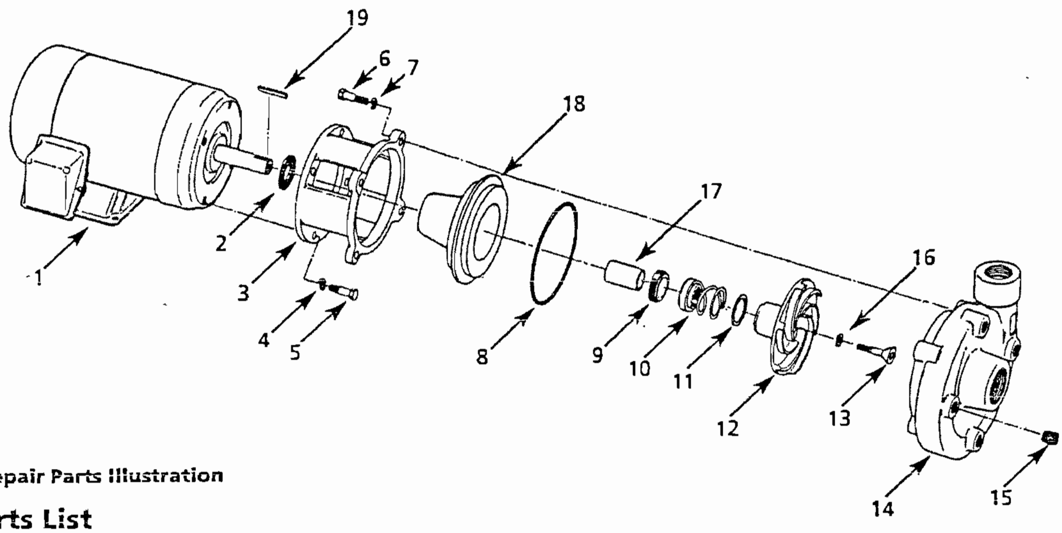


Figure 3 — Repair Parts Illustration

Repair Parts List

Ref. No.	Description	Part Number For Models: 3150-98 (2HP) 3151-98 (3HP) 3152-98 (5HP) 315E-98 (5HP)	4260-98 (7½HP) 4261-98 (10HP)	4240-98 (7½HP)	4250-98 (10HP) 4251-98 (15HP)	Qty.
1	Motor -3 Phase	1626-042-00 (2HP)	1626-045-00 (7½HP)	1626-045-00 (7½HP)	1626-046-00 (10HP)	1
	-3 Phase	1626-043-00 (3HP)	1626-046-00 (10HP)		1626-047-00 (15HP)	
	-3 Phase	1626-044-00 (5HP)				
	-1 Phase	1626-078-00 (5HP)				
2	Slinger washer	1470-093-00	1470-093-00	1470-093-00	1470-093-00	1
3	Adapter	3150-033-09	3150-033-09	4252-033-01	4252-033-01	1
4	Washer	*	*	*	*	4
5	Fastener	*	*	*	*	4
6	Fastener	*	*	*	*	4
7	Washer	*	*	*	*	4
8	Casing seal -Viton	*	*	*	*	1
9, 10	†Shaft seal assembly -Viton	1640-163-91	1640-163-91	1640-163-91	1640-163-91	1
11	Impeller shim set, includes (1) 0.005", (1) 0.010", (1) 0.020"	1664-000-90	1664-000-90	1664-000-90	1664-000-90	1
12	Impeller	3150-013-09 (2HP)	4260-013-01 (7½HP)	4240-013-01 (7½HP)	4250-013-01 (10HP)	1
		3151-013-09 (3HP)	4261-013-01 (10HP)		4251-013-01 (15HP)	
		3152-013-09 (5HP)				
13	Impeller fastener	1759-003-00	1761-002-00	1759-003-00	1759-003-00 (10HP)	1
					1757-005-00 (15HP)	
14	Casing	3150-003-09	4260-003-01	4240-003-01	4250-003-01	1
15	Pipe plug	*	*	*	*	4
16	Impeller seal -Viton	*	*	*	*	1
17	Shaft sleeve	1472-000-00	1472-000-00	1472-000-00	1472-000-00	1
18	Casing cover	3150-023-09	3150-023-09	4240-023-01	4240-023-01	1
19	Key	1471-030-00	1471-030-00	1471-030-00	1471-030-00	1
Δ	‡Seal kit -Viton (standard)	3150-300-91	3150-300-91	4240-300-91	4240-300-91	1
Δ	‡Seal kit -Viton & silicon carbide (optional)	3150-300-92	3150-300-92	4240-300-92	4240-300-92	1
Δ	‡Seal kit -Buna N & silicon carbide (optional)	3150-300-93	3150-300-93	4240-300-93	4240-300-93	1

(Δ) Not shown; (*) Standard hardware item, available locally; (‡) Includes all required seals Ref. Nos. 8, 9, 10, 16; (†) Seal head and seat available as set only. When replacing a shaft seal assembly, a new impeller seal (Ref. No. 16) should also be used.

Centrifugal Pumps

Stainless Steel Models

Maintenance (Continued)

3. Wet the rubber portion of new seal seat with a light coating of soapy water. While wearing clean gloves or using a clean light rag, press seal seat squarely into recess. Avoid scratching polished surface. If seat will not position properly, place a cardboard washer over polished surface and use a piece of pipe to press in, firmly but gently.
4. Dispose of cardboard washer. Check again to see that polished surface is free of dirt and all other foreign particles and that it is has not been scratched or damaged.
5. Wet the inside rubber portion of new seal head with a light coating of soapy water. Slide head onto shaft/shaft sleeve. Slide shaft sleeve with seal head onto motor shaft (where applicable). Seal head and seal seat will meet. Reinstall any shims which have been removed. (See "Shim Adjustment" section.)
6. Replace impeller key (where applicable), and impeller. Replace impeller seal (where applicable) before screwing impeller fastener into place.
7. Reassemble pump.
8. A short "run-in" period may be necessary to provide completely leak free seal operation.

SHIM ADJUSTMENT

When installing a replacement impeller (Ref. No. 12) or motor (Ref. No. 1), it may be necessary to adjust number of shims (Ref. No. 11) to insure proper running clearance between impeller and casing (Ref. No. 14). Proceed as follows:

NOTE: A proper running clearance is less than 0.020".

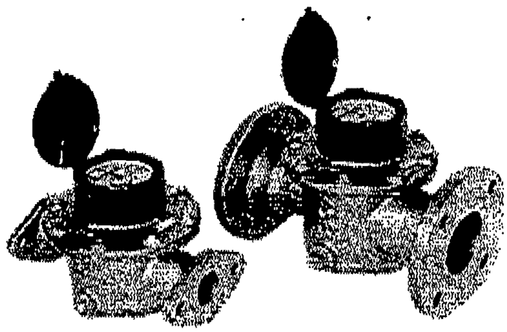
1. For impeller replacement, add one 0.020" shim in addition to those removed originally.
2. For motor replacement, add two 0.020" shims in addition to shims removed during disassembly.
3. Reassemble pump as described in Steps 6 and 7. (See "Installation of New Seal" section.)

IMPORTANT: Insure that casing is snugly in place and check shaft to make sure it is turning freely (rotate impeller by using impeller fastener, Ref. No. 13, and a wrench). If it turns freely, check to insure that adapter (Ref. No. 3), casing cover (Ref. No. 18) (where applicable), and casing are fitted "metal to metal" where they meet on the outside. If they are not "metal to metal", tighten fasteners (Ref. No. 6) and recheck shaft for free turning. Tighten carefully, turning shaft while tightening so that motor bearings are not damaged in the event that too many shims were installed. If shaft seizes before fasteners are completely tight, disassemble pump and remove one shim and repeat reassembly.

Specification Sheet

Kent Turbine Meters Model T-3000 Bronze, Magnetic Drive, Round Flanged Ends

Sizes 1 1/2", 2" & 3"



Description

Operation. The T-3000 Turbine Meter is designed for installation where occasional low and moderate to high sustained flows are demanded. Water passes through the meter without a change in flow direction, driving a helix rotor in direct proportion to the quantity of water passing through the meter. Rotor revolutions are transferred to a register by appropriate reduction gearing and a magnetic drive.

Compliance to Standards. The T-3000 Turbine Meter complies with all performance and material requirements of the American Water Works Association Standard C-701, Class II In-Line (High-Velocity) Type, as most recently revised.

Installation. The meter must be installed in a clean pipeline, free from any foreign materials. Install the meter with direction of flow as indicated by the arrow cast in the meter case. The meter may be installed in horizontal or inclined lines. It is recommended that a Kent Plate Strainer be used to protect the turbine and help reduce the effects of turbulence. The installer should consider a bypass pipe with gate valves for use during maintenance and a downstream test tee for future field testing.

Application. *The meter is for use in POTABLE COLD WATER up to 120° F (50° C) and working pressures up to 150 psi.* The meter will perform with accuracy registration of 100% ± 1 1/2% within the normal flows*. Both pressure loss and accuracy tests are made before shipment. No adjustments need be made before installation.

Construction. The meter consists of a main case, a measuring element, a case cover and a magnetically driven register

Specifications

Size:	1 1/2"	2"	3"
95%-101% Accuracy GPM	2.99	2.99	4
*98.5%-101.5% Accuracy GPM	4-200	4-200	5-750
Continuous Flow GPM	160	160	600
Maximum Flow GPM	200	200	750
Operating Pressure psi	150	150	150
Operating Temperature°F	120	120	120
Sweep Hand Registers			
US Gallons	100	100	100
Cubic Feet	10	10	10
m^3 - Cubic Meters	1	1	1
Imperial Gallons	100	100	100
Capacity of Register			
US Gallons (millions)	100	100	100
Cubic Feet (millions)	10	10	10
m^3 Cubic Meters (millions)	1	1	1
Imperial Gallons (millions)	100	100	100
Register Type	Permanently sealed direct reading register.		
Materials			
Main Case	Bronze		
Top Cover Plate	Bronze		
Body O-Ring	Neoprene Rubber		
Case Bolts	Stainless Steel		
Measuring Element	Polyphenylene Oxide		
Rotor	Polypropylene		
Rotor Bushings	PTFE Compound		
Rotor Thrust Bearing	Ceramic Jewel		
Rotor Spindle	Tungsten Carbide		
Undergearing	Polyacetal Resin		
Register Lens	Tempered Glass		
Register Housing and Lid	Synthetic Polymer or Bronze		
Register Can	90% Copper Alloy		

assembly. The main case is cast in bronze with raised characters showing model, size and direction of flow. The case has a throated inlet. A case dowel pin is inserted for locating the bronze cover plate. The measuring element assembly consists of the rotor, straightening vanes, accuracy regulator, spindles and gears, filters and undergear assembly. The measuring element is attached to the underside of the cover with four stainless steel screws and washers, one insert of which is placed eccentrically in the cover. The internal regulator assembly is interconnected with an external regulator shaft located on top of the cover allowing meter calibration without depressurizing the test bench or meter service. The regulator is protected by a tamperproof device. The main case and cover are assembled with an O-ring gasket and stainless steel bolts. The register assembly is secured to the main case with a tamperproof screw and is hinged over the inlet throat. However, the register can be rotated and locked in any 360 degree position therein.

Register. The register is contained within a 90% copper seamless can which is vacuum purged then filled with a dry nitrogen gas to eliminate condensation. The 1/4" true tempered glass lens is secured in an "L" shaped gasket, then roll sealed to produce a permanent sealed design. To assure easy reading, the totalizer wheels are large and color coded. The applicable size, model, registration, part number and date code are printed on the calibrated dial face. Moving clockwise during operation, the extra thin sweep hand does not interfere with meter reading, and the flow indicator will detect plumbing leaks.

Magnetic Drive. The magnetic drive design eliminates miscoupling associated with right angle drives. Torque is absorbed in the undergear assembly below the driving magnet. Consequently, the driving magnet at all flows is turning slowly, assuring magnetic coupling with the register assembly. The undergearing is protected by an encasement appropriately filtered.

Connections. The 1 1/2" and 2" meters are available with 2-bolt oval flanged end connections and the 3" meter is available with 4-bolt round flanged end connections. Both flanged connections conform to ANSI B16.1 cast-iron pipe flange, Class 125. Both bronze and cast-iron companion flanges are available. The companion flanges are faced, drilled and tapped with ANSI B2.1 internal taper pipe thread and conform to ANSIB16.1 cast-iron pipe flange, Class 125.

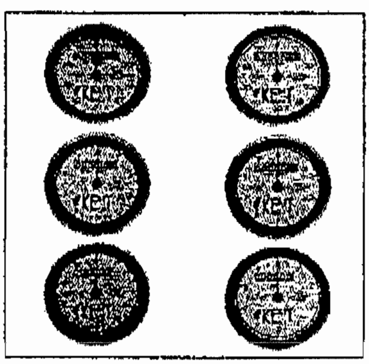
Maintenance. The measuring element with integral straightening vanes can be removed, repaired or replaced without removing the main case from the service line. Blank cover plates are available for use during repair. Pretested and calibrated measuring elements with cover plates and registers are available for exchange or purchase. In addition, Kent Meters, Inc. maintains a fully equipped and staffed repair facility in Ocala, Florida.

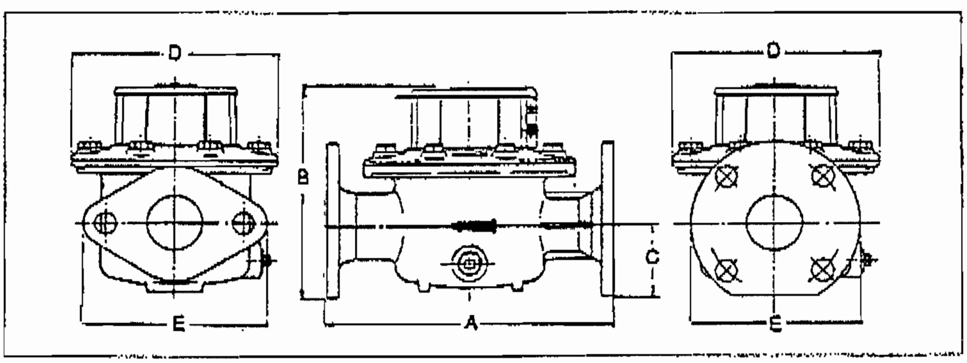
Remote Meter Read (RMR). Kent's RMR system permits visual remote reading from basements, pits, or inaccessible meter settings. Each register pulse is equal to a predetermined volume of water throughput. The pulses are carried by a 2-conductor wire to a remote wall unit. Pulses are accumulated and displayed on the wall unit totalizer.

SCANCODER® Electronic Meter Read (EMR). Kent's EMR system permits electronic interrogation of the encoder register's six number wheels. The 2-wire encoder register features an optional waterproof glass lens and potted terminals for flooded pit installations, expanded data field to include reading, programmable ten digit serial number, registration type billable units and special security number. A simple checksum, standard error codes and cable lengths up to three hundred (300) feet, are all standard features.

Dimensions and Net Weights

Meter Size	Dimensions (inches)					Weight (lbs.)
	A	B	C	D	E	
1 1/2" Oval	10	7 3/4	2 7/16	7 3/8	5 5/8	19 1/2
1 1/2" Round	10	7 3/4	2 7/16	7 3/8	5 1/16	20
2" Oval	10	7 3/4	2 7/16	7 3/8	6 1/8	21 1/2
2" Round	10	7 7/8	2 9/16	7 3/8	6 1/16	22
3"	12	9 3/8	3 13/16	7 3/8	7 1/2	33 3/8





ASEA BROWN BOVERI

The company's policy is one of continuous product improvement and the right is reserved to modify the specifications contained herein without notice. These products have been manufactured with current technology in accordance with applicable AWWA Standards.

T3-BZ-215/01-93/SS/6.5M

Kent Meters, Inc.
P.O. Box 1852
Ocala, Florida 34478-1852
Local Florida 904-732-4670
Outside Florida TOLL FREE 800-874-0890
Inside Florida TOLL FREE 800-356-6829
FAX: 904-368-1950

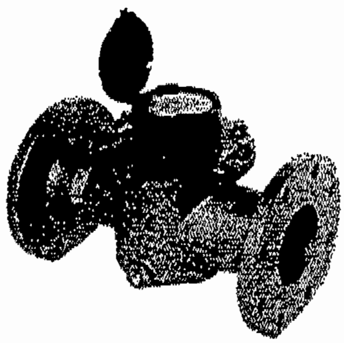
Kent Meters, Inc.
1200 Aerowood Drive-#35
Mississauga, Ontario
Canada L4W 2S7
Tel: 416-238-9622
FAX: 416-238-5640

An ABB Kent Meter Division Company
Distributed by:

Specification Sheet

Kent Turbine Meters Model T-3000 Bronze, Magnetic Drive, Round Flanged Ends

Sizes 4" - 8"



Description

Operation. The T-3000 Turbine Meter is designed for installation where occasional low and moderate to high sustained flows are demanded. Water passes through the meter without a change in flow direction, driving a helix rotor in direct proportion to the quantity of water passing through the meter. Rotor revolutions are transferred to a register by appropriate reduction gearing and a magnetic drive.

Compliance to Standards. The T-3000 Turbine Meter complies with all performance and material requirements of the American Water Works Association Standard C-701, Class II In-Line (High-Velocity) Type, as most recently revised.

Installation. The meter must be installed in a clean pipeline, free from any foreign materials. Install the meter with direction of flow as indicated by the arrow cast in the meter case. The meter may be installed in horizontal or inclined lines. It is recommended that a Kent Plate Strainer be used to protect the turbine and help reduce the effects of turbulence. The installer should consider a bypass pipe with gate valves for use during maintenance and a downstream test tee for future field testing.

Application. *The meter is for use in POTABLE COLD WATER up to 120° F (50° C) and working pressures up to 150 psi.* The meter will perform with accuracy registration of 100% ±1 1/2% within the normal flows*. Both pressure loss and accuracy tests are made before shipment. No adjustments need be made before installation.

Construction. The meter consists of a main case, a measuring element, a case cover and a magnetically driven register

Specifications

Size:	4"	6"	8"
95% - 101% Accuracy GPM	7	15	25
* 98.5%-101.5% % Accuracy GPM	10-1250	20-2500	30-3500
Continuous Flow GPM	1000	2000	2800
Maximum Flow GPM	1250	2500	3500
Operating Pressure psi	150	150	150
Operating Temperature °F	120	120	120
Sweep Hand Registers			
US Gallons	100	1000	1000
Cubic Feet	10	100	100
m^3 - Cubic Meters	1	10	10
Imperial Gallons	100	1000	1000
Capacity of Register			
US Gallons (millions)	100	1000	1000
Cubic Feet (millions)	10	100	100
m^3 Cubic Meters (millions)	1	10	10
Imperial Gallons (millions)	100	1000	1000
Register Type	Permanently sealed direct reading register.		

Materials	
Main Case	Bronze
Top Cover Plate	Bronze
Body O-Ring	Neoprene Rubber
Case Bolts	Stainless Steel
Measuring Element	Polyphenylene Oxide
Rotor	Polypropylene
Rotor Bushings	PTFE Compound
Rotor Thrust Bearing	Ceramic Jewel
Rotor Spindle	Tungsten Carbide
Undergearing	Polyacetal Resin
Register Lens	Tempered Glass
Register Housing and Lid	Synthetic Polymer or Bronze
Register Can	90% Copper Alloy

Kent Meters, Inc.
An ABB Kent Meter Division Company

ABB
ASEA BROWN BOVERI

assembly. The main case is cast in bronze with raised characters showing model, size and direction of flow. The case has a throated inlet. A case dowel pin is inserted for locating the bronze cover plate. The measuring element assembly consists of the rotor, straightening vanes, accuracy regulator, spindles and gears, filters and undergear assembly. The measuring element is attached to the underside of the cover with four stainless steel screws and washers, one insert of which is placed eccentrically in the cover. The internal regulator assembly is interconnected with an external regulator shaft located on top of the cover allowing meter calibration without depressurizing the test bench or meter service. The regulator is protected by a tamperproof device. The main case and cover are assembled with an O-ring gasket and stainless steel bolts. The register assembly is secured to the cover with a tamperproof screw and is hinged over the inlet throat. However, the register can be rotated and locked in any 360 degree position therein.

Register. The register is contained within a 90% copper seamless can which is vacuum purged then filled with a dry nitrogen gas to eliminate condensation. The 1/4" true tempered glass lens is secured in an "L" shaped gasket, then roll sealed to produce a permanent sealed design. To assure easy reading, the totalizer wheels are large and color coded. The applicable size, model, registration, part number and date code are printed on the calibrated dial face. Moving clockwise during operation, the extra thin sweep hand does not interfere with meter reading, and the flow indicator will detect plumbing leaks.

Magnetic Drive. The magnetic drive design eliminates miscoupling associated with right angle drives. Torque is absorbed in the undergear assembly below the driving magnet. Consequently, the driving magnet at all flows is turning slowly, assuring magnetic coupling with the register assembly. The undergearing is protected by an encasement appropriately filtered.

Connections. These meters are available with eight-bolt round flanged end connections. Round flanged connections conform to ANSI B16.1 cast-iron pipe flange, Class 125. Both bronze and cast-iron companion flanges are available. The companion flanges are faced, drilled and tapped with ANSI B2.1 internal taper pipe thread and conform to ANSIB16.1 cast-iron pipe flange, Class 125.

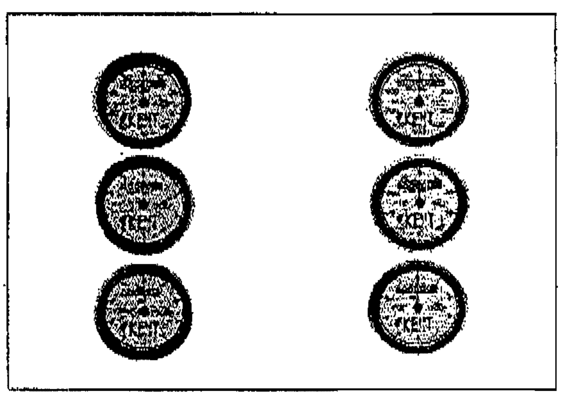
Maintenance. The measuring element with integral straightening vanes can be removed, repaired or replaced without removing the main case from the service line. Blank cover plates are available for use during repair. Pretested and calibrated measuring elements with cover plates and registers are available for exchange or purchase. In addition, Kent Meters, Inc. maintains a fully equipped and staffed repair facility in Ocala, Florida.

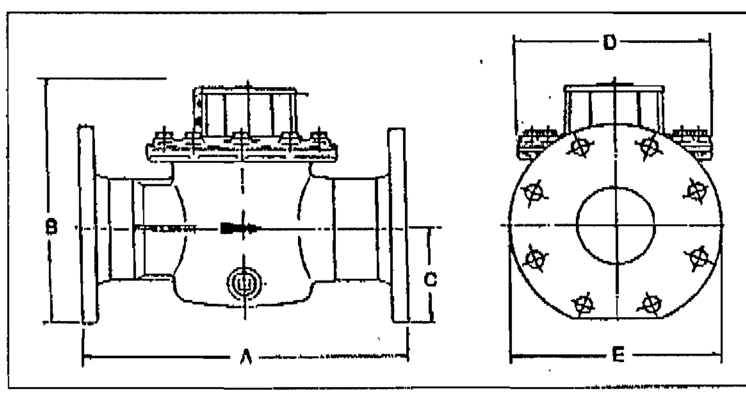
Remote Meter Read (RMR). Kent's RMR system permits visual remote reading from basements, pits, or inaccessible meter settings. Each register pulse is equal to a predetermined volume of water throughput. The pulses are carried by a 2-conductor wire to a remote wall unit. Pulses are accumulated and displayed on the wall unit totalizer.

SCANCODER® Electronic Meter Read (EMR). Kent's EMR system permits electronic interrogation of the encoder register's six number wheels. The 2-wire encoder register features an optional waterproof glass lens and potted terminals for flooded pit installations, expanded data field to include reading, programmable ten digit serial number, registration type billable units and special security number. A simple checksum, standard error codes and cable lengths up to three hundred (300) feet, are all standard features.

Dimensions and Net Weights

Meter Size	Dimensions (inches)					Weight (lbs.)
	A	B	C	D	E	
4"	14	10 3/4	4 3/16	8 3/16	9	51 1/2
6"	18	13 3/8	5 1/4	10 15/16	11	90
8"	20	16 1/16	6 15/16	11 7/16	13 7/16	168





T3-BZ-232/01-93/SS/5M

ABB
ASEA BROWN BOVERI

The company's policy is one of continuous product improvement and the right is reserved to modify the specifications contained herein without notice. These products have been manufactured with current technology in accordance with applicable AWWA Standards.

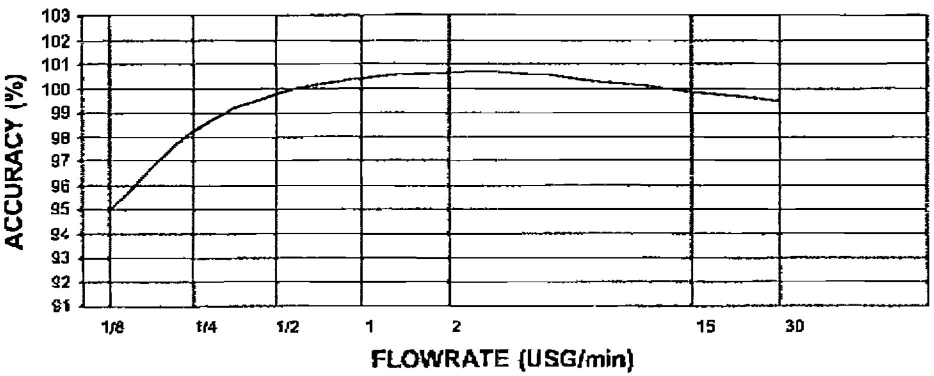
Kent Meters, Inc.
P.O. Box 1852
Ocala, Florida 34478-1852
Local Florida 904-732-4670
Outside Florida TOLL FREE 800-874-0890
Inside Florida TOLL FREE 800-356-6829
FAX: 904-368-1950

Kent Meters, Inc.
1200 Aerowood Drive-#35
Mississauga, Ontario
Canada L4W 2S7
Tel: 416-238-9622
FAX: 416-238-5640

An ABB Kent Meter Division Company
Distributed by:

C-700 Positive Displacement Meters
3/4" x 3/4" and 3/4" x 1"

ACCURACY



PRESSURE LOSS

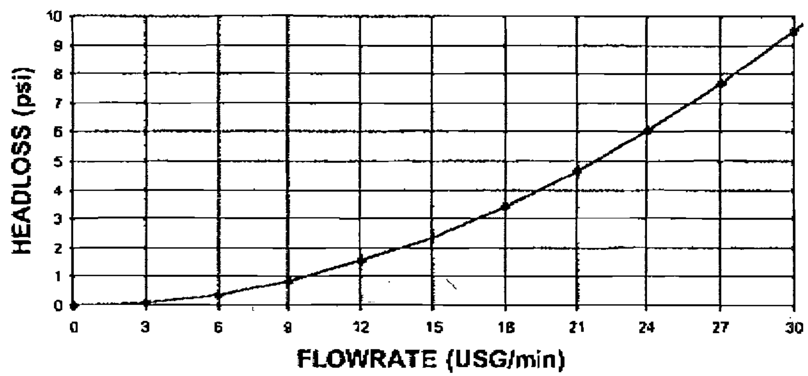


ABB Water Meters, Inc.
P.O. Box 1852
Ocala, Florida 34478-1852
Outside Florida TOLL FREE 800/874-0890
Inside Florida TOLL FREE 800/356-6829
FAX: 352-368-1950
E-mail: abbwatermeters@worldnet.att.net
http://www.abbwatermeters.com

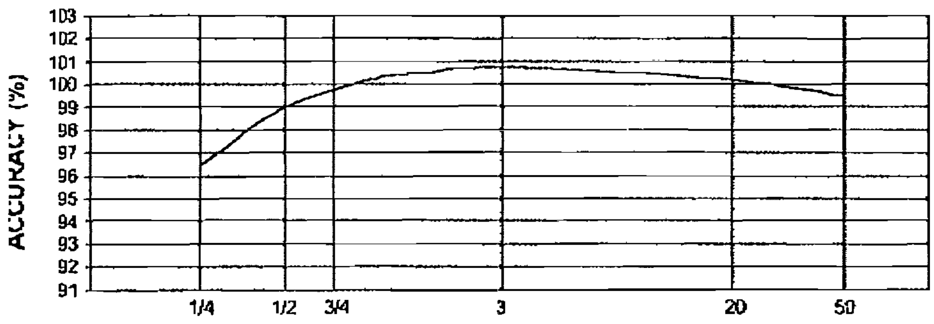
ABB Water Meters, Inc.
1200 Aerowood Drive-#35
Mississauga, Ontario
Canada L4W 2S7
Tel: 905-238-9622
FAX: 905-238-5640

C7-A/P-110/8-98

ISO 9002

C-700 Positive Displacement Meter
1"

ACCURACY



PRESSURE LOSS

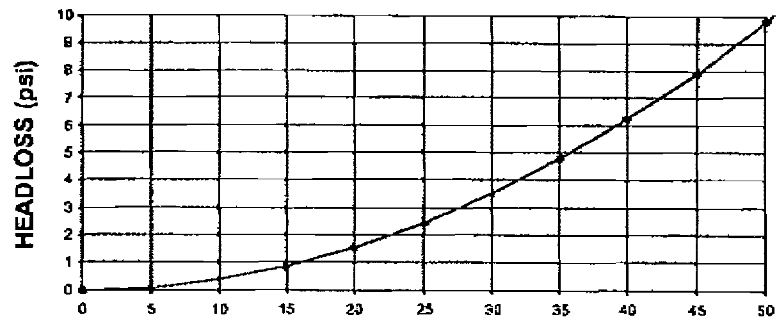


ABB Water Meters, Inc.
P.O. Box 1852
Ocala, Florida 34478-1852
Outside Florida TOLL FREE 800/874-0890
Inside Florida TOLL FREE 800/356-6829
FAX: 352-368-1950
E-mail: abbwatermeters@worldnet.att.net
http://www.abbwatermeters.com

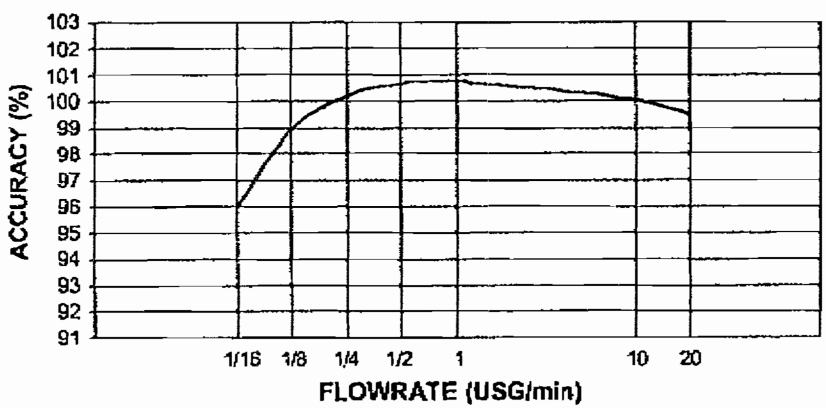
ABB Water Meters, Inc.
1200 Aerowood Drive-#35
Mississauga, Ontario
Canada L4W 2S7
Tel: 905-238-9622
FAX: 905-238-5640

C7-A/P-120/7-98

ISO 9002 SGS

C-700 Positive Displacement Meters
5/8" and 5/8" x 3/4"

ACCURACY



PRESSURE LOSS

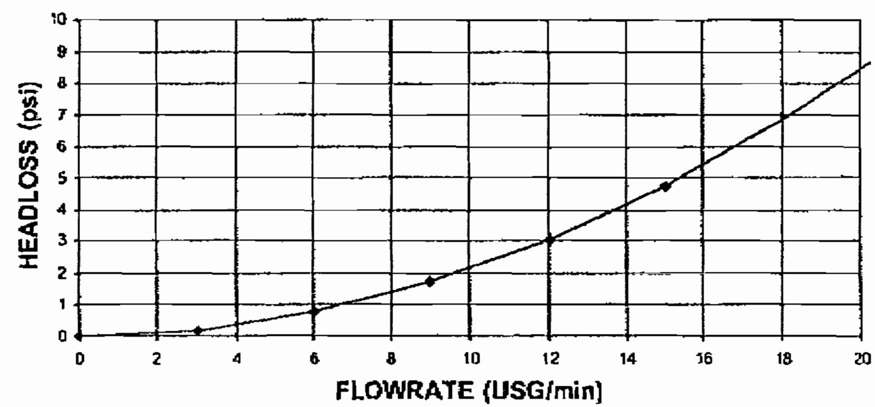


ABB Water Meters, Inc.
P.O. Box 1852
Ocala, Florida 34478-1852
Outside Florida TOLL FREE 800/874-0890
Inside Florida TOLL FREE 800/356-6829
FAX: 352-368-1950
E-mail: abbwatermeters@worldnet.att.net
http://www.abbwatermeters.com

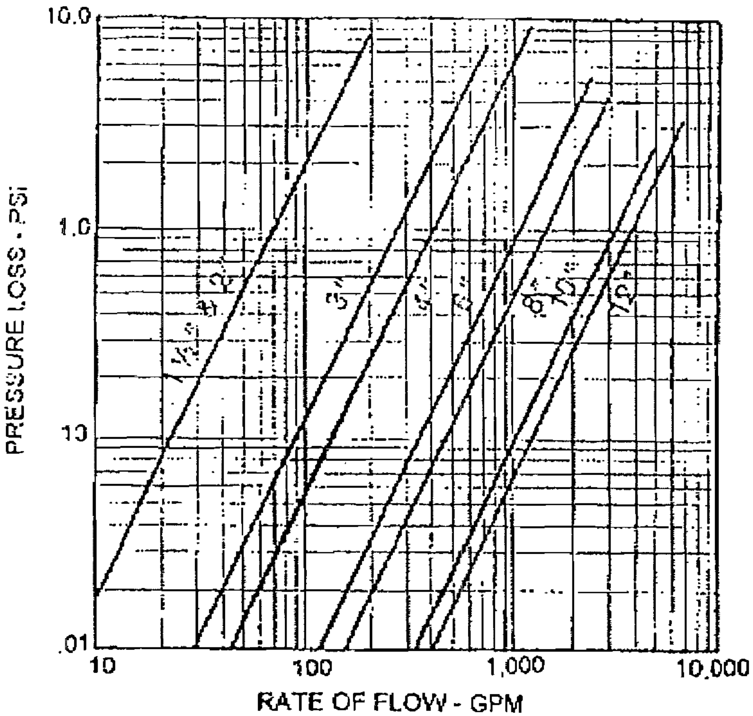
ABB Water Meters, Inc.
1200 Aerowood Drive-#35
Mississauga, Ontario
Canada L4W 2S7
Tel: 905-238-9622
FAX: 905-238-5640

C7-A/P-100/8-98

ISO 9002

ACCURACY/PRESSURE LOSS
Model T-3000 Turbine Meters

PRESSURE LOSS



ACCURACY

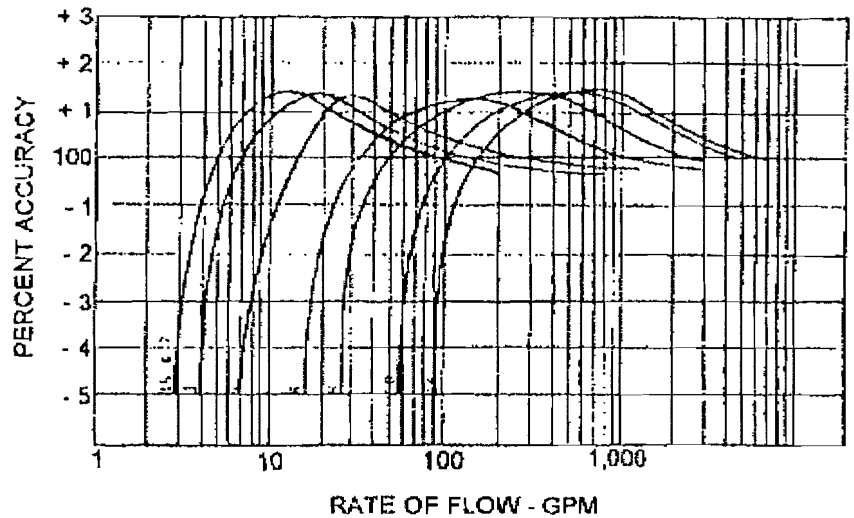


ABB Water Meters, Inc.
P.O. Box 1852
Ocala, Florida 34478-1852
Local Florida 352-732-4670
Outside Florida TOLL FREE 800/874-0890
Inside Florida TOLL FREE 800/356-6029
FAX: 352-368-1950
E-mail: abbwatermeters@wcdonet.att.net
http://www.abbwatermeters.com

ABB Water Meters, Inc.
1200 Acrowood Drive-#35
Mississauga, Ontario
Canada L4W 2S7
Tel: 905/238-9622
FAX: 905/238-5640
E-mail: abblib@passport.ca

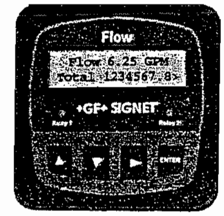
T3FL-PA-295/7-99

ISO 9002

+GF+ SIGNET 8550-1 Flow Transmitter Instructions

3-8550.090-1

A-9/99 English



CAUTION!

- Remove power to unit before wiring input and output connections.
- Follow instructions carefully to avoid personal injury.

Contents

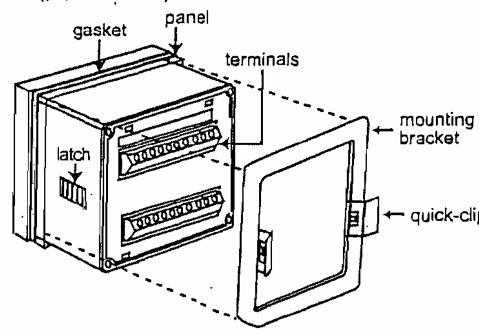
1. Installation

The transmitter is available in three versions: a panel mount version, an integral (pipe mount) version, and a universal assembly for installation near the sensor.

1.1 Panel Installation

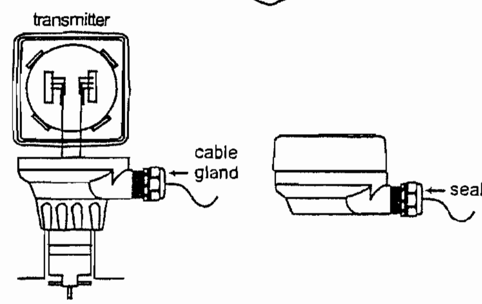
The Panel Mounting kits are supplied with the hardware to install instrumentation into panels and maintain a NEMA 4X seal.

1. Punch out panel and de-burr edges. Recommended clearance on all sides between instruments is 1 inch.
2. Place gasket on instrument, and install in panel.
3. Slide mounting bracket over back of instrument until quick-clips snap into latches on side of instrument.
4. Connect wires to terminals.
5. To remove, secure instrument temporarily with tape from front or grip from rear of instrument. DO NOT RELEASE. Press quick-clips outward and remove.



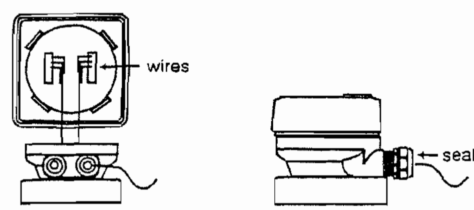
1.2 Integral Assembly (3-8051)

1. Punch out conduit ports if necessary.
2. Connect sensor to integral adapter. Push and twist-lock integral adapter to conduit base and secure with locking ring and screw.
3. Mount unit in pipe. Route cable through cable gland and connect to transmitter.
4. Close unit and secure. Seal cable entry.



1.3 Universal Assembly (3-8050)

1. Install transmitter base
2. Connect wires to transmitter.
3. Close unit and secure with push and twist lock. Seal cable entry.



2. Specifications

General

Compatibility: +GF+ SIGNET Flow Sensors (w/freq out)
Accuracy: ±0.5 Hz
Enclosure:

- Rating: NEMA 4X/IP65 front
- Case: PBT
- Window: Polyurethane coated polycarbonate
- Keypad: Sealed 4-key silicone rubber
- Weight: Approx. 325g (12 oz.)

Display:

- Alphanumeric 2 x 16 LCD
- Update rate: 1 second
- Contrast: User selected, 5 levels

Environmental

Operating temperature: -10 to 70°C (14 to 158°F)
Storage temperature: -15 to 80°C (5 to 176°F)
Relative humidity: 0 to 95%, non-condensing

Standards and Approvals

- CSA, CE, UL listed
- Manufactured under ISO 9001

Electrical

Sensor Input:

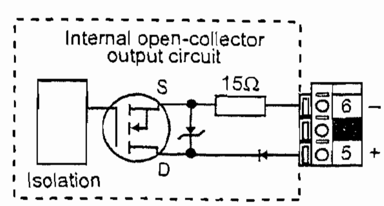
- Range: 0.5 - 1500 Hz
- Sensor power: 2-wire: 1.5 mA @ 5 VDC ± 1%
  3 or 4 wire: 20 mA @ 5 VDC ± 1%
- Optically isolated from current loop
- Short circuit protected

Current output:

- 4 to 20 mA, isolated, fully adjustable and reversible
- Power: 12 to 24 VDC ±10%, regulated
- Max loop impedance: 50 Ω max. @ 12 V, 325 Ω max. @ 18 V, 600 Ω max. @ 24V
- Update rate: 100 ms
- Accuracy: ±0.03 mA

Open-collector output: Hi, Lo, Frequency, Pulse Programmable

- Optically isolated, 50 mA max. sink, 30 VDC max. pull-up voltage.



APPENDIX VII
EFFLUENT LIMITATIONS
AND MONITORING REQUIREMENTS

1166/corr

91-20-2a (1/89)

Site No.:3-44-039

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning June 2001
and lasting until June 2006

the discharges from the treatment facility to Hackensack River , water index number NJ-1-9 , Class A , RECEIVING WATER shall be limited and monitored by the operator as specified below:

Outfall Number and Parameter	Discharge Limitations		Units	Minimum Monitoring Requirements	
	Daily Avg.	Daily Max		Measurement Frequency	Sample Type
Outfall 001 - Treated Groundwater Remediation Discharge:					
Flow	Monitor	435,000	GPD	Continuous	Meter
pH (range)	6.0 to	9.0	SU	Daily	Grab
Cadmium, Total	Monitor	42	µg/l	Weekly	Grab
Chromium, Total	Monitor	500	µg/l	Weekly	Grab
Copper, Total	Monitor	144	µg/l	Weekly	Grab
Lead, Total	Monitor	150	µg/l	Weekly	Grab
Nickel, Total	Monitor	1000	µg/l	Weekly	Grab
Zinc, Total	Monitor	1000	µg/l	Weekly	Grab
Arsenic	Monitor	100	µg/l	Weekly	Grab
1,1,1,2-Tetrachloroethane	Monitor	50	µg/l	Weekly	Grab
1,1,1 Trichloroethane	Monitor	10	µg/l	Weekly	Grab
1,1,2 Trichloroethane	Monitor	10	µg/l	Weekly	Grab
1,1 Dichloroethane	Monitor	10	µg/l	Weekly	Grab
1,1 Dichloroethene	Monitor	7	µg/l	Weekly	Grab
Benzene	Monitor	5	µg/l	Weekly	Grab
Carbon Tetrachloride	Monitor	4	µg/l	Weekly	Grab
Chloroform	Monitor	70	µg/l	Weekly	Grab
cis-1,2 Dichloroethene	Monitor	10	µg/l	Weekly	Grab
trans-1,2 Dichloroethene	Monitor	10	µg/l	Weekly	Grab
Methylene Chloride	Monitor	10	µg/l	Weekly	Grab
sec- Butylbenzene	Monitor	50	µg/l	Weekly	Grab
Tetrachloroethene	Monitor	7	µg/l	Weekly	Grab
Trichloroethene	Monitor	10	µg/l	Weekly	Grab
Vinyl Chloride	Monitor	3	µg/l	Weekly	Grab

Note: The treatment facility consists of the dual phase extraction system and the pump-and- treat system installed in compliance with the NYSDEC Record of Decision for the cleanup of the groundwater contamination.

Additional Conditions:

(1) Discharge is not authorized until such time as an engineering submission showing the method of treatment is approved by the Department. The discharge rate may not exceed the effective or design treatment system capacity. All monitoring data, engineering submissions and modification requests must be submitted to:

Chief - Operation Maintenance and Support Section
Bureau of Hazardous Site Control
Division of Environmental Remediation
NYSDEC
50 Wolf Road
Albany, N.Y. 12233-7010

With a copy sent to:
Joe Marcogliese, RWE - 3
NYS Dept. of Env. Con.
200 White Plains Rd., 5th Fl
Tarrytown, NY 10591-5805

(2) Only site generated wastewater is authorized for treatment and discharge.

(3) Authorization to discharge is valid only for the period noted above but may be renewed if appropriate. A request for renewal must be received 6 months prior to the expiration date to allow for a review of monitoring data and reassessment of monitoring requirements.

(4) Both concentration (mg/l or µg/l) and mass loadings (lbs/day) must be reported to the Department for all parameters except flow and pH.

(5) Any use of corrosion/scale inhibitors or biocidal-type compounds used in the treatment process must be approved by the department prior to use.

(6) This discharge and adminstration of this discharge must comply with the attached General Conditions.

(7) ***This condition is applicable only when the max. flow rate of outfall 001 is 7200 GPD and outfall 001 consists of discharge only from the Dual Phase extraction system.***
The measurement frequency for all parameters of outfall 001except flow and pH shall be **Monthly** following a period of **eight** consecutive weekly sampling events that show no exceedance of discharge limits. If the discharge limit for any parameter is exceeded, the measurement frequency for **all** parameters shall again be **weekly**, until a period of eight consecutive sampling events that show no exceedance at which point Monthly monitoring may resume.

APPENDIX VIII
AIR EMISSIONS ESTIMATE
AND AIR GUIDE 1 ANALYSIS

ENVIRONMENTAL ALLIANCE

Former Chromalloy Site Remedial System
Total Volatile Organic Potential To Emit

DPE SYSTEM

Constituent	Concentration (ppm - ml/L)	Concen.(L /L)	Blower (cu.ft./min.)	(L/gal)	(gal/cu.ft.)	(g-mole/22.4L)	(g/g-mole)	(min/hr)	(hr/day)	(lb/gr)	Emission (lb/day)	lb/hr	TPY
1,1,1-Trichloroethane	0.30	0.000000	87.5	3.78	7.48	0.045	167.9	60	24	0.002	0.018	0.001	0.003
1,2,4 (&1,3,5)-Trimethylbenzene	3.97	0.000004	87.5	3.78	7.48	0.045	120.2	60	24	0.002	0.168	0.007	0.031
2-Butanone	4.60	0.000005	87.5	3.78	7.48	0.045	72.1	60	24	0.002	0.117	0.005	0.021
Acetone	5.20	0.000005	87.5	3.78	7.48	0.045	58.1	60	24	0.002	0.107	0.004	0.019
Benzene	0.14	0.000000	87.5	3.78	7.48	0.045	78.1	60	24	0.002	0.004	0.000	0.001
Carbon Disulfide	0.49	0.000000	87.5	3.78	7.48	0.045	76.1	60	24	0.002	0.013	0.001	0.002
Chlorodifluoromethane	0.50	0.000001	87.5	3.78	7.48	0.045	102.9	60	24	0.002	0.018	0.001	0.003
cis-1,2-Dichloroethene	0.29	0.000000	87.5	3.78	7.48	0.045	97	60	24	0.002	0.010	0.000	0.002
Cumene/4-Ethyltoluene	3.09	0.000003	87.5	3.78	7.48	0.045	120.2	60	24	0.002	0.131	0.005	0.024
Ethylbenzene	2.10	0.000002	87.5	3.78	7.48	0.045	106.2	60	24	0.002	0.079	0.003	0.014
Heptane	3.90	0.000004	87.5	3.78	7.48	0.045	100.2	60	24	0.002	0.138	0.006	0.025
Hexane	110.00	0.000110	87.5	3.78	7.48	0.045	86.2	60	24	0.002	3.348	0.140	0.611
m/p-Xylene	9.30	0.000009	87.5	3.78	7.48	0.045	106.2	60	24	0.002	0.349	0.015	0.064
Methylene Chloride	1.90	0.000002	87.5	3.78	7.48	0.045	84.9	60	24	0.002	0.057	0.002	0.010
Octane/Isooctane	16.00	0.000016	87.5	3.78	7.48	0.045	114.2	60	24	0.002	0.645	0.027	0.118
o-Xylene	4.80	0.000005	87.5	3.78	7.48	0.045	106.2	60	24	0.002	0.180	0.008	0.033
Pentane	2.70	0.000003	87.5	3.78	7.48	0.045	72.2	60	24	0.002	0.069	0.003	0.013
Tetrachloroethene	8.40	0.000008	87.5	3.78	7.48	0.045	165.8	60	24	0.002	0.492	0.020	0.090
Toluene	11.00	0.000011	87.5	3.78	7.48	0.045	92.1	60	24	0.002	0.358	0.015	0.065
Trichloroethene	0.66	0.000001	87.5	3.78	7.48	0.045	131.4	60	24	0.002	0.031	0.001	0.006
										TOTAL	6.331	0.264	1.155

PUMP & TREAT SYSTEM

Constituent	CAS #	Concen.(L/L)	(150 gal/min)	(8.35 lb/gal)	(60 min/hr)	(24 hr/day)	Conversion Factor Equal To	Emission (lb/day)	lb/hr	TPY
1,1,1,2-Tetrachloroethane		2.62E-08	150	8.35	60	24	1803600	4.73E-02	0.00197	0.0086
1,1,1-Trichlorethane		7.85E-09	150	8.35	60	24	1803600	1.42E-02	0.00059	0.0026
1,1,2-Trichloroethane		3.71E-09	150	8.35	60	24	1803600	6.69E-03	0.00028	0.0012
1,1-Dichlorethane	00075-34-3	1.40E-09	150	8.35	60	24	1803600	2.53E-03	0.00011	0.0005
1,1-Dichloroethene		4.98E-09	150	8.35	60	24	1803600	8.98E-03	0.00037	0.0016
1,2-Dichloroethene (total)	00540-59-0	6.08E-08	150	8.35	60	24	1803600	1.10E-01	0.00457	0.0200
Acetone	00067-64-1	4.46E-07	150	8.35	60	24	1803600	8.04E-01	0.03349	0.1467
Benzene	00071-43-2	2.27E-09	150	8.35	60	24	1803600	4.09E-03	0.00017	0.0007
Carbon Tetrachloride	00056-23-5	1.57E-09	150	8.35	60	24	1803600	2.83E-03	0.00012	0.0005
Chloroform	00067-66-3	3.20E-09	150	8.35	60	24	1803600	5.77E-03	0.00024	0.0011
Methylene Chloride		2.53E-08	150	8.35	60	24	1803600	4.56E-02	0.00190	0.0083
sec-Butylbenzene		1.15E-09	150	8.35	60	24	1803600	2.07E-03	0.00009	0.0004
Tetrachloroethene		2.42E-08	150	8.35	60	24	1803600	4.37E-02	0.00182	0.0080
Trichloroethene		3.38E-06	150	8.35	60	24	1803600	6.09E+00	0.25375	1.1114
Vinyl Chloride		4.56E-09	150	8.35	60	24	1803600	8.22E-03	3.43E-04	0.002
							TOTAL	7.195	0.300	1.31318

REMEDIAL SYSTEM PTE

DPE	6.331	LB/DAY					
PUMP & TREAT	7.195	LB/DAY					
	13.527	LB/DAY					
TOTAL SYSTEM	(LB/DAY) X	(365 DAYS) =	4937.23	LB/YR OR	2.47	TONS/YR	

NOTES

1) DPE influent concentration - concentration from DPE Start-up test. Steady state condition will result in lower actual concentration.

2) Pump & Treat influent concentrations calculated by taking the geometric mean of the highest constituent concentrations in pumping zone (bedrock).
Resultant influent concentration should reflect steady state conditions.

3) Assumed 100% stripper efficiency.

ENVIRONMENTAL ALLIANCE, INC.

CONTAMINANT ASSESSMENT SUMMARY OF AIR GUIDE 1 ANALYSIS

CAS NUMBER	AGC ug/m3	SGC ug/m3	SUMMATION OF SHORT-TERM IMPACTS, MAXIMUM (Cav,Pt,Area) % OF SGC	SUMMATION OF CAVITY IMPACTS ACTUAL ANNUAL % OF AGC	SUMMATION OF POINT or AREA SOURCE IMPACTS POTENTIAL ANNUAL % OF AGC	SUMMATION OF POINT or AREA SOURCE IMPACTS ACTUAL ANNUAL % OF AGC
**********	****************	***************	***************	***************	***************	***************
00067-64-1	28000.000000000	180000.0000	0.0049	0.0000	0.0006	0.0007
00071-43-2	0.130000000	1300.0000	0.0238	0.0000	4.8804	7.9680
00075-02-9	****************	0.0000	0.0000	0.0000	0.0000	0.0000
00075-15-0	700.000000000	6200.0000	0.0392	0.0000	0.0071	0.0030
00076-14-2	17000.000000000	0.0000	0.0000	0.0000	0.0000	0.0000
00078-93-3	1000.000000000	59000.0000	0.0187	0.0000	0.0227	0.0218
00079-01-6	0.450000000	54000.0000	0.0041	0.0000	10.0707	13.8112
00095-47-6	700.000000000	4300.0000	0.4113	0.0000	0.0518	0.0488
00095-63-6	290.000000000	0.0000	0.0000	0.0000	0.1094	0.1107
00098-82-8	400.000000000	0.0000	0.0000	0.0000	0.0566	0.0622
00100-41-4	1000.000000000	54000.0000	0.0123	0.0000	0.0136	0.0145
00108-88-3	400.000000000	37000.0000	0.0896	0.0000	0.1699	0.1683
00109-66-0	4200.000000000	0.0000	0.0000	0.0000	0.0032	0.0032
00110-54-3	200.000000000	0.0000	0.0000	0.0000	3.1723	3.1645
00111-65-9	3300.000000000	0.0000	0.0000	0.0000	0.0371	0.0370
00127-18-5	****************	0.0000	0.0000	0.0000	0.0000	0.0000
00142-82-5	3900.000000000	210000.0000	0.0063	0.0000	0.0070	0.0066
01330-20-7	700.000000000	4300.0000	0.7712	0.0000	0.0971	0.0947

****

SUMMARY TOTALS			1.3814	0.0000	18.6996	25.5153

** AIR GUIDE 1 - ANALYSIS **

********** INPUT DATA **********

LOC	FAC	E.P.	CAS #	SOURCE TYPE	HA, or h(AREA) FEET	hs FEET	D IN.	T F	V FPS	Q ACFM	EMISSIONS #/HOUR	EMISSIONS #/YEAR	DPL, or D(AREA) FT	BW, or S(AREA) FT	BL FT

Facility Name & Address: Former Chromalloy Facility 169 Western Highway/Pineview Clarckstown
SIC Code: 0 Application: UTME: 6. UTMN: 45. BL FACING DIRECTION: 270.0 %CONTROL: 0.0000
000003 1111 total 00095-63-6 POINT 3. 23. 4. 51. 70.00 450.00 0.00700 62. 375. 300. 175.

Facility Name & Address: Former Chromalloy Facility 169 Western Highway/Pineview Clarckstown
SIC Code: 0 Application: UTME: 6. UTMN: 45. BL FACING DIRECTION: 270.0 %CONTROL: 0.0000
000003 1111 total 00078-93-3 POINT 3. 23. 4. 51. 70.00 450.00 0.00500 42. 375. 300. 175.

Facility Name & Address: Former Chromalloy Facility 169 Western Highway/Pineview Clarckstown
SIC Code: 0 Application: UTME: 6. UTMN: 45. BL FACING DIRECTION: 270.0 %CONTROL: 0.0000
000003 1111 total 00067-64-1 POINT 3. 23. 4. 51. 70.00 450.00 0.00400 38. 375. 300. 175.

Facility Name & Address: Former Chromalloy Facility 169 Western Highway/Pineview Clarckstown
SIC Code: 0 Application: UTME: 6. UTMN: 45. BL FACING DIRECTION: 270.0 %CONTROL: 0.0000
000003 1111 total 00071-43-2 POINT 3. 23. 4. 51. 70.00 450.00 0.00014 2. 375. 300. 175.

Facility Name & Address: Former Chromalloy Facility 169 Western Highway/Pineview Clarckstown
IC Code: 0 Application: UTME: 6. UTMN: 45. BL FACING DIRECTION: 270.0 %CONTROL: 0.0000
000003 1111 total 00075-15-0 POINT 3. 23. 4. 51. 70.00 450.00 0.00110 4. 375. 300. 175.

Facility Name & Address: Former Chromalloy Facility 169 Western Highway/Pineview Clarckstown
SIC Code: 0 Application: UTME: 6. UTMN: 45. BL FACING DIRECTION: 270.0 %CONTROL: 0.0000
000003 1111 total 00076-14-2 POINT 3. 23. 4. 51. 70.00 450.00 0.00010 0. 375. 300. 175.

Facility Name & Address: Former Chromalloy Facility 169 Western Highway/Pineview Clarckstown
SIC Code: 0 Application: UTME: 6. UTMN: 45. BL FACING DIRECTION: 270.0 %CONTROL: 0.0000
000003 1111 total 00098-82-8 POINT 3. 23. 4. 51. 70.00 450.00 0.00500 48. 375. 300. 175.

Facility Name & Address: Former Chromalloy Facility 169 Western Highway/Pineview Clarckstown
SIC Code: 0 Application: UTME: 6. UTMN: 45. BL FACING DIRECTION: 270.0 %CONTROL: 0.0000
000003 1111 total 00100-41-4 POINT 3. 23. 4. 51. 70.00 450.00 0.00300 28. 375. 300. 175.

Facility Name & Address: Former Chromalloy Facility 169 Western Highway/Pineview Clarckstown
SIC Code: 0 Application: UTME: 6. UTMN: 45. BL FACING DIRECTION: 270.0 %CONTROL: 0.0000
000003 1111 total 00142-82-5 POINT 3. 23. 4. 51. 70.00 450.00 0.00600 50. 375. 300. 175.

Facility Name & Address: Former Chromalloy Facility 169 Western Highway/Pineview Clarckstown
SIC Code: 0 Application: UTME: 6. UTMN: 45. BL FACING DIRECTION: 270.0 %CONTROL: 0.0000
000003 1111 total 00110-54-3 POINT 3. 23. 4. 51. 70.00 450.00 0.14000 1222. 375. 300. 175.

Facility Name & Address: Former Chromalloy Facility 169 Western Highway/Pineview Clarckstown
SIC Code: 0 Application: UTME: 6. UTMN: 45. BL FACING DIRECTION: 270.0 %CONTROL: 0.0000
03 1111 total 01330-20-7 POINT 3. 23. 4. 51. 70.00 450.00 0.01500 128. 375. 300. 175.

Facility Name & Address: Former Chromalloy Facility 169 Western Highway/Pineview Clarckstown

SIC Code: 0 Application: UTME: 6. UTMN: 45. BL FACING DIRECTION: 270.0 %CONTROL: 0.0000

000003 1111 total 00075-02-9 POINT 3. 23. 4. 51. 70.00 450.00 0.00200 20. 375. 300. 175.

Facility Name & Address: Former Chromalloy Facility 169 Western Highway/Pineview Clarckstown

SIC Code: 0 Application: UTME: 6. UTMN: 45. BL FACING DIRECTION: 270.0 %CONTROL: 0.0000

000003 1111 total 00111-65-9 POINT 3. 23. 4. 51. 70.00 450.00 0.02700 236. 375. 300. 175.

Facility Name & Address: Former Chromalloy Facility 169 Western Highway/Pineview Clarckstown

SIC Code: 0 Application: UTME: 6. UTMN: 45. BL FACING DIRECTION: 270.0 %CONTROL: 0.0000

000003 1111 total 00095-47-6 POINT 3. 23. 4. 51. 70.00 450.00 0.00800 66. 375. 300. 175.

Facility Name & Address: Former Chromalloy Facility 169 Western Highway/Pineview Clarckstown

SIC Code: 0 Application: UTME: 6. UTMN: 45. BL FACING DIRECTION: 270.0 %CONTROL: 0.0000

000003 1111 total 00109-66-0 POINT 3. 23. 4. 51. 70.00 450.00 0.00300 26. 375. 300. 175.

Facility Name & Address: Former Chromalloy Facility 169 Western Highway/Pineview Clarckstown

SIC Code: 0 Application: UTME: 6. UTMN: 45. BL FACING DIRECTION: 270.0 %CONTROL: 0.0000

000003 1111 total 00127-18-5 POINT 3. 23. 4. 51. 70.00 450.00 0.02000 180. 375. 300. 175.

Facility Name & Address: Former Chromalloy Facility 169 Western Highway/Pineview Clarckstown

SIC Code: 0 Application: UTME: 6. UTMN: 45. BL FACING DIRECTION: 270.0 %CONTROL: 0.0000

000003 1111 total 00108-88-3 POINT 3. 23. 4. 51. 70.00 450.00 0.01500 130. 375. 300. 175.

Facility Name & Address: Former Chromalloy Facility 169 Western Highway/Pineview Clarckstown

SIC Code: 0 Application: UTME: 6. UTMN: 45. BL FACING DIRECTION: 270.0 %CONTROL: 0.0000

000003 1111 total 00079-01-6 POINT 3. 23. 4. 51. 70.00 450.00 0.00100 12. 375. 300. 175.

CONTAMINANT TOXICITY PROFILE FOR AIR GUIDE 1 ANALYSIS

CONTAMINANT NAME	CAS NUMBER	SGC ug/m3	HOW SGC ASSIGNED	AGC ug/m3	HOW AGC ASSIGNED	DAR TOXICITY	COMMENTS
ACETONE	00067-64-1	180000.00000	TRICHLOROETHYLENE	28000.000000000	ACGIH TWA-TLV	LOW	I
BENZENE	00071-43-2	1300.00000	NYSDEC	0.130000000	EPA	HIGH	A,H,U
	00075-02-9	0.00000	NO SGC EXISTS	9999999.000000000	you assigned		
CARBON DISULFIDE	00075-15-0	6200.00000	NYSDEC	700.000000000	EPA	MODERATE	H
DICHLORTETRAFLUORETH	00076-14-2	0.00000	NO SGC EXISTS	17000.000000000	ACGIH TWA-TLV		I
METHYL ETHYL KETONE	00078-93-3	59000.00000	NYSDEC	1000.000000000	EPA	MODERATE	H
TRICHLOROETHYLENE	00079-01-6	54000.00000	TRICHLOROETHYLENE	0.450000000	NYSDEC	MODERATE	H,I,U
XYLENE,O-	00095-47-6	4300.00000	NYSDEC	700.000000000	NYSDEC	MODERATE	H,I
TRIMETHYL BENZENE 1,	00095-63-6	0.00000	NO SGC EXISTS	290.000000000	NYSDEC "ANALOGY"		
CUMENE	00098-82-8	0.00000	NO SGC EXISTS	400.000000000	EPA		H
ETHYL BENZENE	00100-41-4	54000.00000	TRICHLOROETHYLENE	1000.000000000	EPA	MODERATE	H
TOLUENE	00108-88-3	37000.00000	NYSDEC	400.000000000	EPA	LOW	H
PENTANE	00109-66-0	0.00000	NO SGC EXISTS	4200.000000000	ACGIH TWA-TLV		
HEXANE	00110-54-3	0.00000	NO SGC EXISTS	200.000000000	EPA	MODERATE	H
OCTANE	00111-65-9	0.00000	NO SGC EXISTS	3300.000000000	ACGIH TWA-TLV		
	00127-18-5	0.00000	NO SGC EXISTS	9999999.000000000	you assigned		
HEPTANE, N-	00142-82-5	210000.00000	TRICHLOROETHYLENE	3900.000000000	ACGIH TWA-TLV	MODERATE	
X[illegible]NE,M,O&P MIXT.	01330-20-7	4300.00000	NYSDEC	700.000000000	NYSDEC	MODERATE	H,I

COMMENTS :

(A) ACGIH Human Carcinogen.

(H) HAP identified by 1990 CAAA.

(I) Refer to ACGIH Handbook.

(U) AGC equivalent to "one in a million risk".

APPENDIX IX

LOW-FLOW SAMPLING PROTOCOL

ENVIRONMENTAL ALLIANCE

Appendix IX

Standard Operating Procedures for Low-Flow Groundwater Sampling

---

Purpose

The low-flow sampling protocol is presented as an addendum to the As-Built Report in order to limit the generation of contaminated groundwater from monitoring of deep wells pursuant to Sequa's Waste Minimization and Pollution Prevention programs. The low-flow sampling protocol will also provide the following beneficial results:

- ❖ Reduce the quantity of VOC affected groundwater that is difficult for treatment at either onsite or offsite facilities,
- ❖ Reduce the hazard of potential releases in storing and transporting large quantities of purge affected water for treatment at onsite or offsite facilities,
- ❖ Reduce the physical hazards to workers associated with the collection and handling of large quantities of purge water generated during normal purging activities,
- ❖ Reduce the costs associated with purge water handling, storage, transportation, and treatment of affected groundwater.

Low-Flow Sampling Objectives

The objectives of the low-flow sampling protocol are to:

1) Collect groundwater samples that are representative of groundwater chemistry in the aquifer surrounding the borehole;
2) Minimize disturbance of the water column and solids in and adjacent to the borehole; and
3) Minimize the volume of required purge water.

Low-Flow Groundwater Sampling Equipment

The following equipment will be used during low-flow groundwater sampling, depending on the specific requirements of that event:

1) Disposable latex or vinyl sampling gloves,
2) Electronic water level meter with a precision of 0.01 feet,
3) pH, conductivity, oxidation-reduction potential (ORP), and dissolved oxygen (DO) meter(s),
4) Airtight flow-through cell for measurement of above water-quality parameters,
5) Clean, dedicated neoprene or polypropylene tubing,

6) Decontaminated or new plastic or stainless steel tee fitting and cap for bypass of flow-through cell, and
7) Stainless steel, variable speed (e.g., Grundfos Rediflo™) submersible pump.

Low-Flow Groundwater Sampling Procedure

The procedures to be followed for low-flow groundwater sampling from a deep monitoring well are as follows:

1) Determine appropriate level of PPE required according to the approved Site Safety Plan (SSP, Environmental Alliance, Inc., June 1997).
2) Obtain laboratory-prepared sample containers prior to sampling.
3) Obtain a depth to static water measurement of the well using a decontaminated water level meter. The static water level of the well will be measured to the nearest 0.01 ft.
4) Enter well data into bound field book and sample information data sheet.
5) Attach pump discharge tubing to submersible pump and lower pump, tubing, and electrical wiring to sampling depth prescribed on Table IX-1. Pump, tubing, and wiring should be lowered slowly to avoid disturbance of the water column, and care should be taken not to contact the sides of the casing, screen, and borehole. Table IX-1 presents the selected sampling depth for each of the deep groundwater wells. Sampling depths were selected to coincide with the deepest water-bearing fracture observed during drilling and/or historical downhole geophysical surveys. For wells without observed water-bearing fractures, sampling depth at the screen zone or the Zone of Good Water Protection (MW-18B) was selected. Care should be taken to keep the pump off the well bottom to avoid disturbing any solids collected in the bottom.
6) Calibrate water quality meter probes using manufacturer-supplied reference standards. For pH, the probe should be calibrated using two buffer solutions that bracket the expected pH range (typically 4 and 10).
7) Attach tee fitting and fitting cap to pump discharge tubing. Attach additional tubing and flow-through cell downstream of the tee fitting. Attach water quality monitoring probes to flow-through cell and ensure that cell is airtight.

8) Following placement of the pump, obtain a second depth to water measurement (to the nearest 0.01 ft.) using a decontaminated water level meter. If the second water level measurement is different than the static water level, continue to measure the water level until it returns to or near the static position.
9) Activate the water-quality meter and record the initial pH, conductivity, ORP, and DO. If using a water-quality meter with a datalogger, program the datalogger to record parameters at two (2)-minute intervals. The sampler's watch must be synchronized with the datalogger's clock.
10) If using a water-quality meter with a datalogger, activate the datalogger to begin recording and then activate the submersible pump. The initial flow rate should be set to a very low value.
11) Measure and record depth to water levels to the nearest 0.01 ft. during the initial five (5) minutes of pumping. If drawdown greater than 0.5 ft. from the static water level is observed, the pumping rate should be decreased until the water level returns to less than 0.5 ft. from static. If no drawdown is observed, the pumping rate can be increased making sure that drawdown does not exceed 0.5 feet. Once a stable pumping rate is achieved, maintain and record this pumping rate during the entire purging period. Continue to monitor depth to water at ten (10) minute intervals for the remainder of the purging period, adjusting flow rate to prevent drawdown if needed. Record any adjustments in pumping rate. Minimization of drawdown during low-flow purging will prevent the creation of vertical hydraulic gradients around the borehole. As a result, flow into the well and pump intake from the aquifer will be essentially horizontal, ensuring that the samples are representative of the desired sampling interval. Minimization of drawdown is a goal during low-flow purging and may not be achieved at all well locations depending upon geologic heterogeneities.
12) Record pH, conductivity, ORP, and DO at two (2) minute intervals, either by hand or via the datalogger, during the entire purging period. Stabilization of these parameters indicates that representative formation groundwater is being purged. Stabilization is defined as three successive readings within ± 0.1 for pH, ± 3% for conductivity, ± 10 millivolts (mV) for ORP, and ± 10% for DO. Stabilization of water-quality parameters is a goal during low-flow

purging and may not be achieved at all well locations depending upon geologic heterogeneities.

13) Groundwater generated during the well purging process will be collected and treated on-site with liquid phase carbon units housed in 55-gallon drums. The treated water will be discharged on-site into drainage culverts.
14) Once stabilization of water-quality parameters has been achieved, reduce the pumping rate to a flow acceptable for sampling (e.g., 0.1 L/min). Remove the cap from the tee fitting to allow pumped water to discharge upstream of the flow-through cell.
15) After purging the wells, don fresh disposable latex sampling gloves prior to collecting a groundwater sample.
16) Collect groundwater samples within laboratory-supplied bottleware. Preservatives will be added to sampling containers prior to sampling as required by the receiving laboratory.
17) Obtain duplicate and trip blank samples per sampling event.
18) Once sampling is completed, deactivate the sampling pump and stop recording water-quality parameters.
19) Label the sample containers using stick-on labels and waterproof ink with project information.
20) Check that the bottleware caps are tight and place samples within an iced cooler at a temperature of 4 ° Centigrade.
21) Enter the following sampling information into bound field log book:
    - location and depth where sample was obtained
    - purge rate in gallons per minute (gpm)
    - sampling rate in gpm or L/min
    - date and time of sample collection
    - pH, conductivity, ORP, and DO at time of sample collection
    - weather conditions at the time of sampling
    - include the name(s) of sampler(s), and any deviations from the sampling and analysis plan (SAP) or any events or activities which may affect the samples
    - any additional remarks

22) Disconnect flow-through cell, tubing and fittings from pump discharge tubing. Slowly remove pump, tubing, and electrical wiring from the well so as to avoid disturbance of the water column and any solids. All pumps, tubing, and wiring will be decontaminated prior to each use or dedicated (new and disposable) equipment will be used.
23) Complete sample information data sheet.
24) Store the collected samples together with any blank samples collected for that sampling event. The sample set and blanks must be stored together under refrigeration (or on ice) in an area known to be free of contamination.
25) Transport the sample set to the laboratory, maintaining chain-of-custody.

References

Environmental Alliance, Inc., June 1997, Site Safety Plan, Sequa Corporation, Hackensack, New Jersey.

Puls, R.W., and Barcelona, M.J., 1995, Low-flow (Minimal Drawdown) Ground-Water Sampling Procedures, U.S. Environmental Protection Agency Ground Water Issue EPA/540/S-95/504.

TABLE IX-1
LOW FLOW WELLS / PUMP DEPTHS FOR TESTING
FORMER CHROMALLOY FACILITY
WEST NYACK, NEW YORK

Well ID	Pump Set to Depth BGS	Explanation
MW-1B	50 feet	Screen Zone / Well Log
MW-3B	50 feet	Screen Zone / Well Log
MW-4B	55 feet	Screen Zone / Well Log
MW-11B	90 feet	Fractures / High Concentration Zone / Packer Testing / Geophysical
MW-12B	65 feet	Fractures / High Concentration Zone / Packer Testing / Geophysical
MW-16B	160 feet	Only Water Zone (Fracture) / Geophysical
MW-18B	210 feet	Zone of Good Water Protection – 2 gpm
Option: #41 Kohut	100 feet	Lowest Portion of Fracture Zone / Geophysical

Appendix C

Monitoring Well Construction Logs

Well Construction Table
Former Chromalloy Facility
West Nyack, NY

WELL ID	WELL INSTALL DATE	WELL DIAMETER (IN)	TOTAL DEPTH OF WELL FROM GRADE (FT)	ELEV OF TOC (FEET ABOVE MSL)	DEPTH TO T.O.S. FROM GRADE (ft)	DEPTH TO B.O.S. FROM GRADE (ft)	SCREEN / OPEN BOREHOLE INTERCEPT	COMMENTS
MW-1A	Oct-91	2	17	88.55	7	17	Overburden	
MW-1B	May-92*	4	62.6	88.61	42.6	62.6	Bedrock	Open borehole colapse; install screen
MW-2A	Oct-91	2	21	84.25	11	21	Overburden	
MW-2B	Apr-92*	4	65.2	84.70	45 2	65.2	Bedrock	Open borehole colapse; install screen
MW-3A	Oct-91	2	15	69.39	5	15	Overburden	
MW-3B	Apr-92*	4	52.2	69.68	32.2	52.2	Bedrock	Open borehole colapse; install screen
MW-4A	Oct-91	2	16	83.30	6	16	Overburden	
MW-4B	Apr-92*	4	65	83.39	45	65	Bedrock	Open borehole colapse; install screen
MW-5A	Oct-91	2	18	83.83	8	18	Overburden	
MW-5B	May-92*	2	68	83.69	48	68	Bedrock	Open borehole colapse; install screen
MW-6A	Oct-91	2	20	82 38	10	20	Overburden	
MW-6B	May-92*	2	53.6	81.90	33.6	53.6	Bedrock	Open borehole colapse; install screen
MW-7B	Apr-92	4	72 3	84.95	52.3	72.3	Bedrock	
MW-8B	Apr-92	4	61	76.32	41	61	Bedrock	
MW-9B	Apr-92	4	60.5	71.35	42	62	Bedrock	
MW-11A	Apr-98	2	34	69.17	9	34	Overburden	
MW-11B	Apr-98	6	120	69.65	--	--	Bedrock	Open borehole 50' - 120' bg
MW-12A	May-98	2	30	63.00	10	30	Overburden	
MW-12B	May-98	6	120	62.80	--	--	Bedrock	Open borehole 40' - 120' bg
MW-13A	May-98	2	23	87.94	5	23	Overburden	Abandoned
MW-13B	May-98	6	80	87.92	--	--	Bedrock	Open borehole 30' - 80' bg; Abandoned
MW-14A	Dec-00	2	30	87.18	20	30	Overburden	
MW-14B	Dec-00	6	62	87.29	--	--	Glacial till	Open borehole 41' - 62' bg
MW-15A	Dec-00	2	34 5	86.14	9 5	34.5	Overburden	
MW-16A	Sep-00	2	23.5	75.88	6.5	23.5	Overburden	
MW-16B	Nov-00	6	163	75.77	--	--	Bedrock	Open borehole 33' - 163' bg
MW-17A	Sep-00	2	36	86.65	9	36	Overburden	
MW-18B	May-02	6	275	77.43	--	--	Bedrock	Open borehole 21' - 275' bg
MW-19A	May-02	2	28.5	62.82	23.5	28.5	Glacial till	
MW-20A	May-02	2	14	64.06	4	14	Overburden	
MW-21AS	Jun-05	2	16	59.47	6	16	Overburden	Cluster well MW-21A borehole
MW-21AI	Jun-05	2	29	59.43	24	29	Glacial till	Cluster well MW-21A borehole
MW-22AS	May-05	2	18	64.84	3	18	Overburden	Cluster well MW-22A borehole

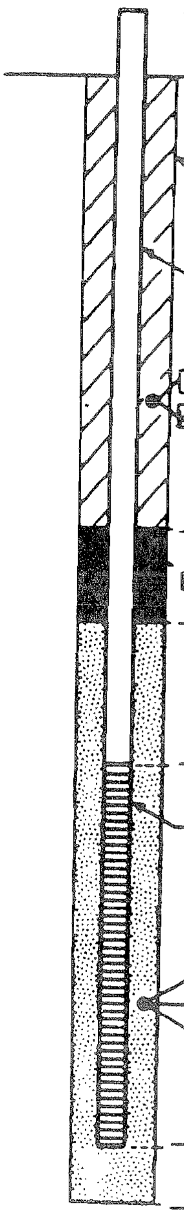
Well Construction Table
Former Chromalloy Facility
West Nyack, NY

WELL ID	WELL INSTALL DATE	WELL DIAMETER (IN)	TOTAL DEPTH OF WELL FROM GRADE (FT)	ELEV OF TOC (FEET ABOVE MSL)	DEPTH TO T.O.S. FROM GRADE (ft)	DEPTH TO B.O.S. FROM GRADE (ft)	SCREEN / OPEN BOREHOLE INTERCEPT	COMMENTS
MW-22AI	May-05	2	30	64.85	25	30	Glacial till	Cluster well MW-22A borehole
MW-23AS	May-05	2	18	61.73	8	18	Overburden	Cluster well MW-23A borehole
MW-23AI	May-05	2	27	61 74	22	27	Glacial till	Cluster well MW-23A borehole
MW-23AD	May-05	2	42	61.76	37	42	Bedrock	Cluster well MW-23A borehole
MW-24AS	May-05	2	23	68.77	13	23	Overburden	Cluster well MW-24A borehole
MW-24AI	May-05	2	31	68.77	26	31	Glacial till	Cluster well MW-24A borehole
MW-24AD	May-05	2	43 5	68.75	43	51	Bedrock	Cluster well MW-24A borehole
MW-25AS	May-05	2	15	80.13	5	15	Overburden	Cluster well MW-25A borehole
MW-25A-I	May-05	2	24	80.09	15	24	Glacial till	Cluster well MW-25A borehole
MW-26A	Jan-08	2	20	NA	5	20	Overburden /Glacial	
MW-27A	Jan-08	2	20	NA	5	20	Overburden /Glacial	
PW	Unknown	6	400	86.11	--	--	Bedrock	Open borehole (unknown interval)
RW-1 (MW15B)	Dec-00	10 / 8	300	86 01	--	--	Bedrock	Open borehole 59' - 300' bg ; collapsed borehole approx. 100' bg; set 8" steel casing grade - 169' bg with slotted steel casing 84' - 126' bg and 147' - 169' bg; open borehole 168' - 300' bg
#10	Unknown	4	34.5	NA	--	--	Unknown	Open borehole (unknown interval); lost/destroyed by property development
#12	Unknown	6	133	79.36	--	--	Bedrock	Open borehole 71' - 133' bg; Blockage at 90' bg
#16	Unknown	6	158	76.29	--	--	Bedrock	Open borehole 70' - 158' bg
#20	Unknown	6	122	72.62	--	--	Bedrock	Open borehole 60' - 122' bg
#25	Unknown	6	99	76.55	--	--	Bedrock	Open borehole 46' - 99' bg
#35	Unknown	6	117	67.79	--	--	Bedrock	Open borehole 33' - 117' bg
#36	Unknown	6	116	71.91	--	--	Bedrock	Open borehole 69' - 116' bg
#41	Unknown	6	128	69.24	--	--	Bedrock	Open borehole 61' - 128' bg

* = Date screen was installed previously open borehole.

GERAGHTY & MILLER, INC.
Environmental Services

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



ft 1.41
LAND SURFACE

6 inch diameter drilled hole

Well casing, 2 inch diameter, PVC

☐ Backfill
☒ Grout 5% bentonite

1.5 ft*

Bentonite ☐ slurry
3 ft* ☒ pellets

7 ft*

Well Screen.
2 inch diameter
PVC, 10 slot

☐ Gravel Pack
☒ Sand Pack
☐ Formation Collapse

17 ft*

19 ft*

Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project Sequa NY21301 Well MW-1A

Town/City West Nyack

County Rockland State NY

Permit No. --

Land-Surface Elevation and Datum 86.51 feet sea level ☐ Surveyed ☐ Estimated

Installation Date(s) 10-18-91

Drilling Method Auger

Drilling Contractor Boyd Artesian Well Co., Inc.

Drilling Fluid None

Development Technique(s) and Date(s)
2" diameter bailer, 10-31-91 to 11-1-91

Fluid Loss During Drilling None gallons

Water Removed During Development 150+ gallons

Static Depth to Water 10.63 feet below M.P.

Pumping Depth to Water -- feet below M.P.

Pumping Duration -- hours

Yield 0.3 gpm Date 11-1-91

Specific Capacity -- gpm/ft

Well Purpose Monitoring

Remarks Hole was drilled to 22' bls and collapsed to 19' bls.

Well key #3753 - Master Lock.

Prepared by

G&M Form 06 12-86 Soumprint 89-0978

GERAGHTY & MILLER, INC.
Environmental Services

WELL CONSTRUCTION LOG

(BEDROCK)

Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

**Depth to bottom of 6" PVC Casing

Project: Sequa/NY21301 Well: MW-1B

Town/City: West Nyack

County: Rockland State: New York

Permit No.: ----

Land-Surface Elevation and Datum: 86.4 feet relative to MSL ☒ Surveyed ☐ Estimated

Installation Date(s): 5-4-92 and 5-5-92

Drilling Method: Air Rotary

Drilling Contractor: Eastern States Well Drillers, Inc.

Drilling Fluid: ---

Development Technique(s) and Date(s):
Air lift 5-4-92
Submersible Pump (5-6-92)

Fluid Loss During Drilling: ---- gallons

Water Removed During Development: 450 gallons

Static Depth to Water: 27.40 (5-11-92) feet below M.P.

Pumping Depth to Water: ______ feet below M.P.

Pumping Duration: 0.33 hours

Yield: 20 gpm Date: 5-4-92

Specific Capacity: ______ gpm/ft

Well Purpose: Monitoring Well

Remarks: Depth to bedrock is 22 ft.

Diameter of borehole below 6" casing is 6".

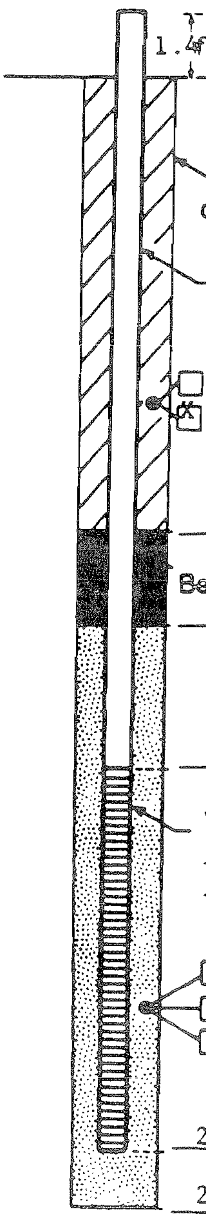
Fracture zone: 50'-70' bls.

Open bedrock well was initally installed 11-1-91.

Prepared by: J.L. Jasiorkowski

GERAGHTY & MILLER, INC.
Environmental Services

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



1.4ft
LAND SURFACE

6 inch diameter drilled hole

Well casing, 2 inch diameter, PVC

☐ Backfill
☒ Grout 5% Bentonite

3 ft*

Bentonite ☐ slurry ☒ pellets
7 ft*

11 ft*

Well Screen. 2 inch diameter PVC, 10 slot

☐ Gravel Pack
☒ Sand Pack
☐ Formation Collapse

21 ft*

26 ft*

Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Sequa NY213-01 Well MW-2 A

Town/City West Nyack

County Rockland State N.Y.

Permit No. —

Land-Surface Elevation and Datum 82.70 feet sea level ☒ Surveyed ☐ Estimated

Installation Date(s) 10-11-91

Drilling Method Auger

Drilling Contractor Boyd Artesian Well Co., Inc.

Drilling Fluid None

Development Technique(s) and Date(s)
2" diameter bailer, 10-31-91 to 11-1-91

Fluid Loss During Drilling None gallons

Water Removed During Development 250+ gallor

Static Depth to Water 14.18 feet below M.P.

Pumping Depth to Water -- feet below M.[

Pumping Duration -- hours

Yield 1.0 gpm Date 11-1-91

Specific Capacity -- gpm/ft

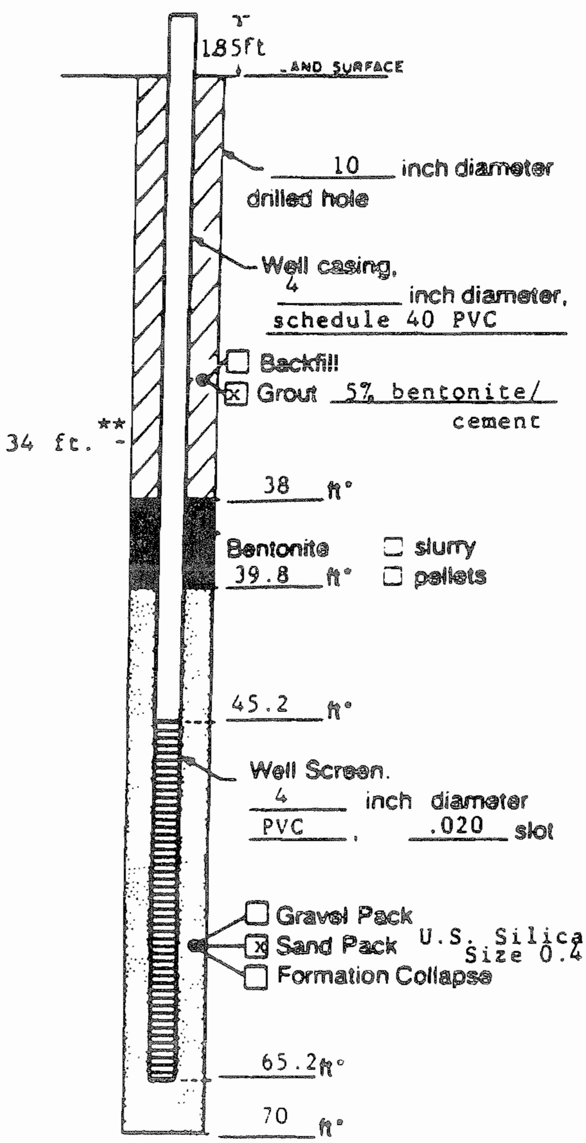
Well Purpose Monitoring

Remarks Well key #3753 - Master Lock.

Prepared by D. Stockar

GERAGHTY & MILLER, INC.
Environmental Services

WELL CONSTRUCTION LOG
(BEDROCK)



Project Sequa/NY21301 Well MW-2B

Town/City West Nyack

County Rockland State New York

Permit No. ----

Land-Surface Elevation and Datum 82.4 feet relative to MSL [x] Surveyed [ ] Estimated

Installation Date(s) 4-9-90

Drilling Method Air Rotary

Drilling Contractor Eastern States Well Drillers, Inc.

Drilling Fluid ---

Development Technique(s) and Date(s)

Air Lift 4-9-90

Submersible Pump 5-5-92

Fluid Loss During Drilling --- gallons

Water Removed During Development 200 - 300 gallons

Static Depth to Water (5-11-92) 23.36 feet below M.P.

Pumping Depth to Water ---- feet below M.P.

Pumping Duration 0.33 hours

Yield 10-15 gpm Date 4-9-90

Specific Capacity ______ gpm/ft

Well Purpose Monitoring Well

Remarks Depth to bedrock is 26 ft.*

Diameter of borehole below 6" casing to 6".

Open bedrock well was initially installed 11-4-91.

Measuring Point is Top of Well Casing Unless Otherwise Noted.

°Depth Below Land Surface

**Depth to bottom of 6" PVC casing.

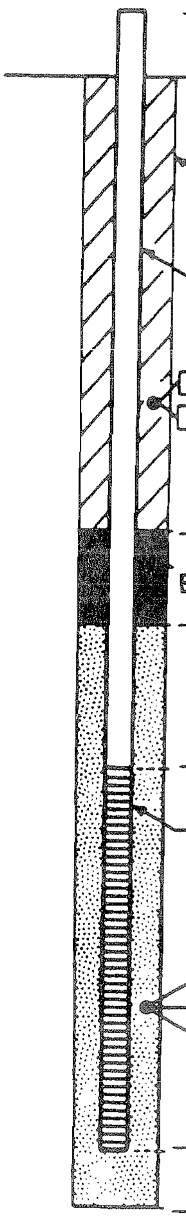
Prepared by J.L. Jasiorkowski

G&M Form 35 12-88

Southport 89-0378

GERAGHTY & MILLER, INC.
Environmental Services

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



ft flush mount
LAND SURFACE

6 inch diameter drilled hole

Well casing;
2 inch diameter,
PVC

☐ Backfill
☒ Grout 5% Bentonite

1 ft*

Bentonite ☐ slurry
3 ft* ☐ pellets

5 ft*

Well Screen.
2 inch diameter
PVC , 10 slot

☐ Gravel Pack
☒ Sand Pack
☐ Formation Collapse

15 ft*

18 ft*

Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project Sequa/NY213-01 Well MW - 3 A

Town/City West Nyack

County Rockland State NY

Permit No. --

Land-Surface Elevation
and Datum 69.30 feet ☒ Surveyed
sea level ☐ Estimated

Installation Date(s) 10/16/91

Drilling Method Auger

Drilling Contractor Boyd Artesian Well Co., Inc.

Drilling Fluid None

Development Technique(s) and Date(s)
Centrifugal Pump, 10-30-91 to 10-31-91

Fluid Loss During Drilling None gallons

Water Removed During Development 450± gallons

Static Depth to Water 5.36 feet below M.P.

Pumping Depth to Water -- feet below M.P.

Pumping Duration -- hours

Yield 0.8 gpm Date 10-31-91

Specific Capacity -- gpm/ft

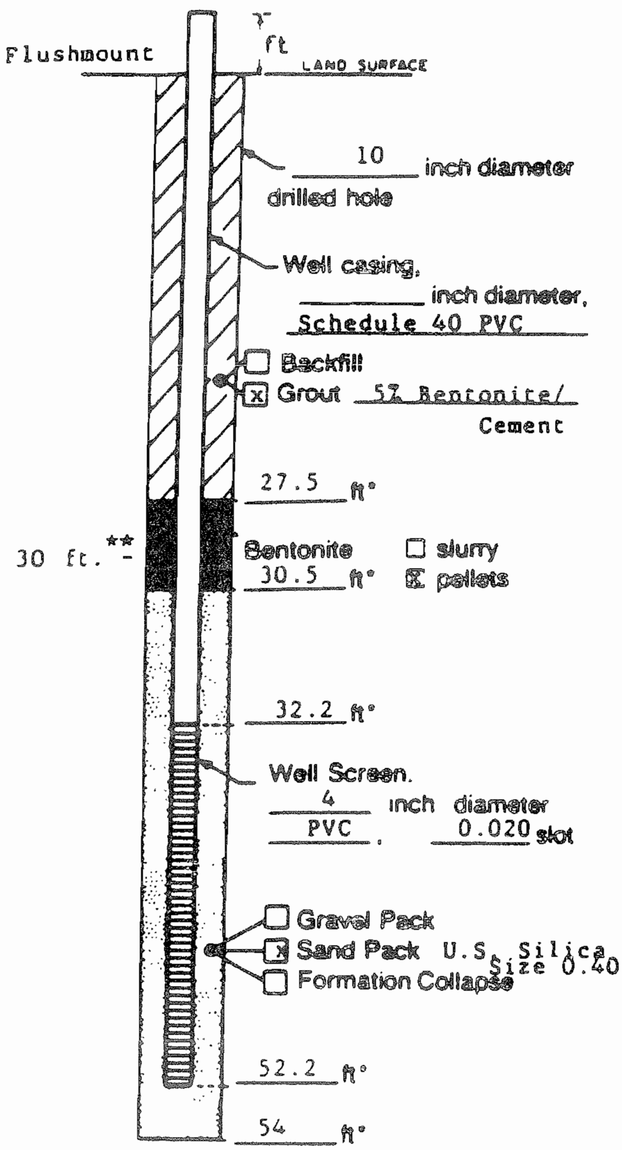
Well Purpose Monitoring

Remarks Bedrock at 22' BLS. The hole collapsed
to 18' BLS.
Well key #3753 - Master Lock.

Prepared by D. Stockar

GERAGHTY & MILLER, INC.
Environmental Services

WELL CONSTRUCTION LOG
(BEDROCK)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

° Depth Below Land Surface

**Depth to 6" PVC casing

Project Sequa/NY21301 Well MW-3B

Town/City West Nyack

County Rockland State New York

Permit No. ______

Land-Surface Elevation and Datum 69.6 feet relative to MSL ☒ Surveyed ☐ Estimated

Installation Date(s) 4-22-92

Drilling Method Air Rotary

Drilling Contractor Eastern States Well Drillers, Inc.

Drilling Fluid -

Development Technique(s) and Date(s)

Air Lift 4-22-92

Submersible Pump 5-6-92

Fluid Loss During Drilling ---- gallons

Water Removed During Development 390 - 480 gallons

Static Depth to Water 8.55 (5-11-92) feet below M.P.

Pumping Depth to Water ______ feet below M.P.

Pumping Duration ______ hours

Yield 12-15 gpm Date 4-22-92

Specific Capacity ______ gpm/ft

Well Purpose Monitoring Well

Remarks Depth to bedrock is 21 ft.*

Diameter of borehole below 6" casing is 6".

Open bedrock well was initially installed 11-6-91.

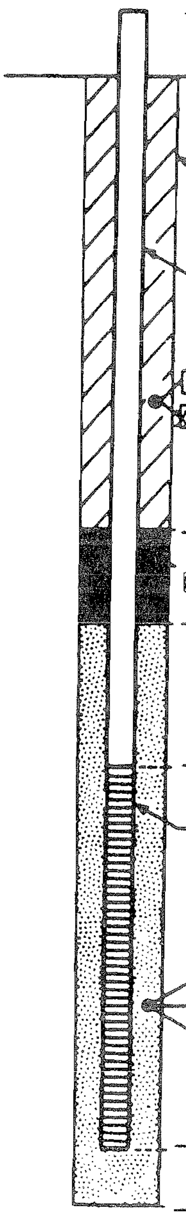
Prepared by J.L. Jasiorkowski

G&M Form 05 12-88

Soumpro 88-0978

GERAGHTY & MILLER, INC.
Environmental Services

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



1.52 ft

LAND SURFACE

6 inch diameter drilled hole

Well casing, 2 inch diameter, PVC

☐ Backfill
☒ Grout 5% bentonite

2 ft*

Bentonite ☐ slurry
4 ft* ☒ pellets

6 ft*

Well Screen.
2 inch diameter
PVC, 10 slot

☐ Gravel Pack
☒ Sand Pack
☐ Formation Collapse

16 ft*

21 ft*

23 ft bottom of bentonite plug

Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project Sequa NY21301 Well W-4A

Town/City West Nyack

County Rockland State NY

Permit No. --

Land-Surface Elevation
and Datum 81.31 feet ☐ Surveyed
sea level ☐ Estimated

Installation Date(s) 10-16-91

Drilling Method Auger

Drilling Contractor Boyd Artesian Well Co., Inc.

Drilling Fluid None

Development Technique(s) and Date(s)
2" diameter bailer, 11-4-91 to 11-7-91

Fluid Loss During Drilling None gallons

Water Removed During Development 250+ gallons

Static Depth to Water 11.55 feet below M.P.

Pumping Depth to Water -- feet below M.P.

Pumping Duration -- hours

Yield 0.5 gpm Date 11-7-91

Specific Capacity -- gpm/ft

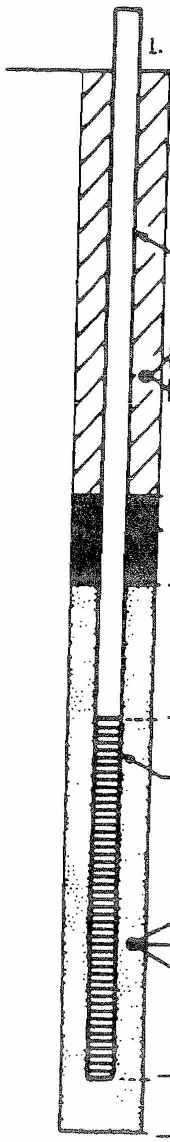
Well Purpose Monitoring

Remarks We placed 2' of bentonite from 23' to 21' bls at the base of the sandpack.
Well key #3753 - Master Lock.

Prepared by

GERAGHTY & MILLER, INC.
Environmental Services

WELL CONSTRUCTION LOG
(BEDROCK)



1.9 ft

LAND SURFACE

10 inch diameter drilled hole

Well casing, 4 inch diameter, Schedule 40 PVC

☐ Backfill
☒ Grout 5% Bentonite/ Cement

36 ft*

Bentonite ☐ slurry ☒ pellets
39 ft*

45.0** ft*

Well Screen. 4 inch diameter PVC, 0.020 slot

☐ Gravel Pack
☒ Sand Pack U.S. Silica Size 0.40
☐ Formation Collapse

65 ft*

65 ft*

Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface
**Depth to bottom of 6" PVC casing

Project Sequa/NY21301 Well MW-4B

Town/City West Nyack

County Rockland State New York

Permit No. ----

Land-Surface Elevation and Datum 81.1 feet relative to MSL ☒ Surveyed ☐ Estimated

Installation Date(s) 4-10-92

Drilling Method Air Rotary

Drilling Contractor Eastern States Well Drillers, Inc.

Drilling Fluid ---

Development Technique(s) and Date(s)
Air Lift (4-10-92)
Submersible Pump (5-5-92)

Fluid Loss During Drilling ---- gallons

Water Removed During Development 250-350 gallons

Static Depth to Water 22.09 (5-11-92) feet below M.P.

Pumping Depth to Water feet below M.P.

Pumping Duration 0.33 hours

Yield 10-15 gpm Date 4-10-92

Specific Capacity gpm/ft

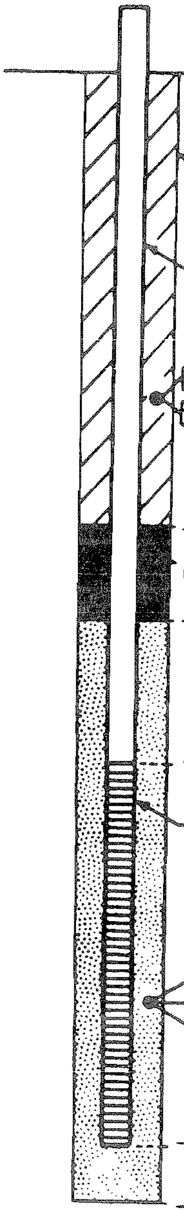
Well Purpose Monitoring Well

Remarks Depth to bedrock is *39 ft.
Diameter of borehole below 6" casing is 6".
Open bedrock well was initially installed 10-31-02.

Prepared by J.L. Jasiorkowski

GERAGHTY & MILLER, INC.
Environmental Services

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Flush Mount ft

LAND SURFACE

6 inch diameter drilled hole

Well casing, 2 inch diameter, PVC

☐ Backfill
☒ Grout 5% bentonite

3.5 ft*

Bentonite ☐ slurry ☒ pellets

6 ft*

8 ft*

Well Screen. 2 inch diameter PVC, 10 slot

☐ Gravel Pack
☒ Sand Pack
☐ Formation Collapse

18 ft*

24.5 ft*

26 ft bottom of bentonite plug

Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Sequa NY21301 Well MW-5A

Town/City West Nyack

County Rockland State NY

Permit No. --

Land-Surface Elevation and Datum 84.12 feet sea level ☐ Surveyed ☐ Estimated

Installation Date(s) 10-12-91

Drilling Method Auger

Drilling Contractor Boyd Artesian Well Co., Inc.

Drilling Fluid

Development Technique(s) and Date(s)

Centrifugal pump. 10-29-91 to 10-30-91

Fluid Loss During Drilling None gallons

Water Removed During Development 600 gallor

Static Depth to Water 8.91 feet below M.P.

Pumping Depth to Water -- feet below M.I

Pumping Duration -- hours

Yield 1.0 gpm Date 10-30-91

Specific Capacity -- gpm/ft

Well Purpose Monitoring

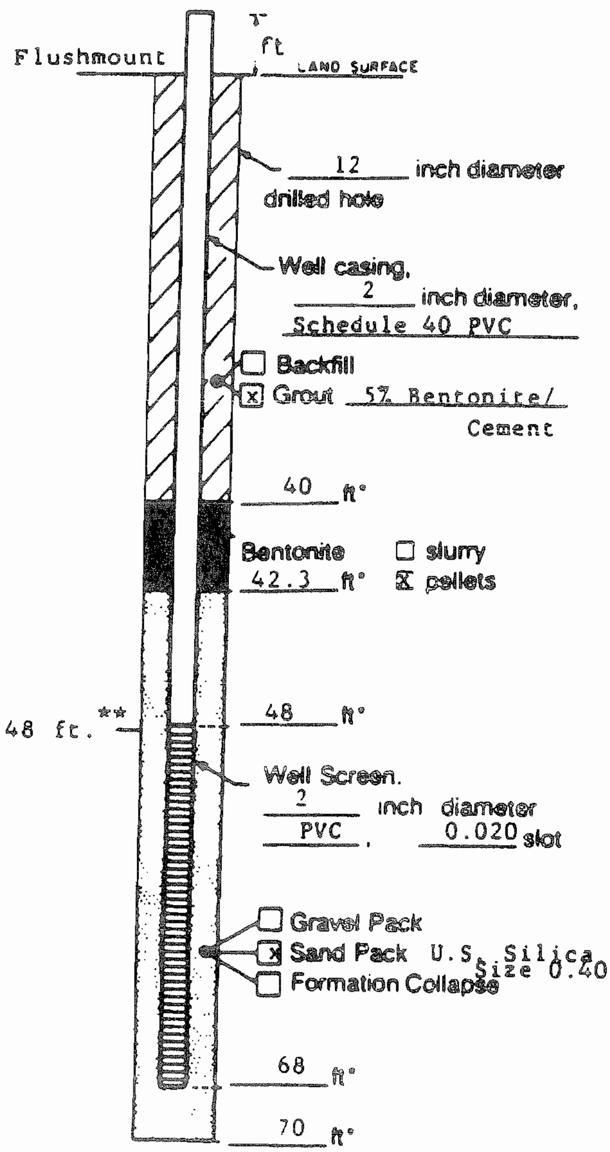
Remarks A bentonite plug (1.5 ft) was placed from 26' to 24.5' bls at the base of the sandpack

Well key #3752 - Master Lock.

Prepared by

GERAGHTY & MILLER, INC.
Environmental Services

WELL CONSTRUCTION LOG
(BEDROCK)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

**Depth of bottom of 6" PVC casing

Project: Sequa/NY21301 Well: MW-5B

Town/City: West Nyack

County: Rockland State: New York

Permit No.: ----

Land-Surface Elevation and Datum: 84.0 feet relative to MSL ☒ Surveyed ☐ Estimated

Installation Date(s): 5-5-92

Drilling Method: Air Rotary

Drilling Contractor: Eastern States Well Drillers, Inc.

Drilling Fluid: -

Development Technique(s) and Date(s):
Air Lift 5-5-92
Bailer 5-8-92

Fluid Loss During Drilling: ---- gallons

Water Removed During Development: 320 gallons

Static Depth to Water: 22.44 (5-11-92) feet below M.P.

Pumping Depth to Water: ______ feet below M.P.

Pumping Duration: 0.33 hours

Yield: 15 gpm Date: 5-5-92

Specific Capacity: ______ gpm/ft

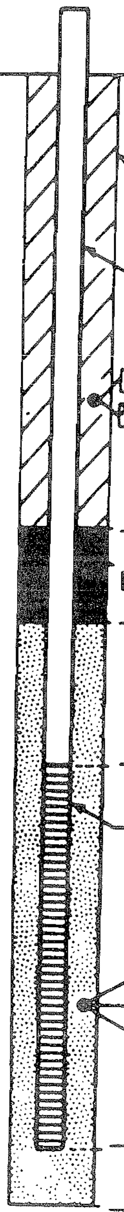
Well Purpose: Monitoring Well

Remarks: Depth to bedrock is 32 ft.*
Fracture zones: 65'-68' bls.
12 inchdiameter steel casing set in the over burden to a depth of 28 ft.*
Diameter of borehole below 6" casing is 6".
Open bedrock well was initially installed 11-5-91.

Prepared by: J.L. Jasiorkowski

GERAGHTY & MILLER, INC.
Environmental Services

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



ft flush mount
LAND SURFACE

6 inch diameter drilled hole

Well casing, 2 inch diameter, PVC

☐ Backfill
☒ Grout 5% Bentonite

6 ft*

Bentonite ☐ slurry
8 ft* ☒ pellets

10 ft*

Well Screen.
2 inch diameter
PVC , 10 slot

☐ Gravel Pack
☒ Sand Pack
☐ Formation Collapse

20 ft*

22 ft*

Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Sequa/NY213-01 Well MW-6A

Town/City West Nyack

County Rockland State NY

Permit No. --

Land-Surface Elevation and Datum 82.30 feet sea level ☒ Surveyed ☐ Estimated

Installation Date(s) 10-18-91

Drilling Method Auger

Drilling Contractor Boyd Artesian Well Co., Inc.

Drilling Fluid None

Development Technique(s) and Date(s)
2" diameter bailer, 10-28-91 to 11-5-91

Fluid Loss During Drilling None gallons

Water Removed During Development 350+ gallons

Static Depth to Water 13.90 feet below M.P.

Pumping Depth to Water -- feet below M.P.

Pumping Duration -- hours

Yield 0.5 gpm Date 11-5-91

Specific Capacity ______ gpm/ft

Well Purpose Monitoring

Remarks Well key #3753 - Master Lock

Prepared by D. Stockar

GERAGHTY & MILLER, INC.
Environmental Services

WELL CONSTRUCTION LOG
(BEDROCK)

Measuring Point is Top of Well Casing Unless Otherwise Noted.

°Depth Below Land Surface

**Depth to bottom of 6" PVC casing.

Project Sequa/NY21301 Well MW-6B

Town/City West Nyack

County Rockland State New York

Permit No. ----

Land-Surface Elevation and Datum 81.7 feet relative to MSL ☒ Surveyed ☐ Estimated

Installation Date(s) 5-7-92 and 5-8-92

Drilling Method Air Rotary

Drilling Contractor Eastern States Well Drillers, Inc.

Drilling Fluid ----

Development Technique(s) and Date(s)

Air Lift 4-28-92 25-30 gpm 0.8 hrs.

Centrifugal pump 5-11-92; 15 gallons

Fluid Loss During Drilling ---- gallons

Water Removed During Development 1215-1455 gallons

Static Depth to Water 20.18 (5-11-92) feet below M.P.

Pumping Depth to Water ______ feet below M.P.

Pumping Duration 0.8 hours

Yield 25-30 gpm Date 4-28-92

Specific Capacity ______ gpm/ft

Well Purpose Monitoring Well

Remarks Depth to bedrock is 24 ft.*

Fractured sandstone at 35'-40' bls and 56'-58' bls.

Diameter of borehole below 6" casing is 6".

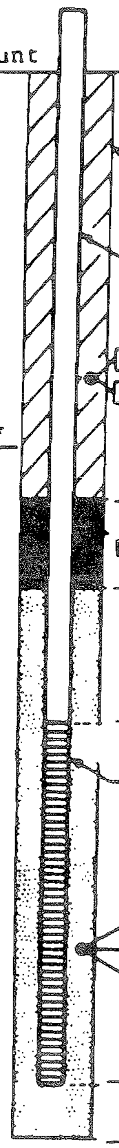
Open bedrock well was initally installed 11-7-91.

Well key #3753 - Master Lock.

Prepared by J.L. Jasiorkowski

GERAGHTY & MILLER, INC.
Environmental Services

WELL CONSTRUCTION LOG
(BEDROCK)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface
**Depth of bottom of 8" steel casing.

Project Sequa/NY21301 Well MW-7B
Town/City West Nyack
County Rockland State New York
Permit No. ______
Land-Surface Elevation and Datum 87.1 feet relative to MSL ☒ Surveyed ☐ Estimated
Installation Date(s) 4-8-92
Drilling Method Air Rotary
Drilling Contractor Eastern States Well Drillers, Inc.
Drilling Fluid Potable water

Development Technique(s) and Date(s)
Air Lift 4-8-92
Submersible Pump 4-22-92

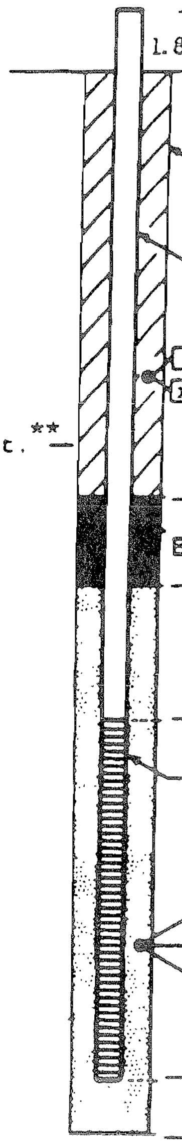
Fluid Loss During Drilling ---- gallons
Water Removed During Development 282-322 gallons
Static Depth to Water 25.6 (4-22-92) feet below M.P.
Pumping Depth to Water 29.5 (4-22-92) feet below M.P.
Pumping Duration 0.25 hours
Yield 15-20 gpm Date 4-8-92
Specific Capacity ______ gpm/ft
Well Purpose Monitoring Well

Remarks Depth to bedrock is 30 ft.*
Diameter of borehole below 8" casing is 8".
Well Key #3753 - Master Lock.

Prepared by J.L. Jasiorkowski

GERAGHTY & MILLER, INC.
Environmental Services

WELL CONSTRUCTION LOG
(BEDROCK)



1.8 ft

LAND SURFACE

12 inch diameter drilled hole

Well casing, 4 inch diameter, Schedule 40 PVC

☐ Backfill
☒ Grout 5% Bentonite/ Cement

30 ft.** — 37 ft*

Bentonite ☐ slurry ☒ pellets
39 ft*

41 ft*

Well Screen. 4 inch diameter PVC, 0.020 slot

☐ Gravel Pack
☒ Sand Pack U.S. Silica Size 0.40
☐ Formation Collapse

61 ft*

63 ft*

Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

**Depth of 8" steel casing.

Project: Sequa/NY21301 Well: MW-8B

Town/City: West Nyack

County: Rockland State: New York

Permit No. ----

Land-Surface Elevation and Datum: 75.3 feet relative to MSL ☒ Surveyed ☐ Estimated

Installation Date(s): 4-21-92

Drilling Method: Air Rotary

Drilling Contractor: Eastern States Well Drillers, Inc.

Drilling Fluid: Potable water

Development Technique(s) and Date(s):
Air Lift 4-21-92
Submersible Pump 4-23-92

Fluid Loss During Drilling ---- gallons

Water Removed During Development 372-447 gallons

Static Depth to Water 16.05 (5-11-92) feet below M.P

Pumping Depth to Water ______ feet below M.P.

Pumping Duration 0.42 hours

Yield 15-20 gpm Date 4-21-92

Specific Capacity ______ gpm/ft

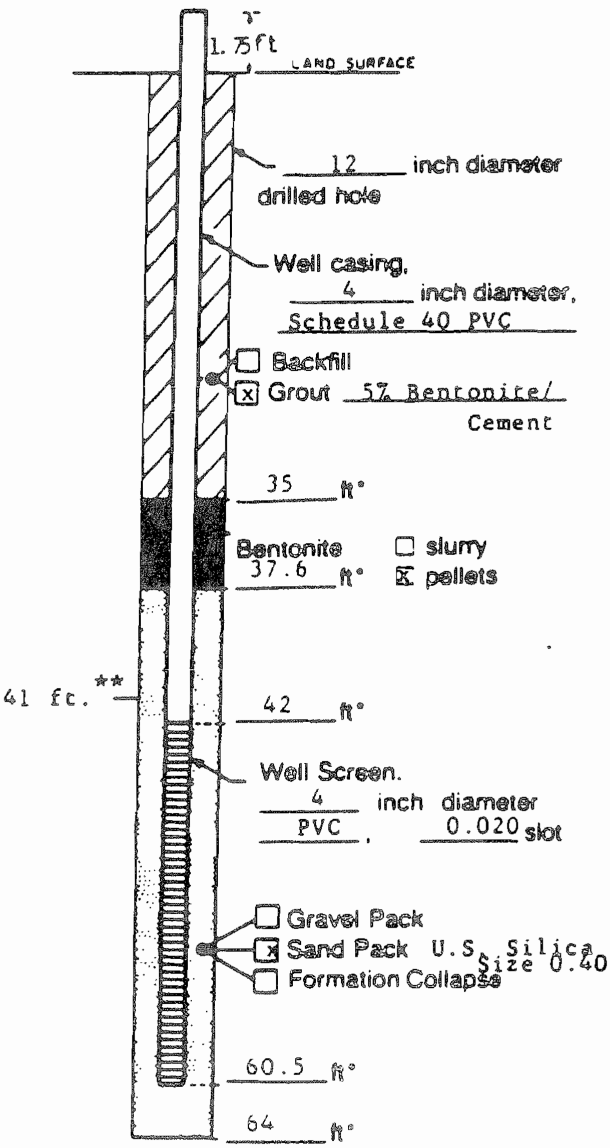
Well Purpose: Monitoring Well

Remarks: Depth to bedrock is 21 ft.*
Diameter of borehole below 8" casing is 8".
Had difficulty grouting outer casing used 550 gal.
grout and 2 buckets of bentonite pellets to grout
it to the surface.
Well Key #3753 - Master Lock.

Prepared by: J.L. Jasiorkowski

GERAGHTY & MILLER, INC.
Environmental Services

WELL CONSTRUCTION LOG
(BEDROCK)



Project Sequa/NY21301 Well MW-9B

Town/City West Nyack

County Rockland State New York

Permit No. ----

Land-Surface Elevation and Datum 71.7 feet relative to MSL ☒ Surveyed ☐ Estimated

Installation Date(s) 4-29-92

Drilling Method Air Rotary

Drilling Contractor Eastern States Well Drillers, Inc.

Drilling Fluid potable water

Development Technique(s) and Date(s)

Air Lift 4-23-92

Submersible Pump 5-1-92 (5.3 gpm)

Fluid Loss During Drilling ---- gallons

Water Removed During Development approx. 1500 gallons

Static Depth to Water 10.73 (5-11-92) feet below M.P.

Pumping Depth to Water ______ feet below M.P.

Pumping Duration 0.8 hours

Yield approx. 20 gpm Date 4-23-92

Specific Capacity ______ gpm/ft

Well Purpose Monitoring Well

Remarks Depth to bedrock is 39 ft.*.
10" diameter steel casing set in the over burden to a depth of 32 ft.*
Well Key #3753 - Master Lock
Diameter of borehole below 8" casing is 8"

Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface
**Depth of bottom of 8" steel casing.

Prepared by J.L. Jasiorkowski

G&M Form 05 12 88 Soumpnt 89-0978

BORING / WELL LOG

CLIENT: Sequa
PROJECT NAME: Former Chromalloy Facility
PROJECT NUMBER: 1166
LOCATION: 169 Western Highway West Nyack, New York
DATE: 5-1-98

BORING NUMBER: MW-11A
BEDROCK DEPTH: Not Encountered
BORING DEPTH: 35 feet
BORING DIAMETER: 6-inch
TOC ELEVATION: 70.46 feet MSL
NO. OF SAMPLES: Five Collected

DRILLER: Samuel Sthotoff Company
DRILL RIG: ReichDrill 650
DRILL METHOD: Air Rotary
DATE(S) DRILLED: 4-23-98
LOGGED BY: AJA
FIRST WATER DEPTH: 2 feet

ANNULUS COMPLETION: 2-inch diameter schedule 40 PVC well set at 34 feet below grade. Screen (0.01slot) set from 34 to 9 feet. Casing set from 9 to 0.5 feet. Annulus completed with #2 sand - 34 to 7 feet, bentonite - 7 to 5 feet, and cement - 5 to 1 foot below grade. Set flush-mount manhole in cement.

**********SAMPLES********** Note: Spoon sample sub-intervals within lithology description measured from top of recovered sample

Spoon Interval	Recovery	Blow Count	Time	Lithological Description	Comments
				0 - 0.5 ' Topsoil, wood chips, mulch, leaves, etc.	
2-4'	14.5 "	NA	13:10	2-4' spoon - 14.5" to 9.5" Brown clay and wood chips (top). 9.5 to 0" Brown silty clay with v.fine sand, saturated (bottom).	PID Screen 2-4' Soil-0.0 ppm
				4-7' As above.	
7-9'	14"	NA	13:50	7-9' spoon - Red brown clayey fine sand with some gravel, damp.	PID Screen 7-9' Soil-0.0 ppm
				9 -12' As above.	
12-14'	15"	NA	14:09	12-14' spoon - As above with sandstone fragments, tough advancing bottom 12" of spoon.	PID Screen 12-14' Soil-0.0 ppm
17-19'	6"	NA	14:23	17-19' spoon - Red brown firm clay with sand (till). Spoon refusal after 9" penetration.	PID Screen 17-19' Soil-10.9 ppm
22-24'	3"	NA	14:40	22-24' spoon - As above, more sand and less clay, hard, dry.	PID Screen 22-24' PID not functioning properly due to rain and high humidity.
				24-35' As above, variable sand and clay percent.	
				35' - End of boring.	
				Borehole caves-in to 34';set PVC well bottom.	

BORING / WELL LOG

CLIENT: Sequa
PROJECT NAME: Former Chromalloy Facility
PROJECT NUMBER: 1166
LOCATION: 169 Western Highway West Nyack, New York
DATE: 5-1-98

BORING NUMBER: MW-11B
BEDROCK DEPTH: 39 feet
BORING DEPTH: 120 feet
BORING DIAMETER: 10-inch/6-inch
TOC ELEVATION: 70.32 feet MSL
NO. OF SAMPLES: None Collected

DRILLER: Samuel Sthotoff Company
DRILL RIG: ReichDrill 650
DRILL METHOD: Air Rotary
DATE(S) DRILLED: 4-22 & 4-24-98
LOGGED BY: AJA
FIRST WATER DEPTH: Deep - 45 feet

ANNULUS COMPLETION: 6-inch diameter schedule 40 steel casing was set at 50 feet below grade. The annulus seal : Bentonite - 50 to 48 feet. Cement/bentonite grout - 48 to 1 foot below grade. Set flush-mount manhole in cement.

**********SAMPLES********** Note Spoon sample sub-intervals within lithology description measured from top of recovered sample.

Spoon Interval	Recovery	Blow Count	Time	Lithological Description	Comments
				0 to 0.5 feet - Topsoil, wood chips, mulch, leaves, etc.	
				0.5 to 11 feet - Brown to red brown silty clay with trace fine sand. Moist to wet at 4.5 feet.	
				11 to 23 feet - Red brown clayey silt with sandstone fragments (after 18 feet). Dry.	
				23 to 30 feet - Red brown clay, hard, rock-like material, dry	
				30 to 32 feet - Loss of drill cutings.	
				32 to 39 feet - Red brown clay with rock fragments. Material wet to 38 feet, then dry.	
				39 to 50 feet - Red brown weathered sandstone with siltstone beds. Water at 39 to 40 feet.	
				50 to 55 feet - Red brown siltstone, dry.	
				55 to 58 feet - Loss of drill cuttings.	
				58 to 90 feet - Red brown fine grained sandstone and siltstone beds. At 86 feet, increased water from borehole.	Chemical odor at 86 feet. Borehole screen
				90 to 103 feet - As above with alternating siltstone beds.	PID - 320 ppm Ambient air screen
				103 to 120 feet - Red brown sandstone.	PID - 16 to 25 ppm
				120 feet - End of boring.	

BORING / WELL LOG

CLIENT: Sequa
PROJECT NAME: Former Chromalloy Facility
PROJECT NUMBER: 1166
LOCATION: 169 Western Highway West Nyack, New York
DATE: 5-1-98

BORING NUMBER: MW-12A
BEDROCK DEPTH: Not Encountered
BORING DEPTH: 30 feet
BORING DIAMETER: 6-inch
TOC ELEVATION: 63.61 feet MSL
NO. OF SAMPLES: Four Collected

DRILLER: Samuel Sthotoff Company
DRILL RIG: ReichDrill 650
DRILL METHOD: Air Rotary
DATE(S) DRILLED: 4-28-98
LOGGED BY: AJA
FIRST WATER DEPTH: 13 feet

ANNULUS COMPLETION: 2-inch diameter schedule 40 PVC well set at 30 feet below grade. Screen (0.01slot) set from 30 to 10 feet. Casing set from 10 to 0.5 feet. Annulus completed with #2 sand - 30 to 8 feet, bentonite -8 to 6 feet, and cement - 6 to 1 foot below grade. Set flush-mount manhole in cement.

**********SAMPLES********** Note: Spoon sample sub-intervals within lithology description measured from top of recovered sample.

Spoon Interval	Recovery	Blow Count	Time	Lithological Description	Comments
				0 - 1 ' Topsoil, grass, roots, gravel, and wood chips.	
				1-11' Grey brown sand, silt, and clay mixed with wood, concrete, and gravel (fill).	
11-13'	NR	NA	13:30	11-13' spoon- No recovery, advance hammer to 13'. Material is as above.	No Screen
13-15'	15"	NA	13:30	13-15' spoon - Red brown fine to coarse sand with rounded gravel, wet to saturated.	PID Screen 13-15' Soil-0.0 ppm
18-20'	11"	NA	13:40	18-20' spoon - As above with some cemented sand (conglomerate).	PID Screen 18-20' Soil-0.0 ppm
22-24'	13"	NA	14:29	22-24' spoon - 13" to 6.5" as above. 6.5 to 0" Red brown clay with sand and cobble fragments.	PID Screen 22-24' Soil-0.0 ppm
				24-30' As above.	
				30' - End of boring.	

BORING / WELL LOG

CLIENT: Sequa
PROJECT NAME: Former Chromalloy Facility
PROJECT NUMBER: 1166
LOCATION: 169 Western Highway West Nyack, New York
DATE: 5-1-98

BORING NUMBER: MW-12B
BEDROCK DEPTH: 32 feet
BORING DEPTH: 120 feet
BORING DIAMETER: 10-inch/6-inch
TOC ELEVATION: 63.51 feet MSL
NO. OF SAMPLES: None Collected

DRILLER: Samuel Sthotoff Company
DRILL RIG: ReichDrill 650
DRILL METHOD: Air Rotary
DATE(S) DRILLED: 4-27 & 4-28-98
LOGGED BY: AJA
FIRST WATER DEPTH: Deep - 40 feet

ANNULUS COMPLETION: 6-inch diameter schedule 40 steel casing was set at 40 feet below grade.
The annulus seal : Bentonite - 40 to 38 feet. Cement/bentonite grout - 38 to 1 foot below grade.
Set flush-mount manhole in cement.

**********SAMPLES********** Note. Spoon sample sub-intervals within lithology description measured from top of recovered sample.

Spoon Interval	Recovery	Blow Count	Time	Lithological Description	Comments
				0 to 0.5 feet - Topsoil, grass, & roots.	
				0.5 to 4 feet - Brown sand, silt, & clay mixed with wood chips and concrete (fill).	
				4 to 8 feet- As above with more concrete(fill)	
				8 to 11 feet- Peat moss and swamp material	11 feet - Borehole PID - 0.0 ppm units
				11 to 20 feet- Red brown, coarse , sand and gravel, wet (1 inch diameter and greater)	
				20 to 32 feet- Red brown, clayey fine to medium sand.	
				32 to 34 feet- Red brown to grey weathered sandstone.	32 feet - Borehole PID - 0.0 ppm units
				34 to 38 feet- Red brown to grey (alternating) sandstone, more competent, dust from borehole.	
				38 to 40 feet- As above, reduction of dust from borehole, possible water bearing zone.	
				set casing at 40 feet (see annulus completion details).	
				40 to 65 feet- Red brown sandstone with occasional grey sandstone beds.	
				65 to 77 feet- Red brown siltstone.	
				77 to 82 feet- Red brown sandstone, large grained (arkosic). More water from borehole-77 to 78 feet.	78 feet - Borehole PID - 12 to 19 ppm
				82 to 96 feet- Red brown siltstone, micaceous	
				96 to 104 feet- Red brown sandstone, crystalline, mica and quartz.	
				104 to 120 feet - Red brown siltstone with shale interbeds. Water noted at 105 feet.	

BORING / WELL LOG

CLIENT: Sequa
PROJECT NAME: Former Chromalloy Facility
PROJECT NUMBER: 1166
LOCATION: 169 Western Highway West Nyack, New York
DATE: 5-1-98

BORING NUMBER: MW-13A
BEDROCK DEPTH: Not Encountered
BORING DEPTH: 23 feet
BORING DIAMETER: 6-inch
TOC ELEVATION: 88.88 feet MSL
NO. OF SAMPLES: Four Collected

DRILLER: Samuel Sthotoff Company
DRILL RIG: ReichDrill 650
DRILL METHOD: Air Rotary
DATE(S) DRILLED: 4-30-98
LOGGED BY: AJA
FIRST WATER DEPTH: 12 feet

ANNULUS COMPLETION: 2-inch diameter schedule 40 PVC well set at 23 feet below grade. Screen (0.01slot) set from 23 to 5 feet. Casing set from 5 to 0.5 feet. Annulus completed with #2 sand - 23 to 3 feet, bentonite - 3 to 1.5 feet, and cement - 1.5 to 0.5 feet below grade. Set flush-mount manhole in cement.

**********SAMPLES********** Note: Spoon sample sub-intervals within lithology description measured from top of recovered sample.

Spoon Interval	Recovery	Blow Count	Time	Lithological Description	Comments
				0 - 0.25' Asphalt.	
				0.25-8' Brown to dark brown silty sand and gravel mixed with construction debris (fill). Petroleum odor at 3.5'.	
5-7'	NR	NA	9:30	5-7' spoon- No recovery, advance hammer to 8'. Material is as above.	No Screen
8-10'	NR	NA	9:40	8-10' spoon- No recovery, advance hammer to 12'. Material is as above.	No Screen
12-14'	9"	NA	9:50	12-14' spoon - Red brown large gravel with sand and some clay, wet.	PID Screen 12-14' Soil-8.1 ppm
				14-18' As above. Hard drilling and advancing casing through gravel	
18-20'	9"	NA	11:00	18-20' spoon - As above with sand, silt, and clay fines.	PID Screen 18-20' Soil-5.6 ppm
22-24'	13"	NA	11:50	22-24' spoon - Red brown sandy clay, firm, hard, and compact, Spoon refusal at 23'.	PID Screen 22-24' Soil-0.8 ppm
				23' - End of boring.	

BORING / WELL LOG

CLIENT: Sequa
PROJECT NAME: Former Cbramalloy Facility
PROJECT NUMBER: 1166
LOCATION: 169 Western Highway West Nyack, New York
DATE: 5-1-98

BORING NUMBER: MW-13B
BEDROCK DEPTH: 25 feet
BORING DEPTH: 80 feet
BORING DIAMETER: 10-inch/6-inch
TOC ELEVATION: 88.95 feet MSL
NO. OF SAMPLES: None Collected

DRILLER: Samuel Sthotoff Company
DRILL RIG: ReichDrill 650
DRILL METHOD: Air Rotary
DATE(S) DRILLED: 4-29 & 4-30-98
LOGGED BY: AJA
FIRST WATER DEPTH: Deep - 37 feet

ANNULUS COMPLETION: 6-inch diameter schedule 40 steel casing was set at 30 feet below grade. The annulus seal : Bentonite - 30 to 28 feet. Cement/bentonite grout - 28 to 1 foot below grade. Set flush-mount manhole in cement. Redrilled open borehole to 80 feet. Set 2-inch schedule 40 PVC screen (0.02 slot) from 74 to 39 feet and PVC casing from 39 feet to 3-inches below grade. The annulus seal: #2 sand - 74 to 35 feet. Bentonite - 35 to 31 feet. Cement grout - 31 to 1 foot below grade.

**********SAMPLES********** Note: Spoon sample sub-intervals within lithology description measured from top of recovered sample.

Spoon Interval	Recovery	Blow Count	Time	Lithological Description	Comments
				0 to 25 feet- Asphalt	
				0.25 to 3 feet- Rock, boulders, gravel.	3 feet borehole
				Note: fuel/oil diesel odor.	PID 0.3-1.5
				3 to 8 feet- Red brown silty sand.	ppm units
				with fuel/oil diesel odor (fill?).	
				8 to 23 feet- Red brown coarse silty sand	8 feet borehole
				with gravel, wet at 15 feet.	PID 0 9
				Gravel larger than 1 inch, fuel/oil diesel odor	ppm units
				23 to 25 feet- Grey to red brown	16 feet borehole
				weatered sandstone fragments with above.	PID 1.1
				25 to 30 feet- Red brown sandstone.	ppm units
				Set 6 inch diameter casing at 30 feet.	
				30 to 37 feet- Red brown sandstone.	
				37 to 48 feet- Red brown/grey sandstone and	37 feet borehole
				siltstone (fine grained)	PID 0.0 ppm units
				Reduction of dust at 37 feet, water bearing zone	
				48 to 50 feet- Loss of drill cuttings (cave-in?).	45 feet borehole
				Drillers add water to bring up cuttings.	PID 0.0 ppm units
				50 to 63 feet- Red brown sandstone.	
				63 to 68 feet- Red brown siltstone.	
				68 to 80 feet- Red brown sandstone with more	
				water from borehole noted at 68 and 74 feet	74 feet borehole
				80 feet- End of boring.	PID 0 0 ppm units

Log of Boring: MW-14A

Date: 01/26/01
Date(s) Drilled: 12/18/00-12/19/00
Boring Depth: 30'
Boring Diameter: 8"
First Water Depth: 11'
Bedrock Depth: 29'
Elevation: NA
Number of Samples: Continuous
Logged By: AJA

Client: Sequa Corporation
Project Name: Former Chromalloy Facility
Project Number: 1166
Location: West Nyack, NY

Driller: Samuel Stothoff Co., Inc.
Drill Rig: Acker
Drill Method: HSA
Sampling Method: Split-spoon

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
							Ground Surface			
0							0'-0.1' Asphalt.			
							0.1'-1' Black gravel w/silty sand mixed with metals and steel rods (fill).			Set MW-14A at 30.0'. (2" Sch. 40 PVC). Casing 0.3'-20'. Screen (0.01" slot) 20'-30'. Cement 1'-3'. Bentonite 3'-15.5'. #00 sand 15.5'-17.5'. #1 sand 17.5'-30'.
2	1	1-3	14"	2-4-8-8	1638	0.0				
4	2	3-5	18.5"	10-10-8-11	1642	0.0	1'-8.5' Red brown fine to medium sandy clay, some rock fragments/gravel, some silt lenses.			
6	3	5-7	16"	5-6-8-8	0735	0.0				
8	4	7-9	23"	5-10-9-14	0745	0.2	8.5'-9' Red brown clayey sand, some silt, rock fragments.			
10	5	9-11	12"	18-19-21-14	0758	0.0	9'-14.5' Red brown gravel with fine sandy silt and clay, wet to saturated, petroleum odor (similar to creosote).			
12	6	11-13	11"	9-10-16-17	0810	6.1				
14	7	13-15	13.5"	9-7-5-5	0818	6.3				
16	8	15-17	14"	4-11-13-21	0830	148	14.5'-21' Red brown silt and clay, some sand and gravel lenses with depth, firm, dry.			
18	9	17-19	12"	21-21-23-22	0845	123				
20	10	19-21	15"	8-15-22-30	0925	76.1				

Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808

Filename: 1166/MW-14A

Log of Boring: MW-14A
Date: 01/26/01
Date(s) Drilled: 12/18/00-12/19/00
Boring Depth: 30'
Boring Diameter: 8"
First Water Depth: 11'
Bedrock Depth: 29'
Elevation: NA
Number of Samples: Continuous
Logged By: AJA

Client: Sequa Corporation
Project Name: Former Chromalloy Facility
Project Number: 1166
Location: West Nyack, NY

Driller: Samuel Stothoff Co., Inc.
Drill Rig: Acker
Drill Method: HSA
Sampling Method: Split-spoon

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
	11	21-23	15"	14-24-26-26	1015	198	21'-29' Red brown to gray sand and sandstone fragments mixed with some silt, clayey lenses.			
23	12	23-25	16"	18-36-21-22	1025	32.7				
25	13	25-27	14"	10-26-26-25	1045	37.9				
27	14	27-29	17"	27-21-30-35	1200	0.3				
29	15	29-30	15"	38-59-75\1"	1225	10.1	29'-30' Weathered bedrock.			
							End of Boring			
31										
33										
35										
37										
39										
41										

Log of Boring: MW-14B
Date: 01/26/01
Date(s) Drilled: 12/20/00 & 12/21/00
Boring Depth: 62'
Boring Diameter: 10"/6"
First Water Depth: 11'/35'
Bedrock Depth: 28'
Elevation: NA
Number of Samples: None collected
Logged By: AJA

Client: Sequa Corporation
Project Name: Former Chromalloy Facility
Project Number: 1166
Location: West Nyack, NY

Driller: Samuel Stothoff Co., Inc.
Drill Rig: T4W Ingersol-Rand
Drill Method: Air rotary hammer
Sampling Method: None

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
							Ground Surface			
0							0'-0.1' Asphalt.			Note: borehole caves in to 20'. Note: drive temporary steel casing (10" diam.) to 20', remove as grout permanent casing. Note: set permanent steel casing (6" diam.) to 41', cement/bentonite grout annulus via tremie pipe.
							0.1'-1' Black gravel, silt, sand and clay with metal chunks (fill).			
							1'-15' Red brown fine to medium sand mixed with clay and gravel, some silt, rock fragments, damp to saturated.			
							15'-21' Red brown silt and clay, some sand and gravel lenses, firm, dry.			
							21'-28' Red brown fine to coarse sand mixed with sandstone fragments, some silt/clay lenses.			
							28'-30' Red brown weathered bedrock, sandstone.			
							30'-35' Red brown sandstone, competent, with a fracture at 32'.			
							35'-38' Red brown sandstone, soft.			
							38'-41' As above, firm.			
							41'-62' Red brown sandstone with significant fractures at 44', 53' and 61'. Fracture zone at 53' produces large amounts of water (>50 gpm).			
62							End of Boring			

Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808

Filename: 1166/MW-14B

Log of Boring: MW-15A
Date: 01/26/01
Date(s) Drilled: 12/18/00
Boring Depth: 35'
Boring Diameter: 8"
First Water Depth: 28'
Bedrock Depth: None encountered
Elevation: NA
Number of Samples: 7
Logged By: AJA

Client: Sequa Corporation
Project Name: Former Chromalloy Facility
Project Number: 1166
Location: West Nyack, NY

Driller: Samuel Stothoff Co., Inc.
Drill Rig: Acker
Drill Method: HSA
Sampling Method: Split-spoon

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
							Ground Surface			
0							0'-10' Red brown silty clay with some rock fragments, damp to moist.			Set MW-15A at 34.5'. (2" Sch. 40 PVC). Casing 0.3'-9.5'. Screen (0.01" slot) 9.5'-34.5'. Cement 1'-3.5'. Bentonite 3.5'-5.5'. #00 sand 5.5'-7.5'. #2 sand 5'-34.5'.
6	1	5-7	1.5'	3-4-7-8	0923	0.0				
10	2	10-12	1'	17-9-9-11	0945	0.0	10'-15' Red brown coarse sand with gravel and silty clay interbedding, dry.			
16	3	15-17	1.75'	26-18-15-30	1005	0.0	15'-25' Red brown fine sand and silt, some clay, rock fragments (lodgement till), very hard, dry to damp.			
18	4	17-19	1'	26-68-75\3"	1020	0.0				
20										

Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808

Filename: 1166/MW-15A

Log of Boring: MW-15A
Date: 01/26/01
Date(s) Drilled: 12/18/00
Boring Depth: 35'
Boring Diameter: 8"
First Water Depth: 28'
Bedrock Depth: None encountered
Elevation: NA
Number of Samples: 7
Logged By: AJA

Client: Sequa Corporation
Project Name: Former Chromalloy Facility
Project Number: 1166
Location: West Nyack, NY

Driller: Samuel Stothoff Co., Inc.
Drill Rig: Acker
Drill Method: HSA
Sampling Method: Split-spoon

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
20–22	5	20-22	1.75'	17-25-22-35	1055	0.0	15'-25' Red brown fine sand and silt, some clay, rock fragments (lodgement fill), very hard, dry to damp.			
25–27	6	25-27	1.2'	15-42-75\4"	1130	0.0	25'-30' Red brown silt and rock fragments, hard, damp to wet.			
30–32	7	30-32	1.6'	28-43-51-61	1310	2000	30'-35' Red brown quartz sand mixed with rock fragments, wet. Grades to weathered bedrock with depth.			
35							End of Boring			

Depth scale: 22, 24, 26, 28, 30, 32, 34, 36, 38, 40

Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808

Filename: 1166/MW-15A

Log of Boring: MW-15B
Date: 01/26/01
Date(s) Drilled: 10/26,11/11,11/12,12/18,12/19/00
Boring Depth: 300'
Boring Diameter: 14"/10"
First Water Depth: 28'/60'
Bedrock Depth: 40'
Elevation: NA
Number of Samples: None collected
Logged By: AJA

Client: Sequa Corporation
Project Name: Former Chromalloy Facility
Project Number: 1166
Location: West Nyack, NY

Driller: Samuel Stothoff Co., Inc.
Drill Rig: Ingersoll-Rand T4W
Drill Method: Wet rotary air hammer
Sampling Method: None

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
0							Ground Surface			
							0'-0.25' Grass, roots and topsoil.			
2–8							0.25'-8' Red brown medium to coarse sand and gravel, some silty clay, damp.			Note: borehole cave-in at 38'. Drive temporary steel casing (14" diam.) to 40'.
8–16							8'-16' Red brown silty clay, some fine to coarse sand, moist.			
16–26							16'-27' Red brown silty fine sand, rock fragments, firm, dry.			Set permanent steel casing (10" diam.) to 59', cement/ bentonite grout annulus via tremie pipe.
28–32							27'-33' Red brown coarse sand and gravel, interbedded silt/clay, moist to wet, hard.			
34–36							33'-36' As above, less silt and clay, wet, softer.			Note: open borehole obstructed by cave-in at various depths. Drive 8" diam. steel casing and slotted casing to 168' to keep borehole open.
38–40							36'-40' Dark red brown weathered rock, some large gravel and coarse sand, wet, very hard.			
42–48							40'-50' Red brown weathered bedrock, sandy.			
50–58							50'-59' Red brown sandstone, soft to firm.			Slotted casing is at 84'-126' and 147'-168'. 8" casing is welded at top of 10" casing.
60–62							59'-63' Red brown fine sandstone and large fracture zone.			
64–70							63'-70' As above, some fracturing, coarse grained.			
70–76							70'-75' Interbedded sandstone/shale.			

Log of Boring: MW-15B
Date: 01/26/01
Date(s) Drilled: 10/26,11/11,11/12,12/18,12/19/00
Boring Depth: 300'
Boring Diameter: 14"/10"
First Water Depth: 28'/60'
Bedrock Depth: 40'
Elevation: NA
Number of Samples: None collected
Logged By: AJA

Client: Sequa Corporation
Project Name: Former Chromalloy Facility
Project Number: 1166
Location: West Nyack, NY

Driller: Samuel Stothoff Co., Inc.
Drill Rig: Ingersoll-Rand T4W
Drill Method: Wet rotary air hammer
Sampling Method: None

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
77, 79							75'-81' As above, sandstone medium to coarse grained.			
81, 83							81'-84' As above, harder.			
85, 87, 89							84'-90' As above, softer.			
91							90'-93' Red brown sandstone.			
93, 95, 97, 99, 101							93'-102' As above, fracture zone.			
103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125							102'-127' Red brown sandstone.			
127, 129, 131							127'-133' As above, fracture zone.			
133, 135, 137, 139, 141, 143, 145							133'-146' Red brown sandstone, soft.			
147							146'-148' As above, fracture zone.			
149, 151										

Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808

Filename: 1166/MW-15B

Log of Boring: MW-15B
Date: 01/26/01
Date(s) Drilled: 10/26,11/11,11/12,12/18,12/19/00
Boring Depth: 300'
Boring Diameter: 14"/10"
First Water Depth: 28'/60'
Bedrock Depth: 40'
Elevation: NA
Number of Samples: None collected
Logged By: AJA

Client: Sequa Corporation
Project Name: Former Chromalloy Facility
Project Number: 1166
Location: West Nyack, NY

Driller: Samuel Stothoff Co., Inc.
Drill Rig: Ingersoll-Rand T4W
Drill Method: Wet rotary air hammer
Sampling Method: None

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
153–169							148'-170' Red brown sandstone.			
171–177							170'-179' As above, fracture zone.			
179–189							179'-190' Red brown sandstone.			
191–227							190'-235' Gray sandstone with siltstone interbeds.			

Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808

Log of Boring: MW-15B
Date: 01/26/01
Date(s) Drilled: 10/26,11/11,11/12,12/18,12/19/00
Boring Depth: 300'
Boring Diameter: 14"/10"
First Water Depth: 28'/60'
Bedrock Depth: 40'
Elevation: NA
Number of Samples: None collected
Logged By: AJA

Client: Sequa Corporation
Project Name: Former Chromalloy Facility
Project Number: 1166
Location: West Nyack, NY

Driller: Samuel Stothoff Co., Inc.
Drill Rig: Ingersoll-Rand T4W
Drill Method: Wet rotary air hammer
Sampling Method: None

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
228–235										
235–240							235'-240' As above, fracture zone.			
240–290							240'-290' Gray sandstone, some shale/siltstone interbeds.			
290–300							290'-300' Gray shale/siltstone.			
300							End of Boring			

Depth scale: 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282, 284, 286, 288, 290, 292, 294, 296, 298, 300, 302

Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808

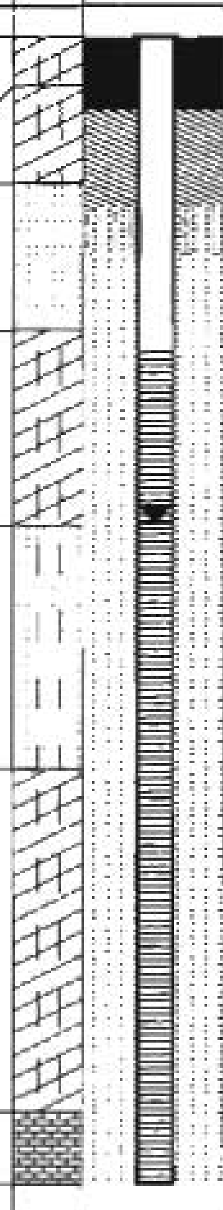
Filename: 1166/MW-15B

Log of Boring: MW-16A
Date: 01/26/01
Date(s) Drilled: 09/07/00
Boring Depth: 23.5'
Boring Diameter: 8"
First Water Depth: 10'
Bedrock Depth: 22'
Elevation: NA
Number of Samples: 8
Logged By: AJA

Client: Sequa Corporation
Project Name: Former Caromalloy Facility
Project Number: 1166
Location: West Nyack, NY

Driller: Talon Drilling
Drill Rig: Canterra CT-250
Drill Method: HSA
Sampling Method: Split-spoon
Page: 1 of 1

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Comments
0							Ground Surface	
0–1							0'-1' Red brown clayey silt mixed with railroad balast, moist	Set MW-16A at 23.5'. (2" Sch. 40 PVC) Casing 0.5'-6.5' Screen (0.01" slot) 6.5'-23.5' Cement 1'-1.5' Bentonite 1.5'-3.5' #00 sand 3.5'-4.5' #1 sand 5'-23.5'
2						0.0	1'-3' Red brown clayey silt, trace fine sand, moist	
4						0.0	3'-6' Tan/brown coarse sand, some gravel, moist to wet	
6	1	5-7	14"	11-8-9-11	0745	0.0		
8							6'-10' Red brown silty clay with coarse sand and gravel, wet, lenticular clay layers	
10	2	10-12	5"	50\5"	0757	0.0		
12							10'-15' Red brown silty coarse sand with rock fragments, damp. (large rock fragments)	
14	3	14-16	13"	62-23-32-28	0823	1.5		
16	4	16-18	9"	56-50\3"	0829	8.7	15'-22' Red brown silty clay with trace fine sand, some gravel, weathered rock fragments, moist	
18	5	18-20	16"	28 50-50\5"	0903	9.3		
20	6	20-22	12"	47 58-50\1"	0930	6.1		
22	7	22-23.5	3"	50\1"	0959	6.6	22'-23.5' Red brown weathered bedrock, dry	
	8	23.5-23.6	3"	100\2"	1020	2.1		
24							End of Boring	



Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808

Filename 1166/MW-16A

Log of Boring: MW-16B
Date: 01/26/01
Date(s) Drilled: 10/27/00-10/30/00 & 11/13/00
Boring Depth: 163'
Boring Diameter: 10"/6"
First Water Depth: 11'/35'-40'
Bedrock Depth: 21'
Elevation: NA
Number of Samples: None collected
Logged By: AJA

Client: Sequa Corporation
Project Name: Former Chromalloy Facility
Project Number: 1166
Location: West Nyack, NY

Driller: Samuel Stothoff Co., Inc.
Drill Rig: T4W Ingersol-Rand
Drill Method: Wet rotary/air rotary hammer
Sampling Method: None

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
							Ground Surface			
0-0.3						0.0	0'-0.3' Grass, topsoil and roots, some railroad ballast.			Note: Drive temporary steel casing (10" diam.) to 28', remove as grout permanent casing.
0.3-5						0.0	0.3'-5' Tan silty sand, some gravel/railroad ballast.			
5-11						0.0	5'-11' Red brown silty clay with some fine to medium sand, gravel, moist to wet.			Note: Set permanent steel casing (6" diam.) to 33', cement/bentonite grout annulus via tremie pipe.
11-21							11'-21' Red brown silty sand, some gravel/rock fragments, damp to dry.			
21-28							21'-28' Red brown weathered sandstone, firm, hard, dry to more competent bedrock.			
28-33							28'-33' Red brown shale.			
33-49							33'-49' Red brown shale, damp to wet.			
49-57							49'-57' Red brown sandstone.			
57-73							57'-73' Red brown shale.			
73-79							73'-79' Red brown sandstone.			
79-90							79'-90' Red brown shale.			

Log of Boring: MW-16B
Date: 01/26/01
Date(s) Drilled: 10/27/00-10/30/00 & 11/13/00
Boring Depth: 163'
Boring Diameter: 10"/6"
First Water Depth: 11'/35'-40'
Bedrock Depth: 21'
Elevation: NA
Number of Samples: None collected
Logged By: AJA

Client: Sequa Corporation
Project Name: Former Chromalloy Facility
Project Number: 1166
Location: West Nyack, NY

Driller: Samuel Stothoff Co., Inc.
Drill Rig: T4W Ingersol-Rand
Drill Method: Wet rotary/air rotary hammer
Sampling Method: None
Page: 2 of 2

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
90-110							90'-110' Gray sandstone.			
110-150							110'-150' Gray shale/siltstone, soft, dry.			
150-163							150'-163' Gray sandstone, fractured zone, producing water (>5 gpm).			
							End of Boring			

Depth scale: 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180

Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808

Filename: 1166/MW-16B

Log of Boring: MW-17A
Date: 01/26/01
Date(s) Drilled: 09/07/00
Boring Depth: 36'
Boring Diameter: 10"
First Water Depth: 26'
Bedrock Depth: 36'
Elevation: NA
Number of Samples: 11
Logged By: AJA

Client: Sequa Corporation
Project Name: Former Chromalloy Facility
Project Number: 1166
Location: West Nyack, NY

Driller: Talon Drilling
Drill Rig: Canterra CT-250
Drill Method: HSA
Sampling Method: Split-spoon (except 3'-4')

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
0							Ground Surface			
0–2							0'-2' Road gravel with red brown silt, clay and some sand, dry.			Set MW-17A at 36' with 2" Sch. 40 PVC. Casing 0.3'-9'. Screen (0.01" slot) 9'-36'. Cement 1'-5'. Bentonite 5'-7'. #1 sand 7'-36'.
2							2'-2.5' Large cobble, drilled through.			
3–4	1	3-4	NA	NA	1452	15.2	2.5'-4.5' Dark brown silty clay with small gravel, moist. Note petroleum odor.			
4							4.5'-5.5' Large boulder, drilled through.			
6										3'-4' soil sample submitted from auger cuttings for lab analysis.
10–12	2	10-12	17"	5-9-14-11	1514	0.0	5.5'-15' Red brown silty clay, some medium to fine sand and small gravel, damp to moist.			
15–17	3	15-17	16"	18-21-29-36	1535	0.0	15'-20' Red brown silt, some clayey to clay zones, weathered rock fragments, damp to dry.			
20										

Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808

Filename: 1166/MW-17A

Log of Boring: MW-17A
Date: 01/26/01
Date(s) Drilled: 09/07/00
Boring Depth: 36'
Boring Diameter: 10"
First Water Depth: 26'
Bedrock Depth: 36'
Elevation: NA
Number of Samples: 11
Logged By: AJA

Client: Sequa Corporation
Project Name: Former Chromalloy Facility
Project Number: 1166
Location: West Nyack, NY

Driller: Talon Drilling
Drill Rig: Canterra CT-250
Drill Method: HSA
Sampling Method: Split-spoon (except 3'-4')

Depth (feet bgs)	Sample Number	Sample Interval	Recovery	Blow Counts	Time	PID Units	Lithological Description	Symbol	Well/Point Construction	Comments
	4	20-22	14"	9-54-50\2"	1557	0.0	20'-24' Red brown silty clay, trace fine sand, mixed in weathered rock fragments (sandstone), dry.			
22	5	22-24	19"	20-16-41-50\4"	1622	0.0				
24	6	24-26	5"	50\5"	1638	0.0	24'-28' Red brown silty fine to medium sand, some clay and large rock fragments (1" diam.), dry to damp, saturated at 26'.			24'-26' soil sample submitted for lab analysis.
26	7	26-28	5"	75\5"	1656	0.0				
28	8	28-30	2"	75\2"	1719	0.0	28'-35.5' Red brown coarse sand with weathered sandstone fragments and gravel, mixed with silty clay interbedded lenses.			
30	9	30-32	12"	28-46-31-29	1730	0.0				
32										
34	10	33-35	7"	45-50\1"	1751	0.0				
	11	35-36	10"	33-50\4"	1818	0.0	35.5'-36' Red brown sandstone, weathered.			
36							End of Boring			
38										
40										

Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19808

Filename: 1166/MW-17A

Log of Boring: OIW-1

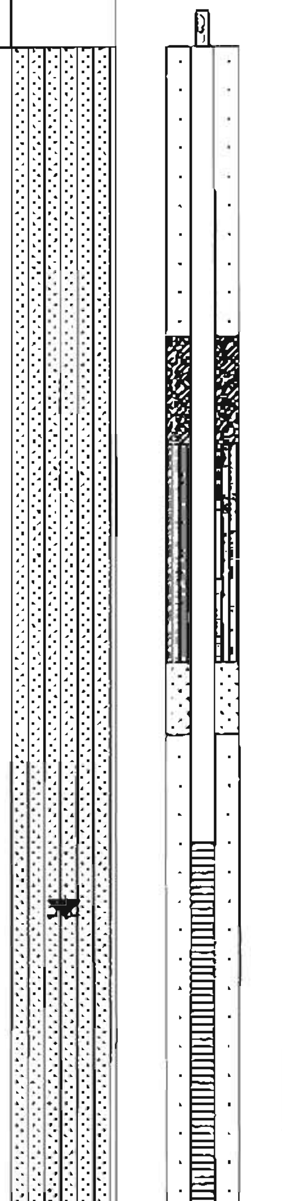
Date Started:	01/08/08	**Project Code:**	1166
Date Completed:	01/08/08	**Project Name:**	Sequa - Nyack
Total Depth (ft):	32.00	**Drilled By:**	Talon Drilling
Boring Diameter (in):	6	**Logged By:**	Greg Cherbonneau
Bedrock Depth (ft):	32	**Drill Rig:**	Air Rotary
Elevation (ft-msl):	N/A	**Drill Method:**	N/A
Remark:		**Sampling Method:**	N/A

Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description	Interpreted Lithology	Well Construction	Comments
0						SM: Brown gravelly, clayey, silt and sand, moist.			0-27'- 2" PVC riser, 21-32'-2" PVC screen
	N/A		N/A		0.0				0-4' sand
-5	N/A		N/A		0.0	ML: Red brown gravel and silt mix, moist.			4-16.5'-grout 18.5-24.5'- bentonite 24.5-25.5'- #00 sand 25.5-32'- #2 sand
-10	N/A		N/A		0.0				
-15	N/A		N/A		0.0	ML: Red brown silt and weathered sandstone fragments, till. Moist to 18'. Dry drilling from 18'.			
	N/A		N/A		0.0				
-20						ML: As above- lodgement till.			
-25	N/A		N/A		0.0				tan color @26'
	N/A		N/A		0.0				
-30									Weathered sandstone 31-32'
	N/A		N/A		0.0				competent rock @32' sandstone

Log of Boring: OIW-2

Date Started:	01/08/08	**Project Code:**	1166
Date Completed:	01/08/08	**Project Name:**	Sequa - Nyack
Total Depth (ft):	16.00	**Drilled By:**	Talon Drilling
Boring Diameter (in):	6	**Logged By:**	Greg Cherbonneau
Bedrock Depth (ft):	N/A	**Drill Rig:**	Air Rotary
Elevation (ft-msl):	N/A	**Drill Method:**	N/A
Remark:		**Sampling Method:**	N/A

Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description	Interpreted Lithology	Well Construction	Comments
0	N/A		N/A		0.0	SM: Brown gravel, sand, silt and clay mix.			0-11'-2" PVC riser
									11-16' PVC screen
									0-4'- sand
									4-5.5'-grout
	N/A		N/A		0.0				-5.5-8.5'-bentonite
-5									-8.5-9.5'-#00 sand
									-9.5-16'-#2 sand
	N/A		N/A		0.0				
-10									
	N/A		N/A		0.0				
-15	N/A		N/A		0.0				

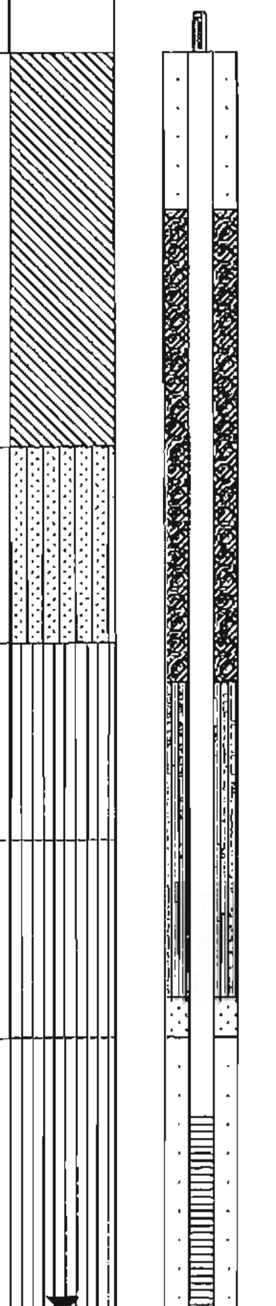


Log of Boring: OIW-3

Date Started:	01/08/08	**Project Code:**	1166
Date Completed:	01/08/08	**Project Name:**	Sequa - Nyack
Total Depth (ft):	32.00	**Drilled By:**	Talon Drilling
Boring Diameter (in):	6	**Logged By:**	Greg Cherbonneau
Bedrock Depth (ft):	32	**Drill Rig:**	Air Rotary
Elevation (ft-msl):	N/A	**Drill Method:**	N/A
Remark:		**Sampling Method:**	N/A

Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description	Comments
0	N/A		N/A		0.0	SC: Brown gravel, sand, silt, clay mix, moist.	0-27'-2" PVC riser 27-32'-2" PVC screen 0-4'-sand 4-16'-grout 16-24'-bentonite 24-25'-#00sand 25-32'-#2 sand
-5	N/A		N/A		0.0		
	N/A		N/A		0.0		
-10	N/A		N/A		0.0	SM: Brown gravelly sand and silt, very moist.	
-15	N/A		N/A		0.0	ML: Red brown silt and fine sand, dry drilling to 32'.	
-20	N/A		N/A		0.0	ML: As above.	
-25	N/A		N/A		0.0	ML: Grades to tan color @25', mixed with red brown.	
	N/A		N/A		0.0		
-30							sandstone, red brown

Interpreted Lithology / Well Construction



Log of Boring: OIW-4

Date Started:	01/08/08	**Project Code:**	1166
Date Completed:	01/08/08	**Project Name:**	Sequa - Nyack
Total Depth (ft):	15.00	**Drilled By:**	Talon Drilling
Boring Diameter (in):	6	**Logged By:**	Greg Cherbonneau
Bedrock Depth (ft):	N/A	**Drill Rig:**	Air Rotary
Elevation (ft-msl):	N/A	**Drill Method:**	N/A
Remark:		**Sampling Method:**	N/A

Depth	Sample Number	Sample Interval	Recovery (inches)	Blow Counts	PID	Lithological Description	Interpreted Lithology	Well Construction	Comments
0	N/A		N/A		0.0	SC: Brown gravel sand silt and clay mix.			0-10'-2" PVC riser
									10-15'-2" PVC screen
									0-4'-sand
									4-6'-grout
	N/A		N/A		0.0				6-8'-bentonite
-5									8-9'-#00 sand
									9-15'-#2 sand
	N/A		N/A		0.0				
-10									
	N/A		N/A		0.0				
						SC: Grades to red brown @ 13'			
	N/A		N/A		0.0				
-15									

Log of Boring: OIW-5

Date Started: 01/08/08
Date Completed: 01/08/08
Total Depth (ft): 33.00
Boring Diameter (in): 6
Bedrock Depth (ft): 32
Elevation (ft-msl): N/A
Remark:

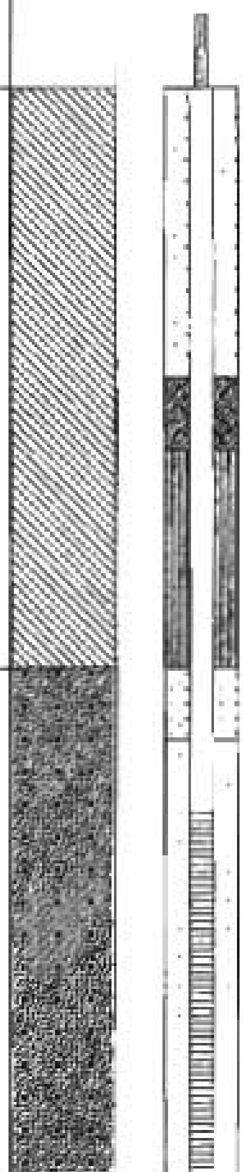
Project Code: 1166
Project Name: Sequa - Nyack
Drilled By: Talon Drilling
Logged By: Greg Cherbonneau
Drill Rig: Air Rotary
Drill Method: N/A
Sampling Method: N/A

Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description	Interpreted Lithology	Well Construction	Comments
0	N/A		N/A		0.0	SC: Brown gravel, sand, silt, clay mix, moist.			0-28'-2" PVC riser 28-33'-2"PVC screen 0-4'- sand 4-20'-grout 20-26'-bentonite 26-27'-#00 sand 27-33'- #2 sand
	N/A		N/A		0.0				
	N/A		N/A		0.0				
-10	N/A		N/A		0.0	SM: Brown gravelly sand and silt, very moist.			
-15	N/A		N/A		0.0	ML: Red brown silt and fine sand, dry drilling to 32'.			
-20	N/A		N/A		0.0	ML: As above.			
-25	N/A		N/A		0.0	ML: Grades to tan color @25'.			
	N/A		N/A		0.0				
-30									Wet, sandstone, red brown

Log of Boring: OIW-6

Date Started:	01/09/08	**Project Code:**	1166
Date Completed:	01/09/08	**Project Name:**	Sequa - Nyack
Total Depth (ft):	15.00	**Drilled By:**	Talon Drilling
Boring Diameter (in):	6	**Logged By:**	Greg Cherbonneau
Bedrock Depth (ft):	N/A	**Drill Rig:**	Air Rotary
Elevation (ft-msl):	N/A	**Drill Method:**	N/A
Remark:		**Sampling Method:**	N/A

Depth	Sample Number	Sample Interval	Recovery (inches)	Blow Counts	PID	Lithological Description	Interpreted Lithology	Well Construction	Comments
0	N/A		N/A		0.0	SC: Dark brown clay sand and silt, very moist, trace gravel.			0-10'-2" PVC riser 10-15'-2"PVC screen 0-4'-sand 4-5'-grout 5-8'-bentonite 8-9'-#00 sand 9-15'-#2 sand
-5	N/A		N/A		0.0				
	N/A		N/A		0.0	GC: As above with more gravel			
-10									
	N/A		N/A		0.0				
	N/A		N/A		0.0				compact hard layer @ 15', till red brown fine sand and silt
-15									



Log of Boring: OIW-7

Date Started:	01/09/08
Date Completed:	01/09/08
Total Depth (ft):	25.00
Boring Diameter (in):	6
Bedrock Depth (ft):	25
Elevation (ft-msl):	N/A
Remark:	

Project Code:	1166
Project Name:	Sequa - Nyack
Drilled By:	Talon Drilling
Logged By:	Greg Cherbonneau
Drill Rig:	Air Rotary
Drill Method:	N/A
Sampling Method:	N/A

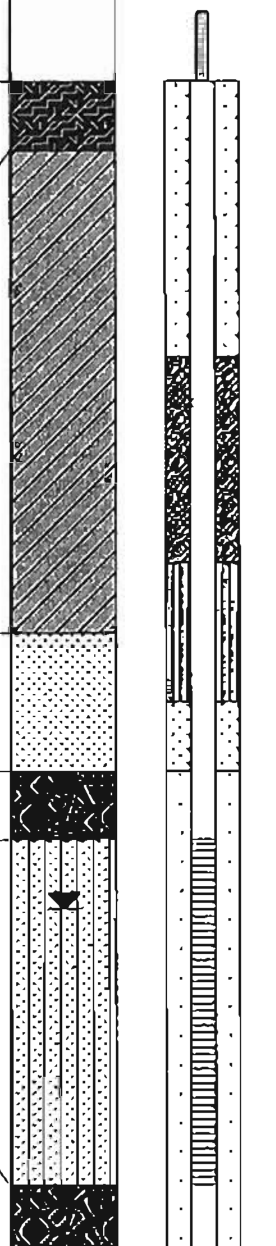
Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description	Interpreted Lithology	Well Construction	Comments
0	N/A		N/A		0.0	CL: Dark brown clay, silt, fine sand, and some coarse gravel, moist. Grades to red brown @ 5'.			0-20'-2" PVC riser 20-25'- 2" PVC screen 0-4'- sand 4-14'-grout 14-18'-bentonite 18-19'-#00 sand 19-25'-#2 sand
	N/A		N/A		0.0				
-5									
	N/A		N/A		0.0	CL: As above with fine to medium sands and quartz fragments, moist.			
-10									
	N/A		N/A		0.0	SP: Red brown medium to coarse, wet @ 13.5'.			
-15									
	N/A		N/A		0.0	ML: Red brown fine sand and silt, lodgement till, dry from 16-24', compact, harder drilling.			
-20	N/A		N/A		0.0	ML: As above, lodgement till. Wet @ 24'.			
	N/A		N/A		0.0				
-25									

Log of Boring: OIW-8

Date Started:	01/09/08	Project Code:	1166
Date Completed:	01/09/08	Project Name:	Sequa - Nyack
Total Depth (ft):	17.00	Drilled By:	Talon Drilling
Boring Diameter (in):	6	Logged By:	Greg Cherbonneau
Bedrock Depth (ft):	N/A	Drill Rig:	Air Rotary
Elevation (ft-msl):	N/A	Drill Method:	N/A
Remark:		Sampling Method:	N/A

Depth	Sample Number	Sample Interval	Recovery (inches)	Blow Counts	PID	Lithological Description	Comments
0	N/A		N/A		0.0	FILL: Fill-concrete, sheet metal	0-11'-2" PVC riser
						CL: Brown gravelly silt and clay mix with sand, moist.	11-16'-2" PVC screen
							0-4'-sand
							4-7'-grout
	N/A		N/A		0.0		7-9'- bentonite
-5							9-10'-#00 sand
							10-17'-#2 sand
							Set well to 16'
	N/A		N/A		0.0	SP: Medium to coarse sand, mixed with quartz fragments.	
-10						GW: Gravel layer-coarse.	
						SM: Gravelly sand and silt mix, wet @ 12'.	
	N/A		N/A		0.0		
-15							
	N/A		N/A		0.0	GW: Gravel layer-coarse, harder drilling @ 16.5'.	

Interpreted Lithology / Well Construction:

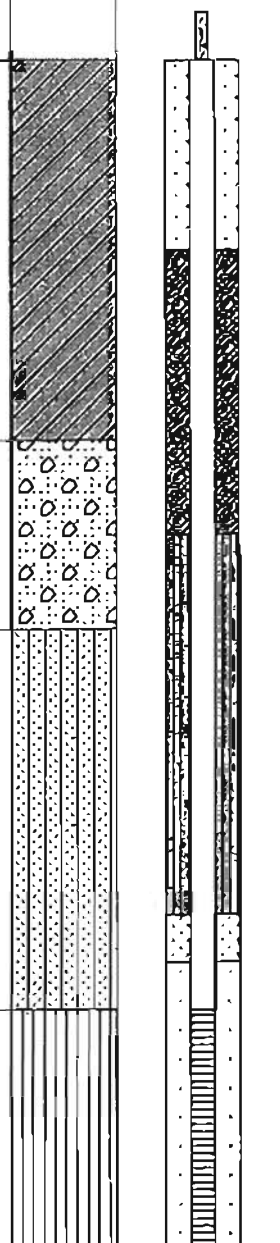


Log of Boring: OIW-9

Date Started:	01/09/08	**Project Code:**	1166
Date Completed:	01/09/08	**Project Name:**	Sequa - Nyack
Total Depth (ft):	25.00	**Drilled By:**	Talon Drilling
Boring Diameter (in):	6	**Logged By:**	Greg Cherbonneau
Bedrock Depth (ft):	> 25'	**Drill Rig:**	Air Rotary
Elevation (ft-msl):	N/A	**Drill Method:**	N/A
Remark:		**Sampling Method:**	N/A

Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description
0	N/A		N/A		0.0	CL: Brown gravelly clay and silt, moist.
	N/A		N/A		0.0	
-5						
	N/A		N/A		0.0	SW: Fine to coarse gravel, and fine to coarse sand, mix, red brown, very moist to wet @ 12'.
	N/A		N/A		0.0	SM: As above with silt.
-15						
	N/A		N/A		0.0	
-20	N/A		N/A		0.0	ML: Red brown fine silt, wet ~ 23'.
	N/A		N/A		0.0	
-25						

Interpreted Lithology / Well Construction



Comments

- 0-20'- 2" PVC riser
- 20-25'- 2" PVC screen
- 0-4'-sand
- 4-10'-grout
- 10-18'-bentonite
- 18-19'-#00 sand
- 19-25'- #2 sand

Log of Boring: OIW-10

Date Started:	01/09/08
Date Completed:	01/09/08
Total Depth (ft):	16.00
Boring Diameter (in):	6
Bedrock Depth (ft):	N/A
Elevation (ft-msl):	N/A
Remark:	

Project Code:	1166
Project Name:	Sequa - Nyack
Drilled By:	Talon Drilling
Logged By:	Greg Cherbonneau
Drill Rig:	Air Rotary
Drill Method:	N/A
Sampling Method:	N/A

Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description
0	N/A		N/A		0.0	CL: Red brown gravelly clay and silt, moist.
						SW: Red brownish tan fine to coarse sand, with fine sized gravel (quartz fragments).
	N/A		N/A		0.0	
-5						
						SW: Red brown fine to coarse sand and fine to medium gravel, very moist.
	N/A		N/A		0.0	
-10						SW: As above with more coarse gravel, wet ~ 12'.
	N/A		N/A		0.0	
-15	N/A		N/A		0.0	

Comments (Well Construction):

- 0-11'-2" PVC riser
- 11-16'-2" PVC screen
- 0-4'- sand
- 4-6'- grout
- 6-9'- bentonite
- 9-10'- #00 sand
- 10-16'- #2 sand

Log of Boring: OIW-11

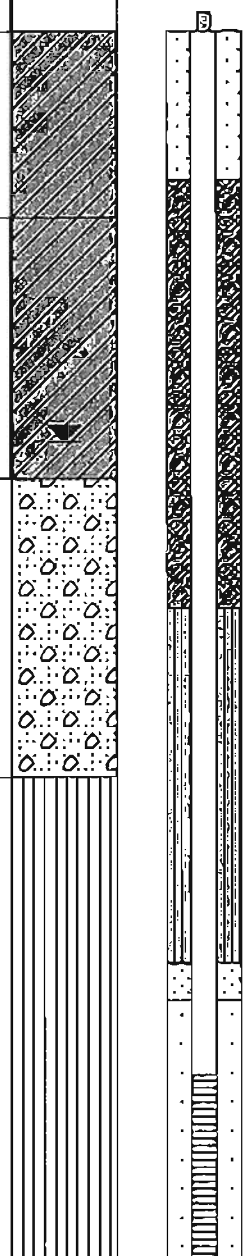
Date Started:	01/07/08	**Project Code:**	1166
Date Completed:	01/07/08	**Project Name:**	Sequa - Nyack
Total Depth (ft):	17.50	**Drilled By:**	Talon Drilling
Boring Diameter (in):	6	**Logged By:**	Greg Cherbonneau
Bedrock Depth (ft):	N/A	**Drill Rig:**	Air Rotary
Elevation (ft-msl):	N/A	**Drill Method:**	N/A
Remark:		**Sampling Method:**	N/A

Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description	Interpreted Lithology	Well Construction	Comments
0	N/A		N/A		0.0	CL: Red brown silty clay with sand and gravel, moist.			0-12.5'- 2" PVC riser 12.5-17.5'- 2" PVC screen 0-4'- sand 4-7.5'- grout 7.5-10.5- bentonite 10.5-11- #00 sand 11-16.5'- #2 sand 16.5-17.5- gravel (natural)
	N/A		N/A		0.0				
-5									
	N/A		N/A		0.0				
-10						GM: At 10'- As above with more gravel, rouded and subrounded, wet ~ 12'.			
	N/A		N/A		0.0				
-15									
	N/A		N/A		0.0				

Log of Boring: OIW-12

Date Started:	01/07/08	Project Code:	1166
Date Completed:	01/07/08	Project Name:	Sequa - Nyack
Total Depth (ft):	33.00	Drilled By:	Talon Drilling
Boring Diameter (in):	6	Logged By:	Greg Cherbonneau
Bedrock Depth (ft):	~ 33	Drill Rig:	Air Rotary
Elevation (ft-msl):	N/A	Drill Method:	N/A
Remark:		Sampling Method:	N/A

Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description	Interpreted Lithology	Well Construction	Comments
0	N/A		N/A		0.0	CL: Dark brown silty clay and fill material- concrete fragments to 5'.			0-28'- 2" PVC riser 28-33- 2" PVC screen 0-4'- sand 4-15.5'- grout 15.5-25'- bentonite 25-26'- #00 sand 26-33'- #2 sand
	N/A		N/A		0.0				
-5						CL: As above-no fill			
	N/A		N/A		0.0				
-10									
	N/A		N/A		0.0	SW: Red brown gravel and sand, wet.			
-15	N/A		N/A		0.0				
-20	N/A		N/A		0.0	ML: Red brown fine silt, compact, till layer, dry.			
-25	N/A		N/A		0.0				
	N/A		N/A		0.0				
-30									Harder drilling @ 33', red brown shale
	N/A		N/A		0.0				

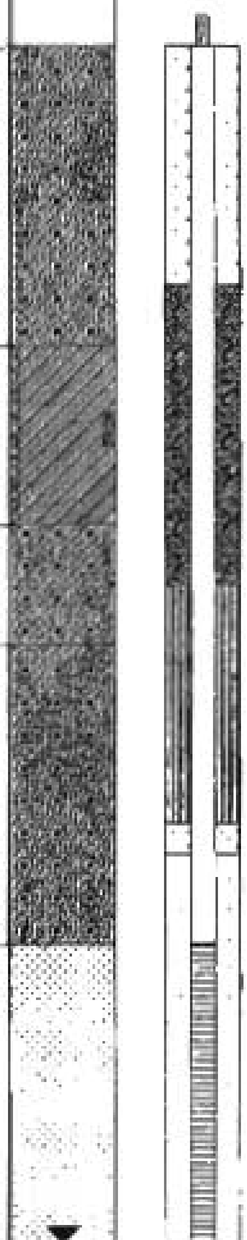


Log of Boring: OIW-13

Date Started: 01/07/08
Date Completed: 01/07/08
Total Depth (ft): 20.00
Boring Diameter (in): 6
Bedrock Depth (ft): N/A
Elevation (ft-msl): N/A
Remark:

Project Code: 1166
Project Name: Sequa - Nyack
Drilled By: Talon Drilling
Logged By: Greg Cherbonneau
Drill Rig: Air Rotary
Drill Method: N/A
Sampling Method: N/A

Depth	Sample Number	Sample Interval	Recovery (inches)	Blow Counts	PID	Lithological Description
0	N/A		N/A		0.0	GC: Dark brown gravel, sand, clay mix, very moist.
	N/A		N/A		0.0	
-5						CL: Dark brown silt and clay, very moist.
	N/A		N/A		0.0	GC: Brownish red gravel, coarse with some clay and silt.
-10						GC: Red brown fine to medium gravel, rounded, with fine sand, silt and clay, more gravel than fines.
	N/A		N/A		0.0	
-15						SP: Red brown fine to medium sand, fine rock fragments, shale, angular, wet ~ 20'.
	N/A		N/A		0.0	
	N/A		N/A		0.0	
-20						



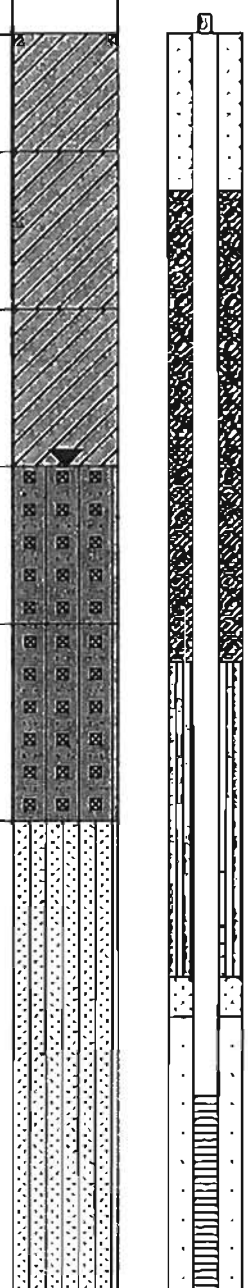
Comments:

0-15'- 2" PVC riser
15-20'- 2" PVC screen
0-4'- sand
4-8' grout
8-13'- bentonite
13-13.5'- #00 sand
13.5-20- #2 sand

Log of Boring: OIW-14

Date Started:	01/08/08	**Project Code:**	1166
Date Completed:	01/08/08	**Project Name:**	Sequa - Nyack
Total Depth (ft):	32.00	**Drilled By:**	Talon Drilling
Boring Diameter (in):	6	**Logged By:**	Greg Cherbonneau
Bedrock Depth (ft):	32	**Drill Rig:**	Air Rotary
Elevation (ft-msl):	N/A	**Drill Method:**	N/A
Remark:		**Sampling Method:**	N/A

Depth	Sample Number	Sample Interval	Recovery (inches)	Blow Counts	PID	Lithological Description	Comments
0	N/A		N/A		0.0	CL: Silt and clay, brown.	0-27'- 2" PVC riser 27-32'- 2" PVC screen 0-4'- sand 4-16'- grout 16-24'- bentonite 24-25'- #00 sand 25-32'- #2 sand Harder drilling @ 32'
-5	N/A		N/A		0.0	CL: As above with concrete fill material.	
	N/A		N/A		0.0	CL: Brown silt and clay.	
-10	N/A		N/A		0.0	GM: Brown gravel and silt, harder drilling @ 11'.	
-15	N/A		N/A		0.0	GM: As above with weathered sandstone fragments, till layer @ 15'.	
-20	N/A		N/A		0.0	SM: Till-fine sand and silt, dry drilling, weathered rock @ 31'. Wet @ 31', Harder drilling @ 32'.	
-25	N/A		N/A		0.0		
-30	N/A		N/A		0.0		

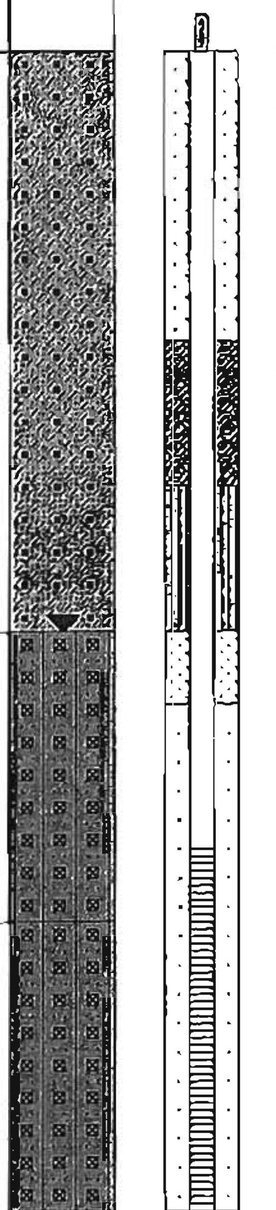


Log of Boring: OIW-15

Date Started:	01/08/08	Project Code:	1166
Date Completed:	01/08/08	Project Name:	Sequa - Nyack
Total Depth (ft):	16.00	Drilled By:	Talon Drilling
Boring Diameter (in):	6	Logged By:	Greg Cherbonneau
Bedrock Depth (ft):	N/A	Drill Rig:	Air Rotary
Elevation (ft-msl):	N/A	Drill Method:	N/A
Remark:		Sampling Method:	N/A

Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description
0	N/A		N/A		0.0	GC: Dark brown gravel, sand, silt, clay, mixed with fill material.
	N/A		N/A		0.0	
-5						
	N/A		N/A		0.0	GM: Red brown fine gravel and sand, wet ~8'.
-10						
	N/A		N/A		0.0	GM: Red brown coarse gravel mixed with fine sand and rock fragments, wet ~ 13', harder drilling @ 15'.
-15	N/A		N/A		0.0	

Interpreted Lithology / Well Construction:



Comments:

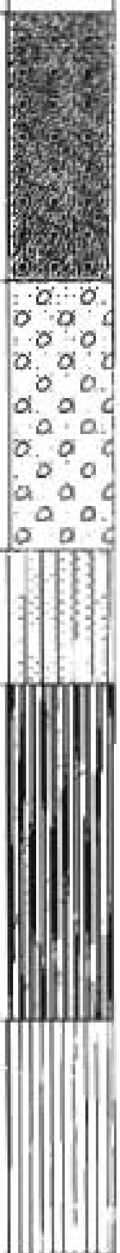
0-11'-2" PVC riser
11-16'- 2" PVC screen
0-4'- sand
4-6'-grout
6-8'- bentonite
8-9'- #00 sand
9-16'- #2 sand

Log of Boring: OIW-16

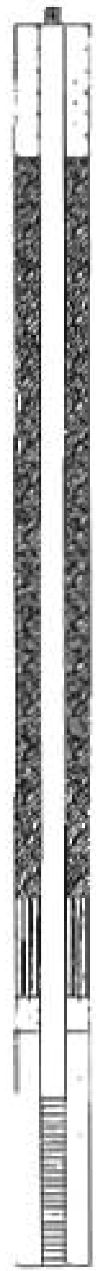
Date Started:	01/08/08	Project Code:	1166
Date Completed:	01/08/08	Project Name:	Sequa - Nyack
Total Depth (ft):	37.00	Drilled By:	Talon Drilling
Boring Diameter (in):	6	Logged By:	Greg Cherbonneau
Bedrock Depth (ft):	36	Drill Rig:	Air Rotary
Elevation (ft-msl):	N/A	Drill Method:	N/A
Remark:		Sampling Method:	N/A

Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description	Comments
0	N/A		N/A		0.0	GC. Dark brown sand, silt, gravel, and clay mixed with fill material, wood and concrete	0-32'- 2" PVC riser 32-37' 2" PVC screen 0-4'- sand 4-28' grout 28-29'- bentonite 29-30'- #00 sand 30-37'- #2 sand
-5	N/A		N/A		0.0		
	N/A		N/A		0.0	SW: Red brown gravelly fine to medium sand, harder drilling @ 11', wet ~ 10' to 15'	
-10	N/A		N/A		0.0		
-15	N/A		N/A		0.0	SM. Red brown fine sand and silt, lodgement till, dry drilling.	
-20	N/A		N/A		0.0	MH. 20-37' - As above, micaceous from 20-30', dry.	
-25	N/A		N/A		0.0		
	N/A		N/A		0.0		
-30	N/A		N/A		0.0	ML. Weathered rock ~ 31', dry drilling, fine sand and silt	
-35	N/A		N/A		0.0		Wet @ 35', harder competent rock @ 36-37'.

Interpreted Lithology



Well Construction



Log of Boring: OIW-17

Date Started:	01/15/08	Project Code:	1166
Date Completed:	01/15/08	Project Name:	Sequa - Nyack
Total Depth (ft):	15.00	Drilled By:	Talon Drilling
Boring Diameter (in):	6	Logged By:	Greg Cherbonneau
Bedrock Depth (ft):	N/A	Drill Rig:	Air Rotary
Elevation (ft-msl):	N/A	Drill Method:	N/A
Remark:		Sampling Method:	N/A

Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description	Interpreted Lithology	Well Construction	Comments
0	N/A		N/A	N/A	0.0	CL: Brown gravelly clay and silt, sand mixed with concrete fill material.			0-11'-2" PVC riser 11-16'- 2" PVC screen 0-4'- sand 4-7'- grout
	N/A		N/A	N/A	0.0				7-9'-bentonite
-5									9-10'-#00 sand 10-16'-#2 sand
	N/A		N/A	N/A	0.0	SW: Brown gravelly sand, very moist.			
-10									
	N/A		N/A	N/A	0.0				
-15									Harder drilling @ 16'- till layer

Log of Boring: OIW-18

Date Started:	01/15/08
Date Completed:	01/15/08
Total Depth (ft):	33.00
Boring Diameter (in):	6
Bedrock Depth (ft):	33
Elevation (ft-msl):	N/A
Remark:	

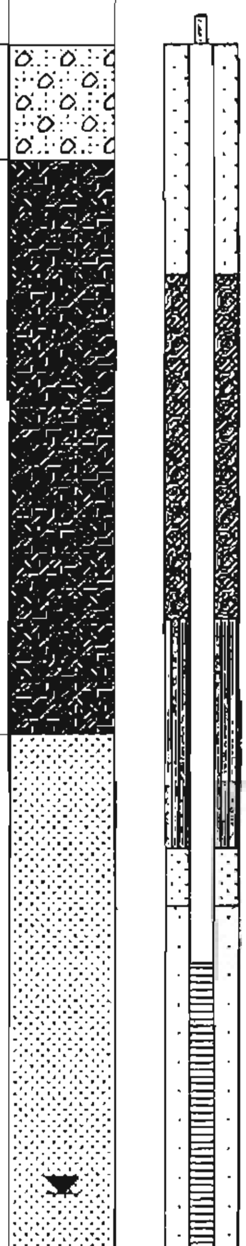
Project Code:	1166
Project Name:	Sequa - Nyack
Drilled By:	Talon Drilling
Logged By:	Greg Cherbonneau
Drill Rig:	Air Rotary
Drill Method:	N/A
Sampling Method:	N/A

Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description	Interpreted Lithology	Well Construction	Comments
0	N/A		N/A	N/A	0.0	GW: Gravel, fill (concrete) and cobbles.			0-28'- 2" PVC riser 28-33'- PVC screen 0-4'- sand 4-20'- grout 20-26'- bentonite 26-27'- #00 sand 27-33'- #2 sand
-5	N/A		N/A	N/A	0.0				
	N/A		N/A	N/A	0.0				
-10						CL: Red brown gravelly clay and silt.			
	N/A		N/A	N/A	0.0	GW: Red brown fine gravel, rounded with firm sand, wet @ 14'.			
-15	N/A		N/A	N/A	0.0				
						SP: Red brown firm sand, dry.			
-20	N/A		N/A	N/A	0.0	ML: Red brown silt with trace fine to medium sands, dry.			
-25	N/A		N/A	N/A	0.0				
	N/A		N/A	N/A	0.0	ML: As above with fine gravel @ 28-30', wet @ 32'. Harder drilling/competent rock @ 33' sandstone			
-30	N/A		N/A	N/A	0.0				

Log of Boring: OIW-19

Date Started:	01/15/08	**Project Code:**	1166
Date Completed:	01/15/08	**Project Name:**	Sequa - Nyack
Total Depth (ft):	21.00	**Drilled By:**	Talon Drilling
Boring Diameter (in):	6	**Logged By:**	Greg Cherbonneau
Bedrock Depth (ft):	N/A	**Drill Rig:**	Air Rotary
Elevation (ft-msl):	N/A	**Drill Method:**	N/A
Remark:		**Sampling Method:**	N/A

Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description	Interpreted Lithology	Well Construction	Comments
0	N/A		N/A	N/A	0.0	SW: Brown gravel sand silt, moist.			0-16'-2" PVC riser 16-21'- 2" PVC screen 0-4'-sand 4-10'-grout 10-14'-bentonite 14-15'-#00 sand 15-21'-#2 sand
-5	N/A		N/A	N/A	0.0	FILL: Fill material-concrete hard drilling to 8'. Leaves and concrete 8-12'.			
	N/A		N/A	N/A	0.0				
-10	N/A		N/A	N/A	0.0	SP: Red brown fine to medium sand, wet @ 20'.			
-15	N/A		N/A	N/A	0.0				
-20	N/A		N/A	N/A	0.0				Terminate boring @ 21'



Log of Boring: OIW-20

Date Started:	01/15/08	**Project Code:**	1166
Date Completed:	01/15/08	**Project Name:**	Sequa - Nyack
Total Depth (ft):	30.00	**Drilled By:**	Talon Drilling
Boring Diameter (in):	6	**Logged By:**	Greg Cherbonneau
Bedrock Depth (ft):	30	**Drill Rig:**	Air Rotary
Elevation (ft-msl):	N/A	**Drill Method:**	N/A
Remark:		**Sampling Method:**	N/A

Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description	Interpreted Lithology	Well Construction	Comments
0	N/A		N/A	N/A		SM: Brown sand, silt, gravel mixed with concrete (fill), hard drilling.			0-25'-2" PVC riser 25-30'- 2" PVC screen 0-4'-sand 4-18'-grout 18-23'-bentonite 23-24'-#00 sand 24-30'-#2 sand
	N/A		N/A	N/A	0.0				
-5									
	N/A		N/A	N/A					
-10						ML: Small amounts of red brown silt, dry. Not many cuttings coming up from 10-20'.			
	N/A		N/A	N/A					
-15									
	N/A		N/A	N/A	0.4				
-20	N/A		N/A	N/A		ML: Red brown silt, with fine gravel sized weathered sandstone fragments.			
	N/A		N/A	N/A	0.0				
-25									
	N/A		N/A	N/A					
-30									Harder drilling @ 30', red brown sandstone @ 30'. Terminate boring @ 30'.

Log of Boring: ESVP-4

Date Started:	01/09/08	Project Code:	1166
Date Completed:	01/09/08	Project Name:	Sequa - Nyack
Total Depth (ft):	7.00	Drilled By:	Talon Drilling
Boring Diameter (in):	6	Logged By:	Greg Cherbonneau
Bedrock Depth (ft):	N/A	Drill Rig:	Air Rotary
Elevation (ft-msl):	N/A	Drill Method:	N/A
Remark:		Sampling Method:	N/A

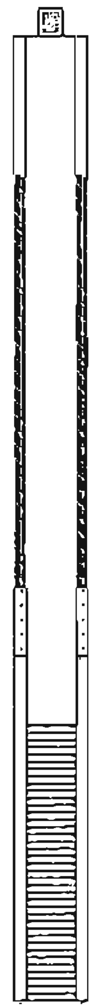
Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description	Interpreted Lithology	Well Construction	Comments
0	N/A		N/A		0.0	CL: Brown gravelly silt and clay.			Constructed soil vapor point on 1/11/08 Set temporary well casing to 7' with stainless steel compression fitting with cap, 1"x1/4" reducer fitting pvc, 1" coupling pvc. 1" riser pvc, 0-5' 1" pvc riser, 5-7' 1" pvc screen, 0.5-4' Bentonite/grout mix, 4-4.5' #00 sand, 4.5-7' #2 sand
					0.0 0.0	CL: As above with sand.			
-5					0.0 0.0				

Log of Boring: ESVP-5

Date Started:	01/16/08
Date Completed:	01/16/08
Total Depth (ft):	7.00
Boring Diameter (in):	N/A
Bedrock Depth (ft):	N/A
Elevation (ft-msl):	N/A
Remark:	

Project Code:	1166
Project Name:	Sequa - Nyack
Drilled By:	Talon Drilling
Logged By:	Greg Cherbonneau
Drill Rig:	Air Rotary
Drill Method:	N/A
Sampling Method:	N/A

Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description	Interpreted Lithology	Well Construction	Comments
0	N/A		N/A		0.0	CL: Brown gravelly clay and silt, moist, no odors.			Set well with stainless steel compression fitting with cap, 1"x1/4" reducer fitting pvc, 1" coupling pvc. 0-5' 1" pvc riser, 5-7' 1" pvc screen, 0-1' sand, 1-4' Bentonite/grout mix, 4-4.5' #00 sand, 4.5-7' #2 sand
-5									



Log of Boring: ESVP-6

Date Started:	01/08/08	Project Code:	1166
Date Completed:	01/08/08	Project Name:	Sequa - Nyack
Total Depth (ft):	7.00	Drilled By:	Talon Drilling
Boring Diameter (in):	6	Logged By:	Greg Cherbonneau
Bedrock Depth (ft):	N/A	Drill Rig:	N/A
Elevation (ft-msl):	N/A	Drill Method:	Air Rotary
Remark:		Sampling Method:	N/A

Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description	Interpreted Lithology	Well Construction	Comments
0	N/A		N/A		0.0	ML: Dark brown clayey silt, with gravel and sand, moist.			Set temporary 2" pvc casing to 7'. Constructed soil vapor point on 1/11/08. 0-5' 1" pvc riser, 5-7' 1" pvc screen, 0.5-4' Bentonite/grout mix, 4-4.5' #00 sand, 4.5-7' #2 sand Water in well on 1/9/08. Did not build soil vapor point with fittings or cap.
-5									

Log of Boring: ESVP-7		Project Code:	1166
Date Started:	01/08/08	Project Name:	Sequa - Nyack
Date Completed:	01/08/08	Drilled By:	Talon Drilling
Total Depth (ft):	7.00	Logged By:	Greg Cherbonneau
Boring Diameter (in):	6	Drill Rig:	Air Rotary
Bedrock Depth (ft):	N/A	Drill Method:	N/A
Elevation (ft-msl):	N/A	Sampling Method:	N/A
Remark:			

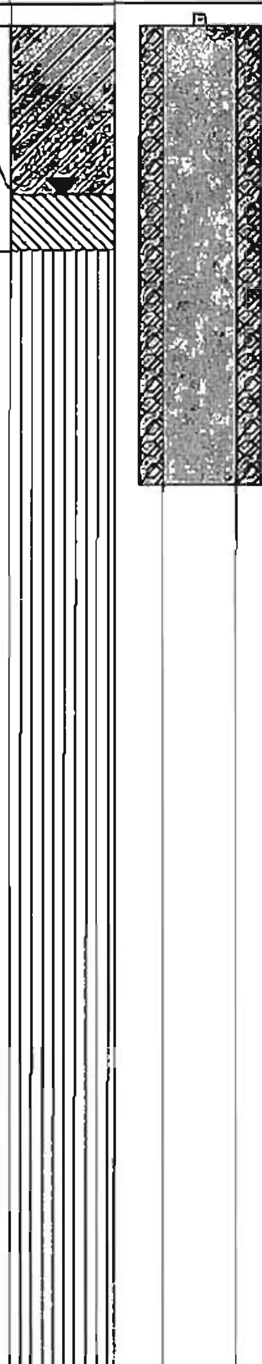
Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID	Lithological Description	Interpreted Lithology	Well Construction	Comments
0	N/A		N/A			ML: Dark brown clayey silt with gravel and sand. Moist			Set temporary 2" pvc casing to 7'. Constructed soil vapor point on 1/11/08. 0-5' 1" pvc riser, 5-7' 1" pvc screen, 1-3' grout, 3-4' #00 sand, 4-7' #2 sand Water in well. Did not construct this point with fittings and cap.
-5									

Log of Boring: IW-1

Date Started:	01/11/08	Project Code:	1166
Date Completed:	1/14/08	Project Name:	Sequa - Nyack
Total Depth (ft):	120.00	Drilled By:	Talon Drilling
Boring Diameter (in):	10" 0-40', 6" 40-120'	Logged By:	Greg Cherbonneau
Bedrock Depth (ft):	31	Drill Rig:	Air Rotary
Elevation (ft-msl):	N/A	Drill Method:	N/A
Remark:		Sampling Method:	N/A

Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID Units	Lithological Description	Comments
0	N/A		N/A		0.0	CL: Brown gravelly clay and silt with fill material (concrete).	Used 10" hammer bit to 41'. Set temporary 10" steel to 20'. Set permanent 6" steel casing to 41'. Grouted around 6" steel. Open bedrock well from 41' to 120'.
-10	N/A		N/A		0.0	SC: Red brown clay, silt, sand, gravel mix.	
-20	N/A		N/A		0.0	ML: Red brown gravelly silt, with some cobbles. Weathered rock @ 29'.	
-30	N/A		N/A		0.0		Competent rock @ 31', red brown siltstone to 37'. Wet @ 35'. red-brown sandstone, fractures at 43' (10-15 gpm). Small fracture @ 47'.
-40	N/A		N/A		0.0 4.5		
-50							Fractured rock from 50-58', soft drilling 50-58', bigger fracture ~58-60' (15 gpm).
-60	N/A		N/A		6.7		Finer grained, red-brown from 60-70'. TCE odor from 60-80'. Wet from 60-80', soft drilling to 80', highly fractured rock from 60-80'.
-70	N/A		N/A		4.2		Sandstone red-brown fine grained. 74-80' siltstone, red-brown, noticable fracture @78'.
-80	N/A		N/A		5.5		Interbedded sandstone, fine grained and siltstone, red-brown, fracture @85'.
-90	N/A		N/A		4.2		Fractures @ 95', 97', and 100'.
-100	N/A		N/A		6.7		Sandstone fine grained with fine quartz fragments reddish brown and tan intermixed.
-110	N/A		N/A		0.2		Fracture @106', 108', and 110'.
-115							

Interpreted Lithology / Well Construction



Log of Boring: IW-2

Date Started:	01/10/08	Project Code:	1166
Date Completed:	01/10/08	Project Name:	Sequa - Nyack
Total Depth (ft):	80.00	Drilled By:	Talon Drilling
Boring Diameter (in):	6	Logged By:	Greg Cherbonneau
Bedrock Depth (ft):	31	Drill Rig:	Air Rotary
Elevation (ft-msl):	N/A	Drill Method:	N/A
Remark:		Sampling Method:	N/A

Depth	Sample Number	Sample Interval	Recovery (inches)	Blow Counts	PID Units	Lithological Description	Interpreted Lithology	Well Construction	Comments
0	N/A		N/A	N/A	0.0	SW: Brown gravelly sand and silt with fill material (concrete), moist.			Used 10" hammer, bit to 41'. Drove temporary 10" steel casing to 20'. 0-41'-6" steel casing 41-80'- open hole in bedrock grout 0-41' around 6" steel
-10	N/A		N/A	N/A	0.0	SC: Red brown clayey silt and fine sand, small amounts of gravel.			
	N/A		N/A	N/A	0.0	CL: Red brown clay and gravel (fine to coarse) mix, wet @ ~12'.			
-20	N/A		N/A	N/A	0.0	CL: As above- more clay, some cobbles, wet.			
-25	N/A		N/A	N/A	0.0	CL: Red brown clay and gravel.			
-35	N/A		N/A	N/A	0.0	CL: Red brown siltstone competent rock @ 31', wet @ 31'.			
-45	N/A		N/A	N/A	0.0	CL: As above-siltstone and fine sandstone, dry drilling from 41-46'.			
						CL: sandstone, red brown.			Small fracture @ 46', dust stopped.
									Small fracture @ 52' and 80'.
-55	N/A		N/A	N/A	0.0				
						CL: As above.			
	N/A		N/A	N/A	0.0	CL: Siltstone-red brown			
	N/A		N/A	N/A	0.0				Highly fractured from 65-70'.
						CL: Sandstone-fine grained.			
-75	N/A		N/A	N/A	0.0				Small fracture ~ 75'
	N/A		N/A	N/A	0.0	CL: Siltstone-red brown			~ 15 gpm for well

Log of Boring: IW-3

Date Started:	01/15/08	**Project Code:**	1166
Date Completed:	01/15/08	**Project Name:**	Sequa - Nyack
Total Depth (ft):	72.00	**Drilled By:**	Talon Drilling
Boring Diameter (in):	N/A	**Logged By:**	Greg Cherbonneau
Bedrock Depth (ft):	30	**Drill Rig:**	Air Rotary
Elevation (ft-msl):	N/A	**Drill Method:**	N/A
Remark:		**Sampling Method:**	N/A

Depth	Sample Number	Sample Interval	Recovery (inches)	Blow Counts	PID Units	Lithological Description	Interpreted Lithology	Well Construction	Comments
0	N/A		N/A	N/A	N/A	CL: Brown gravelly clay and silt, moist 0-10'			Drilled to 20' with 10" hammer and bit. Set temporary casing to 20'. Drilled to 40' with 10" hammer and bit. Set permanent 8" steel to 40'. Grouted around 8"steel. Open hole to 72'
-5									
-10	N/A		N/A	N/A	N/A	CL: Brown sandy clay and silt, very moist to wet ~ 15'			
	N/A		N/A	N/A	N/A				
-15									
-20	N/A		N/A	N/A	N/A	CL: Red brown sandy (fine to coarse) gravelly (fine to coarse) clay and silt, more fines, dry from 17-20'			
-25	N/A		N/A	N/A	N/A	CL: As above			
-30					5.7	MH: Fine silt, micaceous, dry.			
-35	N/A		N/A	N/A	2.2 to 5.9 (30-40')	MH: As above with weathered sandstone, wet @ 27-40'			
-40						MH: Red brown sandstone and shale interbedded harder drilling @ 30'. Wet			
-45	N/A		N/A	N/A	N/A	MH: Siltstone, red brown, fractures @ 45' ~4 gpm			
-50									
-55	N/A		N/A	N/A	N/A	MH: Fracture @ 55' small. As above with coarse grained sandstone Fractures @ 58 and 60' ~ 15 to 20 gpm			
-60									
	N/A		N/A	N/A	N/A	MH: Sandstone, red brown, with bluish gray siltstone beds from 60-72' Fracture @ 64' ~ 20 gpm, small fracture @ 67'			
-65	N/A		N/A	N/A	N/A				well > 50 gpm
-70	N/A		N/A	N/A	10 ppm				

Log of Boring: IW-4

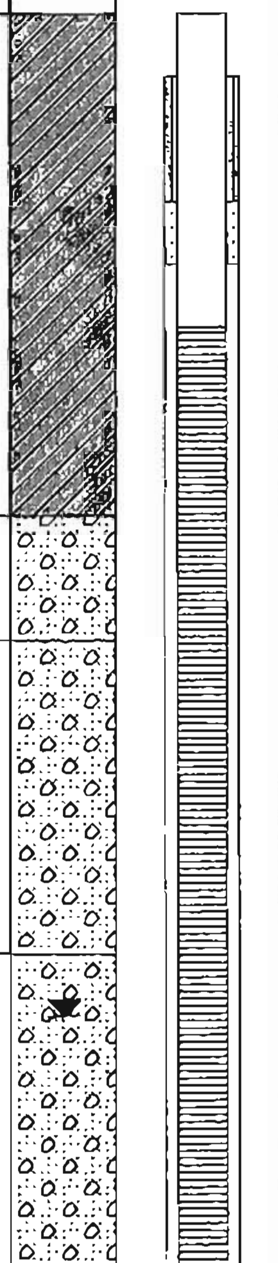
Date Started:	01/17/08	Project Code:	1166
Date Completed:	01/17/08	Project Name:	Sequa - Nyack
Total Depth (ft):	100.00	Drilled By:	Talon Drilling
Boring Diameter (in):	N/A	Logged By:	Greg Cherbonneau
Bedrock Depth (ft):	42	Drill Rig:	Air Rotary
Elevation (ft-msl):	N/A	Drill Method:	N/A
Remark:		Sampling Method:	N/A

Depth	Sample Number	Sample Interval	Recovery (Inches)	Blow Counts	PID Units	Lithological Description	Comments
0 to -15	N/A		N/A		0.0	CL: (0-5'): Brown gravelly silt and clay, wet. (5-10'): Brown gravelly clay, moist. (10-15'): As above with silt.	Drilled to 5' with 10" hammer and bit. Set 10" steel casing to 20'. Drilled to 52' with 10" hammer and bit. Set 6" steel casing to 52'. Grouted 0-52' around 6" steel, 10" steel casing permanent.
-15 to -20	N/A		N/A		0.0	SC: Brown gravelly silt, clay, fine sand, moist.	
-20 to -25						ML: Red brown gravelly silt, fine sand.	
-25 to -35	N/A		N/A		0.0	ML: Red brown clayey silt, dry. (30-35'): Red brown gravelly silt, dry.	
-35 to -40	N/A		N/A		0.0	SM: As above with more gravel (fine to medium), rounded and coarse sand, moist.	
-40						SM: As above.	
-42						SM: Harder drilling @ 42'- sandstone red brown, fine gravelly sand (fine to coarse), dry.	
-45						SM: Harder drilling @ 45', consistent rotation on drill rod, consistent sound of hammer.	
-60						SM: More coarse grained sandstone, with gravel, very moist.	
-65 to -75	N/A		N/A		0.0	SM: Dry dusty drilling, sandstone and siltstone, red brown silt and fine sand with trace coarse sand and gravel (fine).	
-75 to -80	N/A		N/A		0.0	SM: As above, sandstone with alternating siltstone beds.	
-80	N/A		N/A		0-10.1 (80-100')	SM: Siltstone- red brown, small fracture @ 80'.	
-85	N/A		N/A		avg. 5 ppm	SM: Fine to medium grained, red brown wet from 81-100'. @84-85'- turned brown sandstone.	
-90 to -100						SM: Red brown, more coarse grained sand with coarse gravel sized quartz fragments, fractured from 88-90' soft drilling, 30+ gpm.	Terminate boring @ 100'.

Log of Boring: MW-26A

Date Started:	01/09/08	Project Code:	1166
Date Completed:	01/09/08	Project Name:	Sequa - Nyack
Total Depth (ft):	20.00	Drilled By:	Talon Drilling
Boring Diameter (in):	6	Logged By:	Greg Cherbonneau
Bedrock Depth (ft):	N/A	Drill Rig:	Air Rotary
Elevation (ft-msl):	N/A	Drill Method:	N/A
Remark:		Sampling Method:	N/A

Depth	Sample Number	Sample Interval	Recovery (inches)	Blow Counts	PID	Lithological Description	Interpreted Lithology	Well Construction	Comments
0	N/A		N/A			CL: Brown gravelly clay and silt, very moist.			0-5' 2" pvc riser, 5-20' 2" pvc casing
									1-3' Benonite, 3-4' #00 sand, 4-20' #2 sand
-5	N/A		N/A						
						SW: Red-brown sand, medium-coarse quartz fragments.			
-10	N/A		N/A			SW: Gravel, fine-coarse with fine-coarse sand.			
-15	N/A		N/A			SW: As above with more fine sand and silt, wet 16'. Good amount of water.			
-20	N/A		N/A						

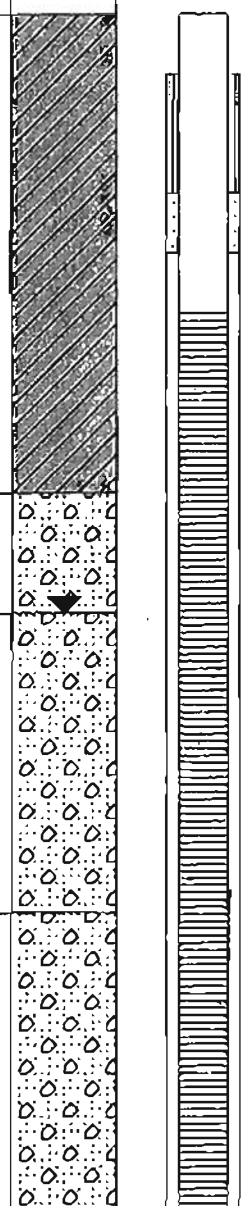


Log of Boring: MW-27A

Date Started:	01/09/08	**Project Code:**	1166
Date Completed:	01/09/08	**Project Name:**	Sequa - Nyack
Total Depth (ft):	20.00	**Drilled By:**	Talon Drilling
Boring Diameter (in):	6	**Logged By:**	Greg Cherbonneau
Bedrock Depth (ft):	N/A	**Drill Rig:**	Air Rotary
Elevation (ft-msl):	N/A	**Drill Method:**	N/A
Remark:		**Sampling Method:**	N/A

Depth	Sample Number	Sample Interval	Recovery (inches)	Blow Counts	PID	Lithological Description	Comments
0	N/A		N/A		0.0	CL: Brown gravelly clay and silt, very moist.	0-5' 2" pvc riser 1-3' Bentonite, 3-4' #00 sand, 4-20' #2 sand
-5	N/A		N/A		0.0		5-20' 2" pvc screen
						SW: Red brown sand, medium-coarse with quartz fragments.	
-10	N/A		N/A		0.0	SW: Fine gravel and coarse sand mixed. Soil wet to very moist.	
-15	N/A		N/A		0.0	SW. As above with fine sand and silt, dry from 18-20'.	
-20	N/A		N/A		0.0		

Interpreted Lithology / Well Construction



Appendix D

Field Groundwater Purge/Sample Form

GROUND WATER SAMPLING FORM

General Information

Client/Project: Chromalloy/W.Nyack
Location: West Nyack, NY
Weather: ____
Date: ____
Project Number: ____
Time Sampling Began: ____
Time Sampling Completed: ____

Evaluation Data

Description of Sampling Point (Well ID): ____
Measuring Point (MP): Top of riser
Total Depth of Well Below MP(ft.): ____
Depth to Water Below MP (ft.): ____
Height of Column in Well (ft.): ____
Well Volume Conversion Factor: ____
(see reverse)
Well Volume (Gallons): ____
Casing Diameter (inches): ____
Type of Casing Material: ____
Tubing Material: ____
Pump Set at (ft. below MP): ____
Evacuation Method: Redi-Flo2 or similar

Ground Water Sampling Parameters

(See reverse for stabilization criteria)

Time	Water Level (ft. below MP)	Volume Removed (Gallons)	Flow (mL/min)	Temperature (ºC)	pH (Std. units	SEC (mS/cm)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Instrument used to measure parameters

Sample Information

Constituents Sampled	*Sample Containers*	*Field Preparation*
VOCs EPA 8260B	3 X 40 mL vials	Preserved w/HCL

Sampling Personnel/Time Samples Collected: ____
Sample Identification Coding/Duplicate Identification Coding: ____
Chain of Custody Record Number(s): ____
Remarks: ____

GROUND WATER SAMPLING FORM

Well Volume Conversion Factor

Volume of Water in Casing or Hole	
Diameter of Casing or Hole (Inches)	***Gallons per foot of Water***
1	0.041
2	0.163
3	0.367
4	0.653
5	1.020
6	1.469
7	2.000
8	2.611

Stabilization Criteria (USEPA Region 2, Rev. No. 1 (2010)) (3 Consecutive Readings)

i. pH: +/- 0.1
ii. specific conductance: +/- 3%
iii. dissolved oxygen: +/- 10% (for values > 0.5 mg/L)
iv. oxidation-reduction potential: +/- 10 millivolts
v. turbidity: +/- 10% (for values > 5.0 NTUs).
vi. drawdown: < 0.3 feet
vii. purge rate: 200-500 mL/min
viii. sample rate: 100-250 mL/min

Appendix E

HASP

HEALTH AND SAFETY PLAN

FORMER CHROMALLOY FACILITY SITE
West Nyack, New York

Project No. 1380.02.20

December 13, 2008

Prepared For

SEQUA CORPORATION
New York, New York

Prepared By

THE PAYNE FIRM, INC.
11231 Cornell Park Drive
Cincinnati, Ohio 45242
513-489-2255 Fax: 513-489-2533

HEALTH AND SAFETY PLAN (HASP)
FORMER CHROMALLOY FACILITY SITE
WEST NYACK, NEW YORK

HEALTH AND SAFETY PLAN APPROVALS

By their signature, the undersigned certify that the Site-Specific HASP is approved for utilization during sampling activities at the Former Chromalloy Facility Site in West Nyack, New York.

Signature, Name, Title

____ ________________________

The Payne Firm, Inc. – Senior Project Manager Date
Mathew D. Bell, CPG

____ ________________________

The Payne Firm, Inc. – Site Safety Officer Date
Richard S. Totino, CEM

____ ________________________

Greystone Strategies, LLC Date
James M. Testo, CIH, CSP

HEALTH AND SAFETY PLAN (HASP)
FORMER CHROMALLOY FACILITY SITE
WEST NYACK, NEW YORK

HASP ACCEPTANCE FORM

I understand, agree to, and will conform with the information set forth in this Site-Specific Health and Safety Plan and as discussed in the Personnel Safety and Health briefing(s).

Name	Signature	Date

TABLE OF CONTENTS

Table of Contents (cont.)

Table of Contents (cont.)

<u>List of Text Tables</u>

<u>List of Figures</u>

<u>List of Appendices</u>

1.0 INTRODUCTION

This Health and Safety Plan (HASP) has been developed to provide the minimum safety and health practices and procedures for The Payne Firm, Inc. (Payne Firm) employees and subcontractor personnel engaged in remedial and construction activities at the Former Chromalloy Facility Site located at 169 Western Highway in West Nyack, New York.

Project investigation and remedial activities have been ongoing for several years. Site-specific health and safety plans (HASPs) and procedures have been developed by previous contractors including:

- Environmental Alliance, Inc., Community Health and Safety Plan for Ground Water Remediation Enhancement Activities, May 10, 2007.
- Lawler, Matusky & Skelly Engineers, Remedial Investigation/Feasibility Study Work Plan, Health and Safety Plan, July, 1994.

These documents have been reviewed and relevant information has been incorporated where appropriate into this HASP. These documents are attached to this HASP as Appendix A and Appendix B respectively.

This HASP discusses personnel responsibilities and establishes requirements to be incorporated into the planned activities for the purpose of protecting personnel from hazards which may be inherent to the project, the tasks associated with the scope of work, and with the surrounding community. The HASP also provides for contingencies that may arise while operations are being conducted at the Site.

The HASP complies with the requirements stipulated in OSHA's Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard 29 CFR 1910.120 and applicable portions of the Construction Industry Standards 29 CFR 1926. Both documents must be available during Site activities.

This HASP has been developed using the latest available information regarding known or suspected chemical contaminants and potential physical and biological hazards associated with the proposed work at the Site. This HASP will be modified if new information becomes available. The provisions of the HASP are mandatory for all on-Site personnel engaged in hazardous waste operations that might result in potential exposure to on-Site hazardous substances.

A copy of this HASP is available to each Site subcontractor in accordance with 29 CFR 1910.120 (b) (1) to inform subcontractors of Site hazards. Each subcontractor shall follow the Health and Safety Plan. If deemed necessary for additional health and safety measures, Payne Firm shall request all subcontractor's company information regarding health and safety programs prior to start of work on the Site. Payne Firm reserves the right to review and approve a subcontractor's plan at any time. Inadequate health and safety precautions on the part of a subcontractor, or the belief that a subcontractor's personnel are or may be exposed to an immediate health hazard, can be cause for the Payne Firm to suspend Site work and ask the subcontractor to evacuate the Site.

Subcontractors working on the Site will be responsible for operating in accordance with the OSHA regulations including 29 CFR Parts 1910 and 1926 including section 1910.120 Hazardous Waste Operations and Emergency Response unless otherwise directed by Payne's designated Site Safety Officer (SSO). These regulations include the provisions for training and medical surveillance of employees who are or may be potentially exposed to hazardous substances or other health or safety hazards. If requested by the SSO, subcontractors must submit proof of training and medical surveillance to Payne Firm prior to initiating Site work.

Site personnel, including subcontractor employees who are determined by the SSO to be subject to the above-referenced regulations, must read this HASP and sign the HASP Acceptance Form found inside the front cover of this document.

1.1 Site Location and Description

The Site is the Former Chromalloy Facility property located at 169 Western Highway in West Nyack, New York and associated commercial and residential properties adjacent to Western Highway and along Pineview Road. A site Location Map is provided in Figure 1. A Site Plan is provided in Figure 2. The Site is situated at the intersection of Western Highway and Pineview Road, adjacent to the east side of the Hackensack River.

The Former Chromalloy Facility property now contains several commercial/industrial buildings. Current activities at the site include a furniture manufacturer, a roofing contractor and an automobile detailing and preparation center. Most of this parcel is paved with bituminous or Portland concrete. The Site is bordered on the north and west by the Hackensack River, classified by the NYSDEC as a Class A stream.

1.2 Project History

The property was first developed in 1926 by Kay Laboratories, Inc., which operated on the property until 1946. Between 1946 and 1960, the group of parcels was passed through several corporations and individuals, and Chromalloy American Corporation (Chromalloy) obtained the property in 1960.

Two different Chromalloy companies operated at the site; Sintercast, which operated throughout Chromalloy's tenure at the site, and the Chromalloy Division, (also known as the Coatings Operation) which operated at the site until 1971. The Sintercast Division produced machineable titanium carbide, carbon, chromium and iron as raw materials. The operations included the use of trichloroethene (TCE) as a degreaser, which was reportedly applied using wipe-on rags. It was reported that only one drum of TCE was purchased every eight to twelve months and, at most, three drums were stored at the site at any one time. In 1986, Chromalloy merged with Sun Chemical Corporation, which then changed its name to Sequa Corporation.

In 1978, a Pineview Road resident complained to the Rockland County Health Department (RCHD) of a taste and odor problem in the potable water well at his property. During an inspection of the well, RCHD noticed a solvent odor in the well water. This inspection was followed by several rounds of ground water monitoring at all of the residences on Pineview Road. Results from these sampling events identified concentrations of trichloroethene (TCE) in some of the wells with one well containing 65,000 ug/L of TCE. As a result, the residents were connected to a new permanent public water supply, and directed not to use water from their wells.

The potential sources of contamination were initially investigated by review of records, plans, maps and aerial photographs of the site. Initial background studies, and subsequent site investigations, identified potential TCE sources in the study area which included a 1956 septic tank, a 1960 acid drain, a 1960 septic tank, pipes emanating from the southwest corner and other areas of the facility building, inactive production wells and cooling water discharges.

The Remedial Investigation/Feasibility Study (RI/FS) conducted between 1994 and 1999 included the installation and sampling of numerous additional monitoring wells and the collection of ground water, surface water, soil vapor and soil samples. Results from these samples indicate concentrations of the same general group of constituents at concentrations within and exceeding the orders of magnitude of concentrations found in 1991. In addition, soil samples obtained from the vicinity of the southwestern corner of the commercial building during soil investigations in 2007 exhibited concentrations of total chromium ranging up to 917 mg/kg. The current Unrestricted Use Soil Cleanup Objective for trivalent and hexavalent chromium per the NYSDEC (NYCRR Chapter IV-Quality Services, Subchapter B: Solid Wastes, Part 375 Environmental Remediation Program, Subpart 375-6: Remedial Program Soil Cleanup Objectives) is 30 mg/kg and 1.0 ug/kg respectively.

1.3 Key Project Personnel and Organization

This section defines responsibility for Site safety and health for contractor and subcontractor employees engaged in Site activities. Personnel assigned to these positions will exercise the primary responsibility for Site health and safety. These persons will be the primary points-of-contact for any questions regarding the safety and health procedures and the selected control measures that are to be implemented for on-Site activities.

The Project Manager (PM) is a Payne Firm employee who is responsible for the overall direction of health and safety for this project. At the Site, the PM has primary responsibility for:

- Ensuring personnel are aware of the HASP provisions, are instructed in safe work practices, and are familiar with emergency procedures;
- Verifying medical surveillance and training and respirator fit testing records are complete;
- Providing immediate verbal notification of Site incidents including employee injury or illness, spills or releases, property damage, motor vehicle accidents, and serious-near-misses to the Site Safety Officer (SSO). Incidents involving Subcontractor employees who are under our direct supervision must also be reported to the SSO;
- Preparing any incident reports for employees and subcontractor activities and participating in incident investigations, as appropriate;
- Stopping operations in the event of an emergency or to correct unsafe work practices and Site conditions;
- Obtaining utility clearances prior to commencement of work; and
- Reviewing and approving the HASP.

The Site Safety Officer (SSO) is a Payne Firm personnel who is responsible for developing this HASP in accordance with applicable OSHA regulations. The SSO is also responsible for:

- Providing information regarding Site contaminants and physical hazards associated with the Site to subcontractors;
- Stipulating training requirements and reviewing appropriate training and medical surveillance certificates;
- Coordinating health and safety activities with the Field Operation leader (FOL);
- Conducting periodic Site inspections (walkthrough surveys) for health and safety hazards/housekeeping;
- Verifying training and medical clearance of on-Site personnel status in relation to Site activities;
- Implementing Hazard Communication and Respiratory Protection and other associated safety and health programs, as they may apply to the operations identified as part of this project;
- Conducting safety briefings as necessary; and
- Posting OSHA “Safety on the Job” and other required posters.

The Payne Firm SSO will not be on site during all field operations. At any time the Payne Firm SSO may designate an alternate SSO, which will be the Field Operations Leader or qualified field technician who is knowledgeable of the activities being conducted at the Site.

As determined by the SSO, subcontractors are required to designate a safety representative known as the Field Operations Leader (FOL). The FOL supports Site activities by supervising and directing personnel while working at the Site, and advising on aspects of health and safety on the Site. This person is responsible for the safe and healthful performance of work by his work crew. During subcontractor activities at the Site, the FOL will conduct work area inspections, safety meetings, and investigate accidents and exposure incidents involving subcontractor personnel. In the SSO's absence, the Field Operations Leader (FOL) will assume the responsibilities of the SSO as described above. The FOL will:

- Serve as the Incident Commander;
- Identify a chain of command for emergency action;
- Educate Site workers to the hazards and control measures associated with planned activities at the Site and to provide early recognition and prevention where possible;
- Establish, communicate, and post emergency evacuation routes for Site emergencies and railcar incidents;
- Enact emergency notification;
- Coordinate authorized visitors for registration onto the site by means of the log in book;
- Establishing air monitoring and decontamination procedures;
- Assigning personnel protective equipment;
- Determining emergency response procedures and emergency contacts;
- Select, apply, inspect, and maintain personal protective equipment;
- Verify that the prescribed PPE is worn by Site employees;
- Establish work zones and control points; and
- Implement the air monitoring program for on-Site activities.

Site personnel involved in the Site operations are responsible for:

- Reviewing this HASP and signing the Acceptance Form;
- Taking reasonable precautions to prevent injury to themselves and to co-workers;
- Performing only those tasks they are trained and qualified to perform, and immediately report any accidents and/or unsafe acts or conditions to the SSO;
- Implementing the procedures set forth in this HASP, and reporting any deviations to the SSO; and
- Notifying the SSO of any special medical problems (such as allergies, contact lenses, hearing loss, fear of heights, claustrophobia, etc.).

Compliance with the requirements stipulated in this HASP is monitored by the SSO and coordinated through the Program Safety Manager (PSM).

1.4 Project Information and Personnel Assignments

Table 1.1: Project Information and Personnel Assignments

Site Name	Former Chromalloy Facility 163 Western Highway West Nyack, New York 10994	Stephen Lowson, Esq. 200 Park Avenue New York, New York 10166 212-692-2623

Project Team	Discipline/Tasks Assigned	Phone Number

Matthew D. Bell	Senior Project Manager	1-800-229-1443
Richard S. Totino	Project Manager, Site Safety Officer	518-281-5436 (Cell)

1.5 Project Contractor Coordination

There is currently one subcontractor on this site who could be affected by the tasks and operations associated with this HASP. The subcontractor's information is summarized in the table below. Should additional subcontractors become active at the site, information about those subcontractors will be added to this HASP as an Addendum.

Table 1.2: Site Contractor Information

Company	Function
Envirotrac Environmental Services 5 Old Dock Road Yaphank, New York 11980 (631) 924-3001	Operation, Monitoring and Maintenance of Site Equipment and Facilities

It is important that all Site contractors and subcontractors are aware of activities that other contractors are undertaking and the associated hazards. To facilitate communication of Site operations and health and safety concerns, all contractor and subcontractor personnel will sign in on the Personnel Log-In book maintained on the site (Remediation System Room). In addition, a subcontractor representative will attend all safety briefings and Site-specific training.

2.0 EMERGENCY ACTION PLAN

2.1 Introduction

This section has been developed as part of a pre-planning effort to direct and guide field personnel in the event of an emergency. For emergencies that cannot be handled using Site resources, personnel will evacuate to a safe place of refuge (the designated assembly area is shown in Figure 2, and is located immediately adjacent to the west side of the Former Chromalloy Facility building) and the appropriate emergency response agencies will be notified. It has been determined that a majority of potential emergency situations would be better supported by outside emergency responders. Based on this determination, all workers and subcontractor personnel will not provide emergency response support beyond the capabilities of on-Site response as listed below. Workers who are ill or who have suffered a non-serious injury may be transported by Site personnel to nearby medical facilities, provided that such transport does not aggravate or further endanger the welfare of the injured/ill person or adversely affect Site conditions or monitoring. The emergency response agencies listed in this plan (Table 2.1) are capable of providing the most effective response and, as such, will be designated as the primary responders. These agencies are located within a reasonable distance from the area of Site operations, which ensures adequate emergency response time. The Payne Firm SSO (Richard S. Totino) will be notified anytime outside response agencies are notified. This Emergency Action Plan conforms to the requirements of 29 CFR 1910.38(a), as allowed in 29 CFR 1910.120(i)(10(ii)).

If qualified and properly trained, Site personnel will provide the following initial response measures:

- Initial stage fire fighting suppression;
- Initial spill control and containment measures and prevention;
- Removal of personnel from emergency situations;
- Initial medical support for injuries or illnesses; and
- Site control and security measures, as necessary.

2.2 Pre-Emergency Planning

Initial hazard/risk assessment efforts have identified exposure to chemical or physical hazards as the most probable emergencies (i.e., illness or injury) that could be encountered during Site activities. To minimize and eliminate these potential emergency situations, pre-emergency planning activities associates with this Site include the following (which are the responsibility of the SSO):

- Coordinating with Payne Firm personnel to ensure that emergency actions are compatible with existing emergency response procedures;
- Conduct a daily health and safety briefing, and complete a daily health and safety report (Appendix D), and
- Establishing and maintaining information at the Site Office (Remediation System Room) for easy access in the event of an emergency. This information will include the following:

    - Chemical inventory (used on-Site), with material safety data sheets (MSDS); and
    - A logbook identifying personnel on Site each day that activities are occurring.

It will be the responsibility of the SSO to:

- Identify a chain of command for emergency action;
- Educate Site personnel to the hazards and control measures associated with planned activities at the Site and to provide early recognition and prevention where possible; and
- Establish, communicate, and post emergency evacuation routes for Site emergencies.

2.3 Emergency Recognition and Prevention

2.3.1 Recognition

Foreseeable emergency situations that may be encountered during Site activities will generally be recognizable by visual observation. Visual observation is primarily relevant for physical hazards that may be associated with the proposed scope of work. Visual observation may also play a role in detecting some chemical exposures (e.g., direct reading instruments, physical appearance of affected personnel, vapor cloud or haze). To adequately recognize exposures to site contaminants, Site personnel must have a clear knowledge of specific action levels for the contaminants of concern, and signs and symptoms of exposure associated with potential Site contaminants shown in Table 5.1: Contaminants of Concern. If Site personnel recognize new, previously unidentified hazards, they must report the potential hazard to the SSO immediately.

Should an incident occur, Site personnel will take measures in the beginning stages to control these situations. However, if the SSO assesses that an incident has progressed to a serious emergency situation; Site personnel will withdraw from the affected areas of the Site into the assembly area, and notify the appropriate response agencies listed in Table 2.1.

2.3.2 Prevention

Site personnel will minimize the potential for emergencies by following the direction and guidance provided within the HASP and applicable OSHA regulations for the tasks to be conducted. Additionally, prevention will be facilitated through employment of preventative measures in removing or restricting access to hazards identified through the Site survey activities.

2.4 Safe Distances and Places of Refuge

In the event that the Site must be evacuated, personnel will immediately stop activities and report to the designated safe place of refuge on the west side of the commercial building, immediately adjacent to the Remediation System Room (Figure 2). If necessary, alternate safe places of refuge will be identified prior to the commencement of Site activities and will be conveyed to Site personnel as part of daily health and safety briefings, which are conducted to preview hazards and control measures identified for the planned tasks. During an evacuation, personnel will remain at the refuge location until directed otherwise by the SSO. The SSO will take a head count at this location to account for and to confirm the location of all Site personnel. Emergency response personnel will be immediately notified of any unaccounted Site personnel.

2.5 Evacuation Routes and Procedures

An evacuation to the identified place of refuge will be initiated whenever the health, safety or welfare of Site workers is compromised. Specific examples of conditions that may initiate an evacuation include, but are not limited to, severe weather conditions; fire or explosion; monitoring instrument readings above prescribed action levels; and personnel showing signs or symptoms of potential overexposure to Site contaminants, or other medical emergency. In the event of an evacuation, personnel will proceed immediately to the designated place of refuge unless doing so would further jeopardize the welfare of workers. In such an event, personnel will proceed to a designated alternate location and remain until further notification from SSO or FOL.

Evacuation procedures will be discussed prior to the initiation of any Site work. Evacuation routes from the Site to safe places of refuge are dependent upon the location at which work is being performed and the circumstances under which an evacuation is required. Additionally, Site location and meteorological conditions (i.e., wind speed and direction) may dictate evacuation routes. As a result, assembly points will be selected and communicated to the workers relative to the Site location where work is being performed.

2.6 Decontamination Procedures/Emergency Medical Treatment

During an evacuation, decontamination procedures will be performed only if doing so does not further jeopardize the welfare of Site personnel. However, it is unlikely that an evacuation would occur at this Site which would require personnel to evacuate the Site without first performing decontamination procedures. If qualified and properly trained to do so, Site personnel will provide medical treatment to the level of first aid. Personnel requiring treatment greater than basic first aid will constitute an emergency situation for which the appropriate agency must be notified. First aid kits will be maintained at the Site and accessible to Site personnel during operations as described within this document.

In the unlikely event of chemical overexposure, the following general response measures will be implemented:

Dermal Contact: Remove contaminated clothing. Wash skin immediately with water. Use soap if available. First aid kits and spill kits contain antibacterial soap.

Eye Splash: Flush eye with water for at least 15 minutes. Call 911 for ambulance transport of person to hospital if irritation/injury persists, or if acid or alkaline materials are involved. An eye wash station is located in the Remediation System Room.

Inhalation: Remove person from contaminated atmosphere. Use artificial respiration if necessary. Call 911 for ambulance transport of person to hospital.

Ingestion: Do NOT induce vomiting on an unconscious person or when acids, alkalis, or petroleum products are suspected. Contact the Poison Control Center. Call 911 for ambulance transport of person to hospital.

2.7 Emergency Alerting and Action/Response Procedures

Personnel will generally be working in close proximity to each other at this Site. As a result, hand signals, voice commands, and air horns will be sufficient to alert Site personnel of an emergency. When multiple teams will be working simultaneously as part of this project, two-way radios or cell phones will be used to communicate between teams of workers.

If an emergency occurs, the following procedures are to be initiated:

- Initiate an evacuation by hand signals, voice commands, mega phone, cell phone or two-way radios,
- Report to the designated refuge point,

- Describe to the SSO what has occurred and as many details as possible. Once Site personnel are evacuated, appropriate beginning stage response procedures will be enacted to control the situation.

In the event that Site personnel cannot control the incident through preventative measures, the SSO will enact emergency notification procedures to secure additional assistance in the following manner:

- Call 911 or other emergency contacts (Table 2.1) and report the emergency. Give the emergency operator the location of the emergency, the type of emergency, the number of persons injured, and a brief description of what occurred. Stay on the phone and follow the instructions give by the operator. The operator will then notify and dispatch the proper emergency response agencies.
- Call the PM, after notifying the appropriate emergency response agency, to inform them of the condition or situation requiring notification of the emergency response agency.

2.8 PPE and Emergency Equipment

A first aid kit, eyewash units, and fire extinguishers will be maintained the at active work locations and will be immediately available for use in the event of an emergency. Personal protective equipment (PPE) used in daily activities will serve as the primary defense for chemical hazards encountered. Situations surpassing the level of protection offered by the prescribed PPE will constitute an emergency and require evacuation and notification of the appropriate response agency.

2.9 Emergency Contacts

Prior to performing work at the Site, personnel will be thoroughly briefed on the emergency procedures to be followed in the event of an accident. Table 2.1 provides a list of emergency contacts and their associated telephone numbers. This table must be posted on-Site where it is readily available to Site personnel. The location of posted emergency information is described in Section 10.0.

Table 2.1: Emergency Contacts

Contact	Phone Number
Fire, Ambulance, Police	**911**
Rockland County Sheriff's Department	**845-638-5400**
New York State Police (Troop F)	**845-344-5300**
Nyack Hospital	
Main No.	**845-348-2110**
Emergency Room	**845-348-2345**
NYSDEC Project Manager – Michelle Tipple	**845-256-3000**
Poison Control (Nyack Hospital)	**1-800-336-6997**

DIG SAFE – New York	**315-437-7394**
Site Safety Officer/Project Health and Safety Officer	
Richard S. Totino	
Office	**1-800-229-1443**
Cell	**518-281-5436**

Table 2.1: Emergency Contacts (cont.)

Contact	Phone Number
Sequa/Chromalloy Contact – Steven Lowson, Esq.	**212-986-5500**
Project Engineer – The Payne Firm, Inc.	
Mathew D. Bell	**518-461-8717**
Richard S. Totino	**518-281-5436**

2.10 Injury and Illness Reporting

After the initial response (e.g., first aid, etc.) to an injury or illness has taken place, the incidence and details of the injury or illness must be properly reported and documented. Incidences must be reported immediately to the Payne Firm Project Manager. Within one (1) hour of occurrence, any occupational injury or illness must be reported to the SSO at **1-800-229-1443** or by cell at **518-281-5436**. The appropriate Incident Report Form (OSHA 301 Incident Report Form) must be completed by the PM and submitted to the SSO within two working days of the event. A copy of this form will be maintained in the Health and Safety Manual at the Site, which will be located at the Payne Firm's Troy, New York office.

It should be noted that "near misses" as well as actual injuries and illnesses should be reported. By identifying near miss situations, possible recommendations for preventing a recurrence can be made.

2.11 Emergency Inventory

In addition to those items specified elsewhere, the SSO will maintain in the Remediation System Room the following protective clothing and equipment in the event of emergencies:

- Chemical-resistant gloves (inner and outer) – inner nitrile rubber, outer nitrile rubber;
- Hard hats;
- Face shields or safety glasses with side shields;
- Chemical-resistant disposable boot covers (latex rubber);
- Disposable chemical-resistant suit (coated chemical-resistant Tyvek©);
- Emergency eye wash apparatus (five-gallon minimum if working with corrosives or pure product),
- First aid kit;
- Fire extinguisher; and

- Potable water available at Remediation System Room.

3.0 SCOPE OF WORK

This section discusses the activities that are performed at the Former Chromalloy Facility Site. Appendix C of this HASP provides information related to each of the tasks that are to be performed as part of the Scope of Work. If tasks other than those described below are performed at the Site, this section and this HASP will be modified accordingly.

Payne Firm and subcontractor Site personnel will conduct the following Site operations:

- Mobilization and Demobilization of personnel and equipment;
- Pump and Treat (P&T) and Dual-Phase Extraction (DPE) Remediation System Operation and Maintenance (O&M);
- Operation and maintenance of Anaerobic Reductive De-chlorination (ARD) system and components located at the northern end of Pineview Road;
- Routine ground water sampling;
- Routine surface water sampling; and
- Excavation of contaminated soil in the vicinity of the former commercial building.

4.0 TASKS, HAZARDS AND ASSOCIATED CONTROL MEASURES

This section serves as the primary portion of the HASP summarizing the tasks, hazards and associated control measures currently applied on the Site. This section will be modified and supplemental information incorporated into this document as new or additional tasks are performed at the Site.

The anticipated hazards, recommended control measure, air monitoring recommendations, required PPE, and decontamination measures for each Site task are discussed in detail. This section shall be revised if the Scope of Work, contaminants of concern or other conditions change. Information in this section will enable Site personnel to assess which hazards are associated with each task at the Site, and what associated control measures are necessary to minimize potential exposure or injuries related to those hazards. This section also assists field team members in assessing which PPE and decontamination procedures to use based on proper air monitoring techniques and Site-specific conditions.

4.1 Air Monitoring

If it is assessed by the SSO that Site activities will result in a potential exposure to air-borne contaminants by Site personnel, the SSO will record and document prescribed air monitoring data on the daily health and safety report. Calibration data sheets for all field instruments will also be prepared. The daily health and safety report and calibration data sheets are provided in Appendix D.

A direct-reading instrument will be used to detect volatile organic compounds at potential source areas (e.g., well head, soil core) as applicable. Source monitoring will be conducted at regular intervals to be determined by the SSO. Depending on readings obtained, the SSO will modify the frequency of monitoring. Positive sustained results at a source or downwind location(s) which exceed 50% of the contaminant PEL (Table 1.1) and may affect Site personnel will require actions in accordance with OSHA and NIOSH regulations as described in Section 6.0 of this document.

4.2 Personal Protective Equipment

PPE selection is determined by the chemical hazard, expected concentrations (in air, soil, ground water, surface water or other media), route of exposure, and availability of appropriate chemical-resistant materials. During field operations, the SSO can determine and/or modify PPE levels and components based on specific conditions related to each activity. The table below details the required attire and equipment applicable to the PPE Levels anticipated at this Site.

Table 4.1: Levels of Personal Protective Equipment

PPE Level	Components
Level D	Coveralls or durable clothing Boots/shoes, steel toe and shank Safety glasses with side shields Hard hat (if overhead hazards are present)
Level D Modified	Poly-coated Tyvek© coveralls (if needed) Chemical-resistant gloves (nitrile or neoprene rubber) Boots/shoes, steel toe and shank Chemical-resistant boot covers (latex rubber) Safety glasses with side shields or goggles Hard hat (if overhead hazards are present) Hearing protection (if needed)
Level C	Full-face or half-mask, air purifying respirators (NIOSH-approved) Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls) Coveralls Gloves, outer, chemical-resistant Gloves, inner, chemical-resistant Boots (outer), chemical-resistant steel toe and shank Boot-covers, outer, chemical-resistant (disposable) Hard hat Face shield

Area evacuation or Level C protection will be required as determined by the SSO (typically when action levels are exceeded or if airborne concentrations or organic vapors cannot be adequately controlled to background levels in the breathing zone).

4.3 Decontamination Procedures

The following personnel and equipment decontamination procedures shall be initiated, as determined to be necessary by the SSO upon completion of each task. For each task, three decontamination zones will be established as necessary. The three zones denoted by means of decontamination are the Contamination

Reduction Zone (CRZ), Exclusion Zone, and Support Zone. Refer to Section 10.0 for further details of the three Zones.

4.3.1 Personnel Decontamination

Personnel decontamination will consist of a soap/water wash and rinse for outer protective equipment (e.g., boots, gloves, polyvinyl chloride (PVC) splash suits, etc.). This function will take place at an area adjacent to the sampling operations bordering the support zone.

The decontamination procedure for modified Level D protection will consist of:

- Equipment drop;
- Soap/water wash and rinse of outer gloves and outer boots, as applicable;
- Soap/water wash and rinse of the outer splash suit, as applicable;
- Wash hands and face; and
- Leave contamination reduction zone.

Decontamination of Level C protection, if necessary, in addition to that described above, shall also include:

- Respirator cartridge change out;
- Respiratory (face mask) protection removal;
- Soap/water wash and rinse of outer gloves and outer boots, as applicable;
- Outer suit, boot covers, outer glove removal;
- Wash hands and face; and
- Leave contamination reduction zone.

4.3.2 Equipment Decontamination

All equipment decontamination will take place at a centralized decontamination area utilizing standard decontamination solutions or steam or pressure washers as needed. All vehicles will have restricted access to exclusion zones, and also have their wheels/tires sprayed off so as not to track mud onto the roadways servicing the activities. Roadways shall be cleared of any soil, sedimentation or debris resulting from the on-Site activity.

All equipment used in designated exclusion zones will require a complete decontamination between locations and prior to removal from the Site. The SSO will be responsible for evaluating equipment arriving on-Site and leaving the Site. No equipment will be authorized access or exit without this evaluation, which will consist of a visual inspection and scan of equipment with air monitoring instruments as applicable or appropriate.

5.0 ACTIVITIES HAZARD ANALYSES

This section provides information regarding the chemical, physical, and biological hazards that may be associated with the Site and the specific activities that are conducted as part of the scope of work. Appendix C contains the Activity Hazard Analyses (AHA) for the activities anticipated to be conducted at the Site. Should future investigative or remedial activities require additional hazard analyses, these AHA's will be incorporated into Appendix C as an Addendum.

5.1 Chemical Hazards

Table 5.1 shows the chemicals found on the Former Chromalloy Facility Site, their permissible exposure limit (PEL), recommended exposure limit (REL), time-weighted average threshold limit value, and immediately dangerous to life and health (IDLH) values, flammability characteristics (lower explosive limit (LEL), upper explosive limit (UEL), flash point and auto-ignition temperature, solubility, ionization potential, vapor pressure and density, odor threshold, toxic effects, and whether or not a respirator should be used.

Table 5.1: Former Chromalloy Facility Site Chemicals of Concern Air Limits, Exposure Limits and Physical Data

Property	Compound/Element				
	TCE	PCE	MC	Chromium (Cr3)	Chromium (Cr6)
Synonyms	Trichloroethene, Ethylene Trichloride	Tetrachloroethene, Perchloroethene	Methylene Chloride, Dichloromethane	Chromic ion, Trivalent Chromium	Chromium Oxide, Chromium Dioxide
ACGIH TLV (ppm)	50	50	50	0.5	0.05 mg/m3
NIOSH REL (ppm)	25	b	d	0.5	1.0 ug/m3
OSHA PEL (ppm)	100	100	500	0.5	5 ug/m3
NIOSH IDLH (ppm)	Carcinogen	Carcinogen	Carcinogen	Non-toxic	15 mg/m3
LEL (%)	11	Noncombustible	12	N/A	N/A
UEL (%)	41	Noncombustible	19	N/A	N/A
Flash Point	Noncombustible	Noncombustible	N/A	N/A	N/A
Auto-Ignition Temperature (F)	788	N/A	1033	N/A	N/A
Vapor Pressure (mm Hg)	58	14	350	N/A	N/A
Vapor Density	4.8	6.86	2.9	N/A	N/A
Ionization Potential (eV)	9.47	9.32	11.35	N/A	N/A

Property	Compound/Element				
	TCE	PCE	MC	Chromium (Cr3)	Chromium (Cr6)
Solubility	1000 mg/L	160-240 mg/L	1320 mg/L	0.1mg/L (pH=7.0)	1680g/L
Odor Threshold (ppm)	21.4 – 400	4.7 – 50	25 – 320	N/A	N/A
Respiratory Protection	No	No	No	No	Yes
Toxic Effects	Headache, vertigo, visual disturbance, tremors, eye irritation, nausea, vomiting, dermal irritation, cardiac arrest	Eye, nose and throat irritation, nausea, flushed face and neck, vertigo, dizziness, incoherence, headache	Fatigue, weakness, sleepiness, light headache, limb numbness or tingling, nausea, eye and skin irritation, vertigo	Non-toxic	Eye and skin irritation, difficulty breathing, headache
	N/A = Not Applicable or Not Established				

A review of the Former Chromalloy Facility Site groundwater and soil quality databases was completed to evaluate whether any additional chemical constituents have been detected at the Site or whether any concentration changes have occurred which might affect health and safety risks to Site personnel. There have been no significant changes in chemical constituents or concentrations since the initial workplace hazard assessment conducted by Environmental Alliance, Inc. in 1994.

Potential routes of exposure are dermal or eye (splash) contact with contaminated materials (soil, water, decontamination fluids) and inhalation of airborne contaminants (gases, vapors, mists, fumes, or dusts) generated or released during Site activities. To a lesser degree, incidental ingestion of Site contaminants as a result of improper PPE usage or decontamination is another potential route of exposure. The Activity Hazard Analyses presented in Appendix C provide various control methods that will be used to minimize potential exposures to Site personnel.

Chemicals used to decontaminate sampling equipment and to preserve environmental samples also present hazards to the Site personnel who handle them. These include chemicals such as isopropyl alcohol, Alconox® detergent, hexane, methanol, and hydrochloric and nitric acids. In order to communicate the hazards of these chemicals to Site personnel, MSDS sheets for each of these chemicals used on Site will be maintained as part of field records and presented as part of the Site-specific training.

5.2 Physical Hazards

In addition to the chemical hazards discussed above, the following physical hazards may be present during Site activities. These physical hazards and their applicability to each Site task are discussed in detail in Appendix C.

- Contact/entanglement with drilling rotating or direct hammer (DPT) equipment or machinery;

- Slips, trips, and falls;
- Contact with underground or overhead utilities (electric, gas, and water lines, etc.);
- Muscle strain from heavy lifting;
- Pinch/compression points;
- Noise in excess of 85 decibels (dBA);
- Thermal stress and inclement weather (depending on season); and
- Heavy equipment operations and vehicle hazards.

The ConRail line that runs adjacent to the Site is an active line. There is a stop sign where the road crosses the tracks; however, there are no flashing lights or gate to signal that a train is approaching. All Site personnel must stop, look and listen at the crossing before proceeding to ensure that a train is not on the tracks.

5.2.1 Slip, Trip and Fall Hazards

Workers should exercise caution when walking around the Site to avoid slip, trip, and fall hazards. If holes or uneven terrain are located in the work area, they must be covered, flagged or marked to warn workers. If conditions become slippery, workers should take small steps with their feet pointed outward to decrease the possibility of slipping. Gravel, sand, or other appropriate material should be spread in wet or muddy areas to reduce the change of slipping. Calcium carbonate will be spread on walkways as needed during the winter months. Workers should watch where they are walking and plan to walk in areas of good stability (designated walkways).

5.2.2 Noise Hazards

Heavy equipment such as drilling rigs, excavation machinery, pumps and generators may produce continuous or impact noise at or above the OSHA action level of 85 dBA. Exposure to excessive noise levels can result in temporary or permanent hearing loss. Personnel stationed within 25 feet of operating equipment or near an operation that creates noise levels high enough to impair conversation will wear hearing protection (i.e., ear plugs or muffs).

5.2.3 Manual Lifting Hazards

Injuries resulting from materials handling tasks are usually the result of unsafe work habits, such as improper lifting technique, carrying too heavy a load, incorrect gripping, or failing to wear PPE. These guidelines will be followed whenever lifting equipment such as portable generators, coolers filled with samples, manhole covers, or any other objects of odd size or shape, or that weigh over 40 pounds.

- Get help when lifting heavy loads. Portable generators should be lifted by at least two people.
- When moving heavy objects such as drums or containers, use a dolly, fork truck, or other means of assistance (truck ramps).
- Plan the lift. If lifting a heavy object, plan the route and where to place the object. Agree on communication signals (i.e., “1, 2, 3, lift”).

- Wear sturdy shoes in good condition that supply traction when performing lifts.
- Keep your back straight and head aligned during the lift. Use your legs to lift the load. Do not twist or bend from the waist. Keep the load in front of you.
- Keep the heavy part of the load close to your body to maintain your balance.

5.2.4 Drilling Rigs and Trucks

General requirements are:

- Operators must be fully trained in the proper use of the equipment, and must be familiar with the limitations of the equipment and applicable conditions of use.
- The equipment must be inspected daily (or before each use) to detect safety violations or defects.
- The operator should not leave the unit unless the load is lowered, the control level is placed in neutral, and the power is shut off, and the brakes are set. The wheels must be blocked if parked on an incline.
- If used or uneven terrain, the truck must be equipped with rollover protection.
- Gasoline and propane-powered trucks can be a problem in enclosed areas because of the possible accumulation of carbon monoxide from the truck exhaust, and must be monitored accordingly and as appropriate.

5.2.5 Electrical Hazards

Safe work practices will be used to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts. OSHA requirements and national and local electrical codes will be followed. A professional electrician should be consulted when necessary. Overhead power lines, downed electrical wires, and buried cables pose a danger of shock or electrocution if workers contact or sever them during field operations.

To minimize electrical hazards, low voltage (below 250 volts AC) equipment with ground fault circuit interrupters (GFCIs) and water-tight, corrosion-resistant cables must be used for outdoor work on-Site. GFCIs must be used on circuits carrying electrical power from an indoor source or a portable generator to outdoor equipment or lighting. Worn switches and wiring should be replaced immediately. Equipment should also be properly grounded for protection against shock, static electricity, and lighting. The ignition of flammable vapors from spark-producing equipment also poses a hazard.

5.2.6 Underground Utilities

The PM is responsible for identifying underground utility locations prior to commencement of any subsurface activities. Resources include a professional electrician, Site plans, utility companies, and third party utility locating services. If determined to be appropriate by the SSO, the proper utility company personnel will certify utility de-activation and the certification will be retained in the permanent log. An Underground Utilities Protection Organization (UFPO) such as DigSafe-New York must be contacted for mark-out public utilities as necessary.

5.2.7 Thermal Stress

Heat Stress

If work is conducted during warm or hot weather, heat stress is recognized health and safety hazard. Cool drinking water will be made available to personnel and its use will be encouraged. The ambient air temperature will be monitored with a digital thermometer and general weather conditions will be recorded in the Site field log-book daily when the temperature is expected to be above 70 degrees Fahrenheit (F). Generally, heat stress can be reduced by:

- Acclimating the body slowly; a period of adjustment will be allowed to make further heat exposure endurable. Acclimation can be lost if a worker is away from the heat for two weeks or more;
- Drinking more liquids (water or diluted electrolyte drinks) to replace body water lost through sweating;
- Resting frequently;
- Get out of the sun;
- Drink water before going out in the field; and
- Do not drink alcohol and avoid caffeine, and do not smoke.

Cold Stress

During winter months, cold stress or hypothermia is a potential health and safety hazard. Environmental and individual factors such as wind and rain, inadequate clothing, physical exhaustion, immersion into cold water, and exposed extremities may lead to cold stress. Cold stress is life-threatening when the deep core body temperature falls below 95 degrees F.

Preventative measures include:

- Prior to cold exposure, eat properly and rest well;
- Drink three to four quarts of fluid per day;
- Wear windproof and waterproof protective outerwear over properly layered clothing;
- Carry emergency survival equipment;
- Remove outer clothing layers when overly warm; replace layer as needed; and
- Do isometric exercises to keep heat production high.

The use of Tyvek© coveralls or other protective clothing is a special concern. Tyvek© coveralls do not breathe and therefore do not vent perspiration. During strenuous physical activity, a worker's inner layer of clothes can become wet, which, when combined with cold temperatures, can lead to hypothermia. Wet clothes should be removed and an extra set of work clothes should be available for change-out into dry clothes if workers must work outdoors in cold weather.

5.3 Biological Hazards

During field activities, Site personnel may encounter various natural hazards. These hazards include, but are not limited to the following:

- Insect bites and stings;
- Vector-transmitted illnesses (e.g., ticks and mosquitoes);
- Snakes, wild cats/dogs, foxes and other wild animal encounters; and/or
- Poisonous plants (e.g., poison oak, sumac, ivy).

Employees who may be exposed to harmful plants or animals shall be instructed regarding the procedures to be used in the event of injury. In order to minimize or eliminate these hazards, the following control measures will be enacted where possible.

5.3.1 Insect Bites and Stings

Insect bites and stings are difficult to control given the environmental setting of the Site. However, in an effort to minimize this hazard, the following control measures will be initiated where possible:

- Loose-fitting clothing with long sleeves, where possible (given heat stress considerations), should be worn to provide a barrier between the field person and the insects. Commercially available insect repellents can be used if necessary. Products containing DEET should not be applied directly to the skin due to potential irritation. This product should be applied over clothing articles. For mosquito-infested areas, mosquito nets may also be used.
- The SSO will preview access routes and work areas in effort to identify physical hazards including nesting areas in and around the work areas. These areas will be communicated to Site personnel.
- Personnel will be directed in the administration of antidotes for personnel who suffer allergic reactions to bee stings. Dermal applications for the bit areas will be maintained as part of the first-aid station in Building 4A.

It is important that allergies be reported on the medical data sheets and to the SSO. Additionally, any specific procedure for administering treatment as directed by your physician must also be communicated to ensure the quickest and most effective response possible.

5.3.2 Vector-Transmitted Illnesses

Ticks and mosquitoes are the primary vectors of concern at this Site. These insects have been identified in the transmission of diseases including Lyme disease, malaria, and West Nile Virus encephalitis. The greatest risk of contact occurs during the warm months (spring through early fall). Information concerning vector-transmitted Lyme disease including recognition, evaluation, tick removal, and control can be provided by the SSO if necessary.

5.3.3 Snakes and Other Wild Animals

Indigenous animals including snakes (poisonous and non-poisonous varieties), wild dogs, foxes, raccoons, eastern rattlesnake and other animals native to the region may be encountered during field operations. Some of the work locations may encroach on nesting areas or territories claimed by these animals.

To avoid the hazards conveyed as part of a direct encounter, the following actions will be taken to minimize impact on field crews and/or Site operations.

- The SSO will preview access routes and work locations for nesting areas, signs or animal activities (i.e., tracks, foraging areas, etc.). Identified suspect areas will be communicated to the field crews. Where avoidance of these areas or the animals which inhabit them is not possible, the relocation of animals and nests will be done through the coordination of the New York Fish and Wildlife Commission.

As stated above, Site personnel should avoid, where possible, nesting and territorial areas claimed by reptiles. However, should Site personnel receive a bite, the following actions are necessary.

- Obtain a detailed description of the snake. This and the bite mark will enable medical personnel administering medical aid to provide prompt and correct antidotes, as necessary;
- Immobilize the bite victim to the greatest extent possible. Physical exertion will mobilize the toxins (if poisonous varieties) from the bit point systemically through the body;
- Apply a pressure wrap (for extremities) just above and over the bite area. With a couple of wraps of the pressure wrap in place over the bite area, apply a splint, and continue the application of the pressure wrap. The purpose for the splint is to restrict the movement of the extremity.

- Seek medical attention immediately.

5.3.4 Poisonous Plants

Various plants that can cause an allergic reaction may be encountered during Site work. These include, but are limited to, poison ivy, poison oak, and poison sumac. Contact may occur when clearing vegetation to gain access to work areas. Oils from the plant are transferred to exposed skin or clothing.

Protective measures to control and minimize the effects of poisonous plants include the following:

- Identify plants for field personnel. These are as follows:
  - Poison Ivy – Suspect plants are characterized as climbing shrubbery, three-leaf configuration ovate to elliptical in shape, greenish flowers, and white berries that produce irritating oils.
  - Poison Sumac – Suspect plants are characterized as a tall bush of the sumac family bearing compound leaves (7-13 entire leaflets), branched from a central axis, drooping, with auxiliary clusters of white fruit producing irritating oils.

- Poison Oak – Suspect plants are characterized as similar to poison ivy consisting of a shrub, stems erect, 0.3 to 2.0 meters tall, leaflets consist of broad thick lobes with coarsely serrated configuration, denser at the base, less than the top.

Protective measures may include the use of disposable garments such as Tyvek© when clearing brush. After use, remove and properly dispose of disposable PPE, and do not reuse.

Personal Hygiene – The oils from the plants will only elicit an allergic response when the person's protective skin layer is penetrated. This can accomplished through open pores when perspiring, cuts, scratches, etc. This can be accomplished when using excessively hot water for cleaning the skin, which also causes pores to open. Immediately wash with rubbing alcohol (isopropyl alcohol) or cool water and soap to remove or neutralize as much of the oils as possible. In heavily vegetated areas of these plants, additional measures including barrier creams and blocks (e.g., Ivyblock™) may be used to prevent the oils from accessing and penetrating the dermal layer.

5.3.5 Bloodborne Pathogens

A thorough review of site conditions and anticipated Site activities are not likely to result in Site personnel exposure to blood borne pathogens. In the unlikely event that exposure to blood borne pathogens arises, Universal Precautions will be observed at all locations to prevent contact with blood or other potentially infectious materials. If possible, personnel will be allowed to self-treat minor injuries, cuts or scrapes using a first aid kit. All blood or other potentially infectious materials will be considered infectious regardless of the perceived status of the source of the individual. The following general measures will be adhered to if and when exposure to blood borne pathogens is considered possible:

- Do not touch blood or other potentially infectious material if at possible;
- Hands or other skin surfaces will be washed immediately if contaminated with blood or other bodily fluids;
- Any items such as knife blades, broken glass or equipment will be disposed of in a puncture and leak-proof container labeled for disposal of such items;
- To minimize exposure to body fluids during CPR, non-reflective breathers or other disposable aids will be used; and
- If clothing is contaminated, it is to be removed as soon as possible.

5.4 New Technology Programs

In accordance with 1910.120 (o)(1) and (2), Payne Firm is required to develop and implement procedures for the introduction of effective new technologies and equipment developed for the improved protection of employees working with hazardous waste clean-up operations at the Former Chromalloy Facility Site. These programs will be implemented as part of the Site safety and health program to assure that employee protection is being maintained.

Equipment or control measures available to the industry, such as the use of foams, absorbents, neutralizers, or other means to suppress the level of air contaminants during excavating or for spill control, will be evaluated by Site personnel. These evaluations will be done to determine the effectiveness of the new methods, materials, or equipment before implementing their use on a large scale for enhancing employee protection.

6.0 HAZARD MONITORING

This section presents requirements for the use of real-time air monitoring instruments during Site activities. It establishes the types of instruments to be used. Information on specific instrumentation, the frequency at which they are to be used, techniques for their use, and the action levels for upgrading/downgrading levels of protection are addressed in Table 5-2 of this document. During field operations, the SSO is responsible for assessing the need and applicability for hazard monitoring and, if necessary, modifying hazard monitoring frequencies, duration and techniques based on the conditions associated with each activity.

6.1 Instruments and Use

Real-time monitoring instruments will be used to monitor source areas (i.e., sample locations, wells, etc.) and worker breathing zones as determined to be applicable by the SSO. Action levels are discussed in the Activities Hazard Analyses in Appendix C as applicable to a specific task or location. This approach (coupled with the use of PPE and the observance of the other control requirements presented in this HASP) has been selected to minimize potential for personnel exposures to hazardous concentrations of airborne contaminants. These instruments will be utilized as screening tools to detect the airborne presence of some of the Site contaminants identified in Table 5.1.

Additionally, long-term sampling methods may be used for personal and area air sampling for various Site contaminants (e.g., VOCs) as deemed appropriate by the SSO/PSHO.

6.1.1 Atmospheric Monitoring Equipment

Generally, a flame-ionization detector (FID) such as a Photovac MicroFID, a photo-ionization detector (PID) such as an HNU PI-101, or an Organic Vapor Analyzer (OVA) such as a 3M 3520, or equivalent will be used to assess the levels of protection.

The approximate detection range of the MicroFID is from 0.5 to 50,000 ppm, and the HNU PID detection range is approximately 1.0 to 2000 ppm. However, the detection ranges on these types of instruments are not linear throughout the range. For example, if calibrated to benzene, the response (for the HNU PID) is linear from about 0-600 units above background. This means the HNU reads a true concentration of benzene only between 0 and 600. Greater concentrations will be detected at a lower level than the true value. Both of these instruments typically have manual or automatic data logging capacity to allow independent storage of a background level, a sample reading, and a calculated difference from each sample or location.

If the SSO determines that scheduled Site activities have the potential for exposure to air-borne contaminants by Site personnel, prior to the commencement of any field activities, the background levels of the Site will be measured and noted. Background readings will be taken away from any areas of potential contamination, typically at a reasonable distance away from the activity area, or at the assembly area adjacent to the Former Chromalloy Facility building. The areas of the site to be worked on that day will be monitored initially and throughout the day. During any invasive type work (e.g., drilling or well installation) continuous air monitoring with the PID will be performed in the breathing zone (i.e., 4-6 feet above the ground surface). If visible dust is observed which may exceed the PEL during any activities, a particulate monitor (e. g., RAM-1) will be used. These readings, any influencing conditions (i.e., weather, temperature, and humidity), location, and the other information will be recorded in the field operations logbook or on the daily health and safety report.

Most of the chemicals identified in Table 5.1 can be filtered with some efficiency by a respirator fitted with an organic vapor cartridge. However, based on data obtained throughout the investigative phases of this Site, an air respirator will not be required for most of the on-Site work.

Air monitoring done as necessary during the course of Site work will ultimately determine the levels of protection. Since TCE is the major compound found in the highest concentrations, the HNU span setting should be set at 8.2 for an optimal reading of TCE concentration. TCE has a REL of 25 ppm, therefore, the following guideline should be used to upgrade from Level D to Level C: If the HNU reading is greater than 20 ppm above background in the breathing zone (sustained), upgrade to Level C may be warranted. If the reading is greater than 500 ppm above background level in the breathing zone (sustained), then upgrade to Level B is recommended. This number is based on the immediate danger to life and health (IDLH) level of tetrachloroethene of 500 ppm. The IDLH of TCE is 1000 ppm, therefore using 500 ppm as the action level is conservative. In addition, if the reading on the OVA exceeds 20 ppm (sustained) and the reading is not due to methane (as determined by using a methane filter), upgrade to Level C may be warranted.

Whenever the action level of 20 ppm is exceeded on a sustained basis, readings at the site perimeter downwind of the location and closest to the residences will be taken. If the 20 ppm action level is exceeded at the site perimeter all site operations will cease until the levels decrease.

6.1.2 Hazard Monitoring Frequency

Appendix C presents the frequencies that hazard monitoring will be required to be conducted and the action levels indicating when elevated levels of protection are necessary, as it may apply to the tasks to be conducted. However, based on instrument responses and general site observations, the SSO may decide to modify these frequencies.

6.2 Instrument Maintenance and Calibration

Hazard monitoring instruments will be maintained and field calibrated by Payne Firm or subcontractor personnel. Operational checks and field calibration will be performed on instruments each day prior to their use. Field calibration will be performed on instruments according to manufacturer's recommendations. These operational checks and calibration efforts will be performed in a manner that complies with the employee's health and safety training, the manufacturer's recommendations, and with the applicable manufacturer standard operating procedure. Calibration measurements must be documented in the daily or field sampling log book, or on the Daily Health and Safety Report. This required information includes the following:

- Date calibration was performed;
- Individual calibrating the instrument;
- Instrument name, model, and serial number;
- Any relevant instrument settings and resultant readings (before and after) calibration;
- Identification of the calibration standard (lot no., source concentration, supplier); and
- Any relevant comments or remarks.

6.3 Particulates

It is anticipated that dusts may be generated as a result of some intrusive construction activities. If dusts are generated during Site operations, exposure to these dusts will be minimized by the use of area wetting methods and/or avoidance of the dusts (moving upwind of source, evacuation, etc.). If the SSO determines that there is a potential for exposure to dusts by Site personnel or nearby residents, respirable dust monitoring will be utilized to measure the respirable dust concentration.

7.0 TRAINING/MEDICAL SURVEILLANCE REQUIREMENTS

7.1 Introduction/Refresher/Supervisor Training

This section is included to specify health and safety training and medical surveillance requirements for both Payne Firm and subcontractor personnel in Site activities.

7.1.1 Requirements for Payne Firm Personnel

Payne Firm personnel must complete 40 hours of introductory hazardous waste training as defined in OSHA Standard 29 CFR 1910.120(e) and eight houses of refresher training meeting the requirements of 29 CFR 1910.120(e)(8) or other applicable standards prior to performing work at the Site. Additionally, Payne Firm personnel who have had the introductory training more than 12 months prior to Site work must have completed eight-hour refresher training. Copies of certificates or other official documentation will be used to fulfill this requirement, and are posted in the Remediation System Room at the site.

Payne Firm will also conduct a brief daily meeting to discuss operations planned for that day. When appropriate, a short meeting will be held to discuss the operations and any problems encountered.

7.1.2 Requirements for Subcontractors

As determined applicable and/or necessary by the SSO, subcontractor personnel must have completed 40 hours of introductory hazardous waste training or equivalent work experience as defined in OSHA Standard 29 CFR 1910.120(e) and eight hours of refresher training meeting the requirements of 29 CFR 1910.120(e)(8) or other applicable standards prior to performing field work at the Site. Subcontractor personnel serving as supervisors must also provide documentation of Supervisory training in accordance with 29 CFR 1910.120(e)(4). Payne Firm subcontractors must certify that each employee has had such training by providing copies of certificates for subcontractor personnel participating in Site activities.

7.2 Site-Specific Training

Payne Firm will provide Site-specific training to Payne Firm employees and subcontractor personnel who will perform work on this Site. Site-specific training will include:

- Contents of this HASP;
- Emergency response procedures (evacuation and assembly points);
- Names of designated personnel and alternates responsible for Site safety and health;
- Hazards present on Site;
- Use of PPE;
- Work practices to minimize risks from hazards;
- Safe use of engineering controls and equipment;
- Medical surveillance requirements;
- Signs and symptoms of overexposure;
- Medical surveillance requirements;
- Signs and symptoms of overexposure;
- Spill response procedures; and
- Review of the contents of relevant MSDS.

7.3 Medical Surveillance

7.3.1 Medical Surveillance Requirements for Payne Firm Personnel

Payne Firm personnel participating in Site field activities will be medically qualified to perform work using respiratory protection.

7.3.2 Medical Surveillance Requirements for Subcontractors

As determined by the SSO, subcontractors working on the Site who are subject to the regulations stipulated in Section 1.0 are required to provide certification that they actively participate in a Medical Surveillance program, including documentation that all personnel have participated in a drug screen testing program. Certificates for medical clearances must be forwarded to the SSO prior to beginning work on the Site.

7.4 Subcontractor Exceptions

Subcontractors who will not enter the exclusion zone during Site operations or whose activities involve no potential exposure to Site contaminants may not be required to meet the requirements for training/medical surveillance as described in Section 7.3. Based on the activities being performed at the Site at a particular location or area, the SSO will determine the applicability of subcontractor exceptions to the requirements described above.

8.0 SITE CONTROL

This section outlines the means which Payne Firm or subcontractor personnel will delineate work zones and use these work zones in conjunction with decontamination procedures to prevent the spread of contaminants into previously unaffected areas of the Site. If determined to be applicable and necessary by the SSO, it is anticipated that a three-zone approach will be used during work at this Site. Where appropriate, a three-zone approach will consist of an exclusion zone, a contamination reduction zone (CRZ), and a support zone. It is also anticipated that this control measure will be used to control access to Site work areas. Use of such controls will restrict the general public, minimize the potential for the spread of contaminants, and protect individuals who are not cleared to enter work areas.

8.1 Exclusion Operational Zone

The exclusion zone will be considered those areas of the Site containing known or suspected chemical contamination or physical hazards. It is not anticipated that significant amounts of surface contamination are present in the proposed work areas of this Site and it is anticipated that this will remain so until/unless contaminants are brought to the surface by intrusive activities, such as soil boring, excavation, sampling, and maintenance of downhole equipment. Furthermore, once intrusive activities have been completed and surface contamination has been removed, the potential for exposure is again diminished and the area can then be reclassified as part of the contamination reduction zone. Therefore, the exclusion operational zone for this Site will be limited to those areas of the Site where intrusive work is being performed plus a designated area surrounding the point of operation. When appropriate, exclusion zones will be delineated using barrier tape, cones, and/or drive poles, and postings to inform personnel other than the field crew. O&M equipment areas and operations involve potential exposure to contaminated media and treatment chemicals and are considered exclusion zone operations.

8.2 Contamination Reduction Zone

If required and/or necessary, the CRZ will be a buffer area between the exclusion zone and any area of the Site where contamination is not suspected. Decontamination of personnel and small equipment will be performed in this area. The decontamination area will be covered with plastic sheeting as appropriate that will be replaced when torn or heavily soiled. A waste container will be placed in the designated work area for the disposal of contaminated equipment and PPE. Surface/soil contamination in this area will be controlled using plastic sheeting or an appropriate substitute.

The equipment decontamination will either take place in this area, or at a central location established for this Site. This area will serve as a focal point in supporting exclusion zone activities. When applicable, this area will be delineated using barrier tape, cones and/or drive poles, and postings to inform and direct facility personnel. Equipment and tools will be thoroughly washed using a soap solution and brushing, followed by a fresh water rinse. If necessary, Simple Green or methanol will be used in the decontamination process. Visible particles must be removed before the tool is considered clean. Spent decontamination fluids will be handled in accordance with applicable regulations.

8.3 Support Zone

If appropriate and/or necessary, a support zone will be designated for the Site consisting of a staging area where vehicles will be parked, equipment will be unloaded, and where food and drink containers are maintained. The support zones are established at areas of the Site where exposure to Site contaminants would not be expected during normal working conditions or foreseeable emergencies. The location of this zone depends on factors such as accessibility, wind direction (standard work clothes) is appropriate in this zone. Eye wash stations are located in the Remediation System Room; additional eye wash stations are located within field vehicles.

8.4 Site Visitors

Site visitors for the purpose of this document are identified as representing the following groups of individuals:

- Personnel invited to observe or participate in operations;
- Regulatory personnel (OSHA, NYSDEC, etc.);
- Sequa/Chromalloy personnel; and
- Other authorized visitors.

Personnel sign-in logs will be located at the on-Site office (Remediation System Room) and will be utilized by all Site visitors.

Once access to the Site is obtained, personnel who require Site access into areas of ongoing operations will be required to obtain permission from the FOL and SSO. The prerequisites for Site visitors wishing to observe operations in progress in the Exclusion Zone will be required to enter the Exclusion Zone. The only anticipated personnel in the Exclusion Zone will be Payne Firm personnel and subcontractor personnel.

Once the Site visitors have obtained authorization from the Payne Firm they will be routed to the FOL who will have them sign into the personnel sign-in log. Information to be recorded in the logbook will include the individual’s name, the entity they represent, and the purpose of the visit. Site visitors will be required to produce the necessary information supporting clearance to the Site. This shall include information attesting to applicable training and medical surveillance, if required, as stipulated in Section

7.0 of this document. Visitors are required to observe the protective equipment and restrictions in effect at the Site at the time of their visit. Any visitors not meeting the requirements stipulated in this plan will not be permitted to enter the Site operational zones during planned activities. Any incidence of unauthorized Site visitation will cause the termination of on-Site activities until the unauthorized visitor is removed from the premises. Removal of unauthorized visitors will be accomplished with support from the West Nyack Police.

Site visitors granted access to the exclusion zones during ongoing operations will be escorted by a Payne Firm representative (arranged for by the FOL) while the visitor remains in the exclusion zone.

8.5 Site Security

Payne Firm will retain control over active operational areas. The FOL will serve as a focal point for Site personnel, and will serve as the final line of security for the work areas. As stated above, work will cease in the event of unauthorized personnel entering the exclusion zone. Work will remain temporarily suspended until the unauthorized visitor can be removed.

8.6 Buddy System

Personnel engaged in on-Site activities practice the “buddy system” to ensure the safety of personnel involved in this operation. Each pair of workers assists each other with the following:

- Observe for signs of chemical exposure or thermal stress;
- Periodically check the integrity of protective clothing; and
- Notify the SSO if emergency help is needed.

Use pre-arranged hand signals such as:

- Hand gripping throat: out of air, cannot breathe;
- Gripping partner’s wrist: leave area immediately, no debate;
- Hands on top of head: need assistance;
- Thumbs up: okay, I understand;
- Thumbs down: no, I do not understand; and
- Arms waving upright: send back-up support.

8.7 MSDS Requirements

Payne Firm subcontractor personnel will provide MSDSs for each chemical brought on the Site. The contents of these documents will be reviewed by the SSO with the user(s) of the chemical substances prior to any actual use or application of these substances on the Site. A chemical inventory of chemicals used on the Site will be maintained in the Remediation System Room and available for review upon request.

8.8 Communication

As personnel may not always be working in proximity to one another during field activities, a supported means of communication between field crews will be used as necessary.

External communication will be accomplished by using designated telephones at the Site or field personnel cell phones. External communication will primarily be used for the purpose of resource and emergency resource communications.

9.0 MATERIALS AND DOCUMENTATION

The FOL shall ensure the following materials/documents are maintained at the Site and used when required.

- A complete copy of this HASP;
- Incident Reports;
- MSDSs for chemicals brought on the Site, including decontamination solutions, fuels, sample preservatives, calibration gases, etc.;
- A full-size OSHA Job Safety and Health Poster (posted in the Remediation System Room),
- Training/Medical Surveillance Documentation; and
- Emergency contacts (posted in the Remediation System Room).

9.1 Materials to be Posted at the Site

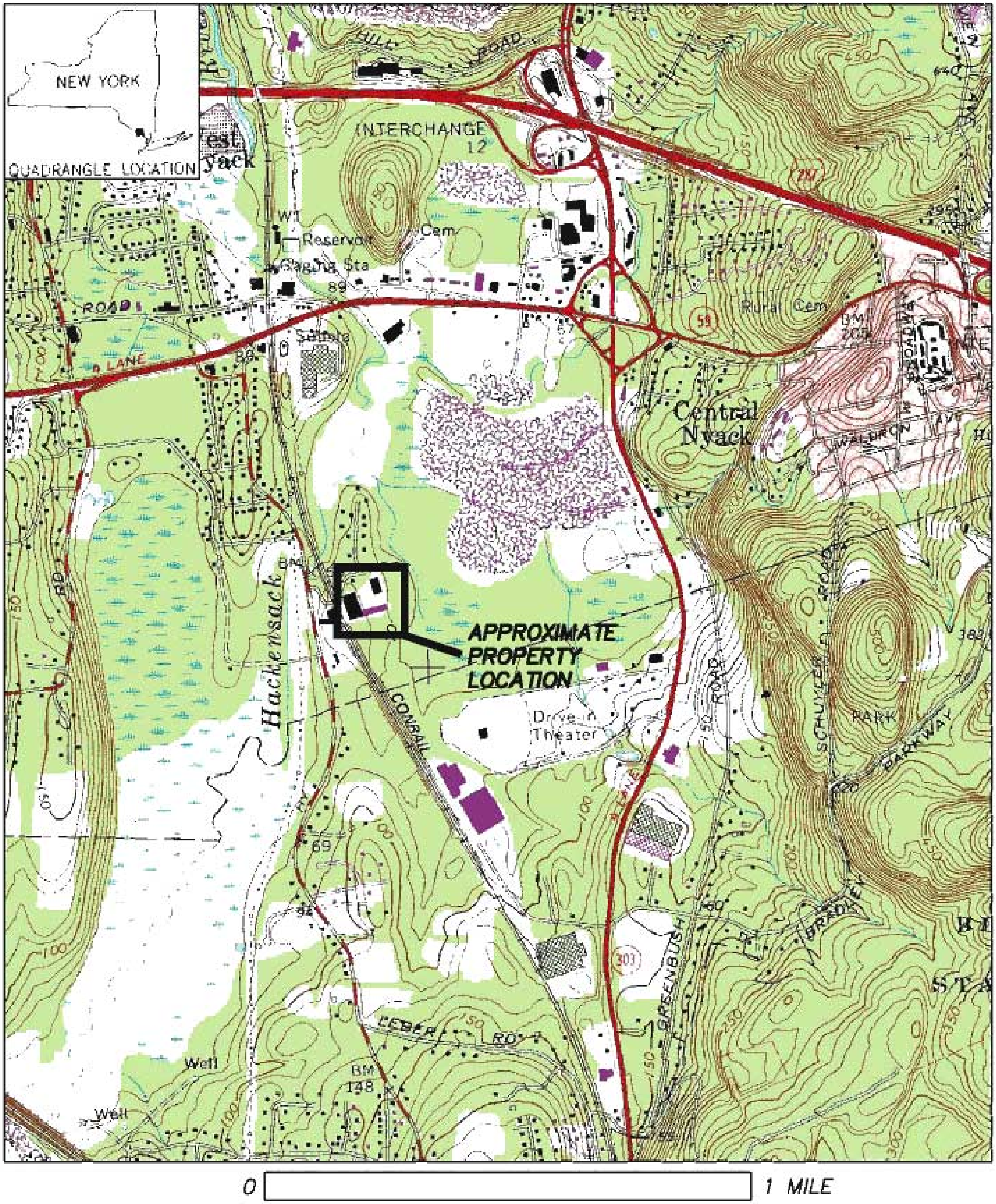
The following documentation is posted at the Site for quick reference purposes.

Chemical Inventory – This list represents chemicals brought on the Site, including decontamination solutions, sample preservatives, fuel, calibration gases, etc. This list is maintained at the Site and in a Microsoft© electronic database.

MSDS – The MSDSs should also be in a central area accessible to Site personnel. These documents should match the listings on the chemical inventory list for substances employed on Site. It is acceptable to have these documents within a central folder and the chemical inventory as the table of contents. The MSDS binders are located in the Remediation System Room.

The OSHA Job Safety and Health Protection Poster – This poster, as directed by 29 CFR 1903.2(a)(1), should be conspicuously posted in places where notices to employees are normally posted (Remediation System Room). Each FOL shall ensure that this posted is not defaced, altered, or covered by material.

Emergency Phone Numbers – This list of numbers and the directions will be maintained next to telephones and in each vehicle.



REFERENCE: USGS 7.5' SERIES TOPOGRAPHIC MAP: NYACK QUADRANGLE (1979)

DRAWN BY JAG	APPROVED BY RST	PROJECT NO. 1380.02.20	DATE 10/2/08	FIGURE 1

CLIENT SEQUA CORPORATION

TITLE SITE LOCATION MAP

The Payne Firm, Inc.

Environmental Consultants
Cincinnati/Cleveland/Chicago


GREENBUSH BROOK
Former Chromalloy Site
HACKENSACK RIVER
WEST SHORE RAILROAD
Legend
Former Chromalloy Site
Evacuation Route
Parcel Boundaries
Support Zone / Assembly Area
Marshland
Sources: -Stream/River locations based on Nyack NW DOQQ
-Marshland extent based on New York NLCD Dataset
0
250
Feet
The Payne Firm, Inc.
CLIENT SEQUA CORPORATION
TITLE SITE BASEMAP
FIGURE NO. 2
DATE 10/2/2008
DRAWN BY JAG
REQUESTED BY RST
PROJECT NO. 1380.02.20

COMMUNITY HEALTH AND SAFETY WORK PLAN FOR GROUNDWATER REMEDIATION ENHANCEMENT ACTIVITIES
FORMER CHROMALLOY FACILITY
WEST NYACK, NEW YORK

May 10, 2007

Prepared for:

SEQUA CORPORATION
THREE UNIVERSITY PLAZA
HACKENSACK, NEW JERSEY 07601

Prepared by:

ENVIRONMENTAL ALLIANCE, INC.
1812 NEWPORT GAP PIKE
WILMINGTON, DELAWARE 19808
(302) 995-7544

Andrew J. Applebaum, P.G.
Geological Services Manager

Reviewed by:

William Smith, P.G.
Project Director

J:\EAI_files\1166_Nyack\Reports\Work Plans\Community H&S WP\COMMUNITY HEALTH AND SAFETY WORK PLAN 2007.doc

ENVIRONMENTAL ALLIANCE

TABLE OF CONTENTS

ENVIRONMENTAL ALLIANCE

TABLE

FIGURE

APPENDICES

1.0 INTRODUCTION

Sequa Corporation (Sequa) on behalf of Chromalloy Gas Turbine Corporation (Chromalloy) has retained Environmental Alliance, Inc. (Alliance) to perform environmental services at the Former Chromalloy Facility (Facility) located at 169 Western Highway in West Nyack, New York (Inactive hazardous Waste Registry Site # 344039). These services have included implementing continuing investigation and remedial corrective action work at the Facility and the residential community along Pine View Road located to the north of the Facility building (the Study Area). A *Groundwater Remediation Enhancement Work Plan* (*Work Plan*) dated October 31, 2006 developed by Alliance was submitted to New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH) to enhance the existing deep groundwater remediation pump and treat (P&T) system in addressing volatile organic compounds (VOCs) in groundwater at the north end of Pine View Road and the Study Area was submitted to the NYSDEC and NYSDOH.

The purpose of the submitted *Work Plan* was three-fold. First was to evaluate the effectiveness of the current remedial system in achieving the NYSDEC goals. Second, was to evaluate alternative remedial technologies to enhance the reduction of volatile organic contaminants in the groundwater system. Third was to more fully evaluate and provide a conceptual design for the enhancement of the existing remedial system. The overall objective of the *Work Plan* was to present a design of the best applicable enhancement to better address residual VOCs, mainly trichloroethylene (TCE) in groundwater. The remedial enhancement design presented in the *Work Plan* included details to monitor the extent and magnitude of TCE contamination in groundwater and geochemical indicators as necessary to evaluate the effects of the remedial system enhancements.

The remediation enhancement activities described in the *Work Plan* included: operation of existing P&T system; install injection wells (bedrock and overburden); install pump in well #41, construct a remediation system; implement groundwater injections in phases (RegenOx™ to oxidize VOCs followed by substrate to induce anaerobic reductive dechloronation – "ARD");

and groundwater monitoring (pre- and post – injection phases) to evaluate enhancements. A detailed description of the remediation activities was previously submitted to NYSDEC and NYSDOH in the *Work Plan*.

This *Community Health and Safety Work Plan* (*CHS Work Plan*) has been prepared in response to final NYSDEC and NYSDOH comments (February 15, 2007) to ensure the well-being of the residents in the Pine View Road neighborhood during implementation of the groundwater remediation enhancements. The *CHS Work Plan* addresses potential issues associated with soil vapor generation, resurfacing of injected materials, dust generation during injection well installation and remediation construction activities, and general project operations (equipment traffic, noise, lights, work hours, and work area security) within a residential neighborhood. The structure of this *CHS Work Plan* is as follows. Section 2.0 provides details on soil vapor monitoring activities. Section 3.0 provides on monitoring for the resurfacing of injected materials. Section 4.0 presents the community air monitoring activities for well installation, remediation system construction, and other associated project work. General project operations to be implemented to minimize impact to and be protective of the local residents of Pine View Road are detailed in Section 5.0.

2.0 SOIL VAPOR MONITORING

Soil vapor monitoring activities will be conducted to evaluate the northern portion of the Pine View Road neighborhood (residential properties #40 and #41) for potential generation of soil vapors (if any) as a result of the enhanced groundwater remediation processes applied to the regolith (unconsolidated sediment and lodgement till) above bedrock. The monitoring information generated during the application of RegenOx™ followed by substrate at the #41 property will determine the exact need for further monitoring with the proposed expansion into the remaining Pine View Road areas. However, residences further south of the #40 and #41 properties are not foreseen to be effected by potential soil vapor generation from groundwater remediation enhancements based on the following:

- The estimated ROI of RegenOx™ (15 feet maximum) and substrates for the ARD process (20 feet maximum) including any dispersion or migration along groundwater gradient, where the closest proposed shallow groundwater injection point is over 50 feet away from the #41 residence and over 125 feet away from the #40 residence.
- RegenOx™ induces a controlled, non-vigorous oxidation reaction that does not directly volatilize VOCs in groundwater to the vapor state.
- The RegenOx™ oxidation reaction of VOCs (specifically TCE) to benign by products is typically complete with little to no generation of intermediate products (i.e. vinyl chloride) surviving the reaction.
- RegenOx™ is depleted to benign byproducts by design after a maximum of 30 days in the subsurface environment.
- The ARD process stimulates microbial activity that breaks down TCE to intermediate products such as cis-1,2-DCE and vinyl chloride to ultimately benign by products in groundwater with no direct volatilization of VOCs in groundwater to the vapor phase. Should the ARD process stall causing an abundance of intermediate products in groundwater, bioaugmentation can be applied to address intermediate products generated. As the ARD process only degrades compounds to daughter products the mass of VOCs is

not increased and should not increase the potential volatilization to the subsurface as compared with current conditions.

The potential for generating soil vapor from the implementation of the groundwater remediation enhancement activities to the deeper portion of the groundwater (deep groundwater) in bedrock is highly unlikely. The above reasoning provided for the shallow groundwater considering the nature of the reactions induced by RegenOx™ and ARD process substrates indicates that generation of VOCs in the vapor phase should be limited to nonexistent. Further, the following Study Area physical conditions would inhibit soil vapor generation or at a minimum isolate the effects of the injected materials on impacted deep groundwater.

- Injection depths in bedrock greater than 40 feet below grade (bg).
- Impermeable nature of bedrock with groundwater presence controlled by fracturing (bedrock porosity estimate of 5%).
- Bedrock is capped by approximately 30 feet (or more) of regolith consisting of compacted glacial "lodgement" till and unconsolidated sediment - clay soil.
- Minimum thickness of 30 feet of groundwater (saturated regolith and bedrock) from top of shallow groundwater table (estimate 10 feet bg) to minimum injection depth in bedrock (40 feet bg) above point where injected material may interact with impacted groundwater.
- Absence of upward deep groundwater flow in the Study Area with the exception of the very north end of Pine View Road where detailed monitoring will be conducted in the initial stages.

Based on the above information presented, soil vapor monitoring will be implemented in the immediate area of where the groundwater remediation enhancements are to be applied. The monitoring activities will include the installation of additional exterior soil vapor points (ESVPs) to supplement the existing ESVP on the #41 Pine View Road property, baseline monitoring, and monitoring during implementation of the RegenOx™ and ARD process substrate applications. Details on the soil vapor monitoring activities are provided in Sections 2.1 and 2.2 below.

Information to support the soil vapor monitoring activities for the groundwater remediation enhancements is the soil vapor investigation data collected over four quarters in 2006 is provided in the *RI/FS Modification No. 13 Soil Vapor Investigation Report* (*SVI Report*) to be published by Alliance in May 2007 for submittal to NYSDEC and other appropriate parties. The *SVI Report* details soil vapor data for the #41 property, the #12 property, and the Facility building and may be used to verify the appropriateness of the enhanced remediation soil vapor monitoring activities. As discussed during the January 8, 2007 meeting between Alliance, NYSDEC, and NYSDOH at the NYSDEC offices in New Paltz, New York; Alliance will move forward with groundwater remediation enhancements and implementing soil vapor monitoring of the northern Pine View Road area and address any other soil vapor monitoring issues as appropriate after the SVI Report has been reviewed by NYSDEC and NYSDOH.

2.1 Additional Soil Vapor Monitoring Point Installation

Four additional exterior soil vapor points (ESVP-4 through 7) are proposed for the #41 Pine View Road property to evaluate soil vapor quality in the area of the groundwater remediation enhancements (refer to Figure 2-1). ESVP-5 through ESVP-7 are proposed for installation between injection locations and residenees. ESVP-4 is proposed for installation between the two injection gallery legs. Final placement of these points will be dependent on field conditions encountered and access to the proposed locations. The installation activities will follow the procedures used to install the initial ESVPs installed as part of the *SVI Report* and will incorporate the appropriate elements of other items presented in this *CHS Work Plan*. In general, the ESVP installation will involve the following activities.

A hollow-stem auger (HSA) or air-rotary drill rig will be used to install the ESVPs. Before initiating installation activities, the locations will be cleared with the property owner for their approval and to locate underground utilities. The New York State utility mark out service will also be contacted to clear the locations for underground utilities. Placement and use of the drill rig, support truck, and miscellaneous equipment (e.g. soil cuttings, drilling tools, materials, Alliance support truck, work area security, etc.) will be coordinated to allow the property owners to maneuver at their respective properties and along Pine View Road in accordance with Section 5.0 of this document. The #41 Pine View Road property owner will receive advanced schedule notification for coordination purposes.

The proposed ESVPs will be installed above the water table, which is typically encountered at approximately 10 feet bg. The proposed depth of the ESVPs is intended to be above the top of the water table. The HSA drill rig will advance 41/4-inch inner diameter augers or the air rotary rig will advance a 6-inch diameter hammer/drill rods to an approximate depth of seven feet bg at each location. The depth of the borehole and absence of groundwater will be verified using a decontaminated water line. Upon confirmation of depth and no groundwater to seven feet bg, the ESVP will be set within the borehole. During the installation activities, ambient air monitoring for dust and VOCs will be conducted in accordance with Section 4.0 of this document. Additionally, per the Alliance health and safety document for this project, monitoring of the work area and drill cuttings for VOCs will be conducted using a Photo-Ionization Detector (PID). No soil sampling is scheduled during the installation of the ESVP's as impacted soil has not been previously identified by soil sampling conducted in this area. Should the PID soil screening indicate significant results (reading >25 ppm) a sample of the drill cuttings will be collected for VOC analysis via EPA method 8260B.

The ESVPs will be constructed of ¾ -inch diameter flush-threaded schedule 40 PVC with two feet of 0.01-inch slot screen from seven to five feet bg and casing to approximately six inches bg. The top of the ¾-inch PVC casing will be fitted with a PVC ¾-inch slip to NPT threaded fitting to which brass NPT reduction fittings will be assembled to a Swagelok female thread connector and cap. The annulus will be completed with #2 sand from seven to five feet bg, #00 sand from five to four feet bg, and bentonite/Portland cement grout from four feet bg to approximately one foot bg. An appropriately sized flush surface irrigation box will be set in concrete to match the existing grade. The grout/cement will be allowed to cure for a minimum of two weeks before a soil vapor sample is collected from a point.

2.2 Soil Vapor Monitoring Procedures

As noted earlier in this section, soil vapor monitoring was conducted at #12 Pine View Road, #41 Pine View Road, and at the Facility building in January, April, July, and October 2006 with data presented in the *SVI Report* (Alliance, May 2007). The soil vapor and ambient air sample data collected for the #41 Pine View Road property will be incorporated as part of the baseline data for the existing ESVP-3 location. The new ESVPs installed (ESVP-4 through 7) and existing ESVP-3 location will be sampled along with the collection of ambient air samples associated with the ESVP locations in accordance with the procedures presented in the *SVI Report* before initiation of injection activities to provide a baseline soil vapor data set for all five ESVP locations. These soil vapor monitoring procedures for baseline sampling will involve the following activities.

Before soil vapor sample collection, each ESVP will be purged of approximately three volumes of air within the point using a peristaltic pump and dedicated Teflon tubing connected to the ESVP. Soil vapor and ambient air samples will be collected using 6-liter stainless steel Summa canisters. A flow meter will be affixed to each canister and calibrated for sample collection over two hours. Each canister will be equipped with a filter to prevent particulate matter from entering the canisters and a vacuum gauge to measure the initial and final vacuum of the canisters. Soil vapor samples will be obtained through dedicated Teflon tubing connecting the Summa canister and the ball valves of the ESVPs. Vacuum readings will be recorded from the vacuum gauge on the canister at the beginning of the sampling period. The time the canister valve is opened will be recorded in the field book. At the end of the sampling period (approximately 2 hours) the valve on the canister will be closed and the time recorded. Canisters will be placed in shipping containers for transport to the laboratory.

At each ESVP location, an ambient air sample will also be collected in conjunction with the ESVP sample. For ambient air sampling, a Summa canister will be placed at each of the designated sample locations with the inlet of the canister placed in the breathing zone level (4.5 to 5 feet above ground surface). Alternatively, Teflon® tubing can be connected to the canister inlet and the air inlet of the tubing can be placed at breathing zone height. Vacuum readings will be recorded from the vacuum gauge on the canister at the beginning of the sampling period. The time the canister valve is opened will be recorded in the field book. At the end of the sampling period (approximately 2 hours) the valve on the canister will be closed and the time recorded. Canisters will be placed in shipping containers for transport to the laboratory.

The samples collected will be analyzed for VOCs by EPA Method TO-15. All sample analysis will be performed in a New York State Department of Health Environmental Laboratory Approval Program (NYSDOH-ELAP) laboratory certified to perform NYSDEC Analytical Services Protocol (ASP). The laboratory will produce Category B deliverables.

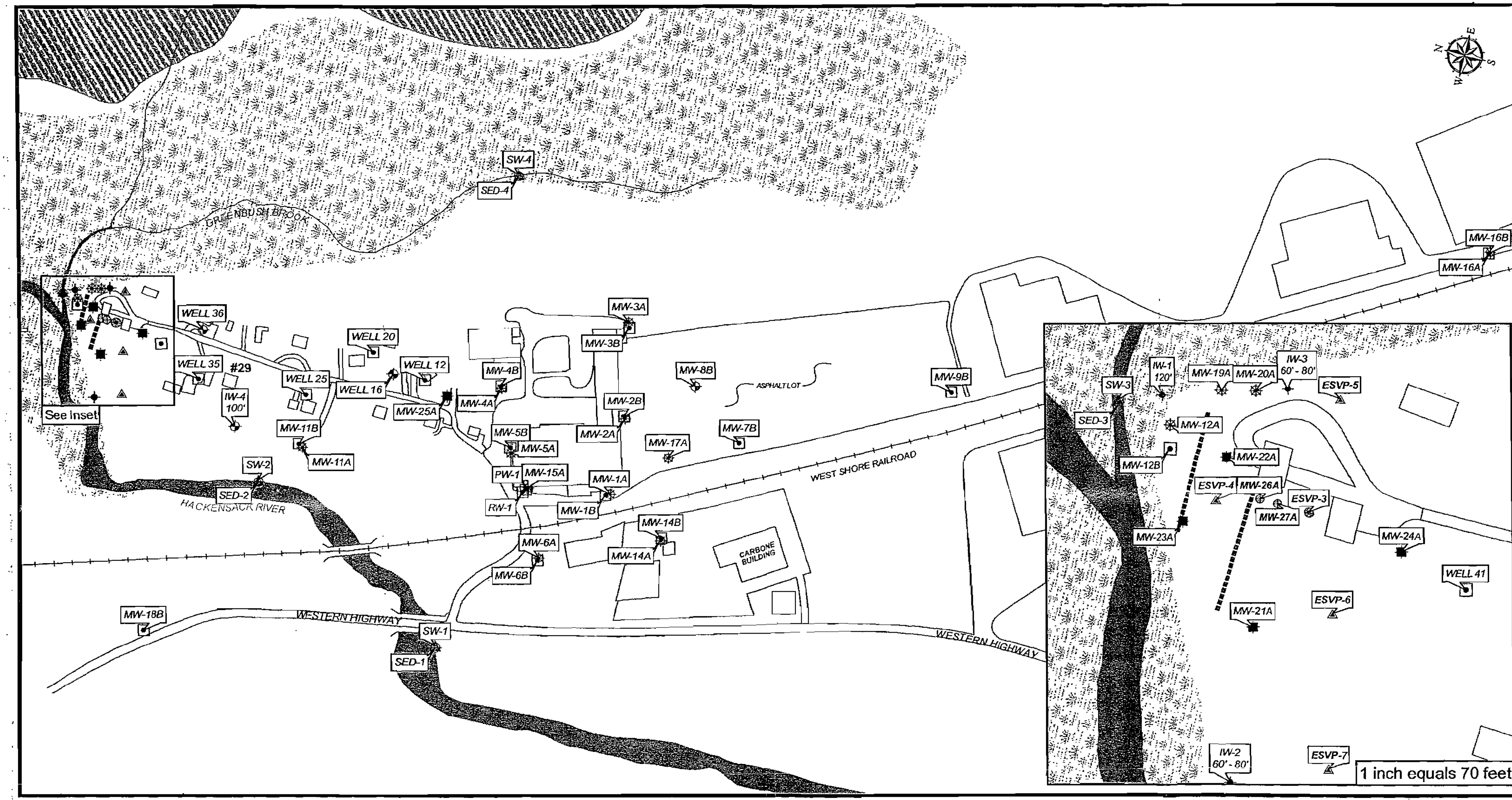
Soil vapor monitoring activities involving continued soil vapor and ambient air sampling will be conducted at locations ESVP-3 through ESVP-7 on a quarterly basis throughout the initial phase (RegenOx™ application) of the enhanced groundwater remediation process anticipated to last about six months. Continued soil vapor and ambient air sampling will be conducted at these locations on a quarterly basis with the initiation of ARD process application at the north end of Pine View Road for an additional six months.

In addition to the quarterly laboratory sampling for soil vapor monitoring detailed above, monitoring activities will be conducted at select ESVPs, existing monitoring wells and two additional monitoring wells proposed for installation into upper groundwater adjacent to the southern most injection gallery to evaluate injected material movement (refer to Section 3.3 for details) will be used to evaluate potential soil vapor associated with the remedial enhancement implementation. Baseline data will be collected from all ESVPs, new wells MW-26A and MW-27A, and existing monitoring wells MW-12A MW-19A, MW-20A, MW-21A-S&I, MW-22A-S&I, MW-23A-S&I, and MW-24A-S&I should these wells be used for soil vapor monitoring during remedial enhancement implementation (refer to Figure 2-1 for locations). During the injection of RegenOx™, locations ESVP-4, ESVP-5, ESVP-7, MW-20A, MW-21A-S&I, MW-23-S&I, MW-26A, and MW-27A will be monitored on a daily basis during injection activities. Upon completion of the RegenOx™ injection, the monitoring will be conducted on a weekly basis for one month, which is the maximum time RegenOx™ to exist in the subsurface environment before depletion to benign by-products. Monitoring of the ESVPs and wells will be continued on a monthly basis thereafter and continue on a monthly basis with the implementation of substrate injection for the ARD process application.

The additional monitoring will involve the collection of field PID screening data at the ESVPs and wells to evaluate potential changes in soil vapor concentrations followed by inspection of the locations to insure no migration of substrate toward the residential dwellings (discussed in Section 3.3). A form for the monitoring of these locations is provided in Appendix I. Should a significant increase in field PID over baseline (e.g. increase of over 50 PID units), a Tedlar™ air bag sample will be collected to qualify the VOCs detected by the PID and a field evaluation will be completed to determine if changes in the injection process could minimize soil vapor concentrations detected or if the injection process should be halted for further evaluation. The field evaluation will include expansion of soil vapor monitoring activities to other viable locations in the remediation enhancement area (i.e. ESVP-3, ESVP-6, MW-12A, MW-19A, MW-22A-S&I, and MW-24A-S&I) as appropriate.

Should Alliance's review of the soil vapor monitoring data note persistent and significant increases in soil vapor generation above baseline levels, the NYSDOH and NYSDEC will be notified and the enhancement system will shut-down until a better evaluation of potential causes can be made. Upon discussing the findings of this evaluation with NYSDEC and NYSDOH, a determination will be made on modification (if any) of the remediation enhancement operation is needed. Potential modifications to be considered may include, but are not limited to: adjustment of injection process procedures, change in injection material, installation of additional monitoring points, change in monitoring frequency, and use of a soil vapor control system. Additionally, if the soil vapor data show no change from baseline levels, the need for continuation of the monitoring activities for continued ARD process application at the north end of Pine View Road as well as expansion of the ARD application process throughout the Pine View Road area and the Facility building area via batch injections should be considered. Prior to implementation of any such actions, NYSDEC and NYSDOH will be notified and consulted on a proposed plan of action.

The schedule for the quarterly soil vapor monitoring activities will coincide with quarterly groundwater sampling activities schedule (January, April, July, and October). The soil vapor monitoring data generated by the monitoring activities will also be reported on the same schedule as the groundwater monitoring data in the quarterly update reports submitted in February, May, August, and November (i.e. January monitoring data is presented in the April report). Additionally, a Remedial Enhancement Fact Sheet has been developed for the residents of #40 and #41 Pine View Road providing general project information and contact information to address resident questions on the groundwater remediation enhancement activities (refer to Section 5.6).



Legend

- Existing ESVP
- Proposed ESVP
- Proposed Well
- Active Injection Point
- Batch Injection Pooint
- Bedrock Monitoring Well
- Cluster Well
- Overburden Monitoring Well
- Sediment Sample
- Stream Sample
- Injection Gallery Point Row
- Railroad Tracks
- Marshland
- Clarkstown Landfill

Sources: -Stream/River locations and Clarkstown Landfill area based on Nyack NW DOQQ
-Marshland extent based on New York NLCD Dataset

0 300 600 Feet
1 inch equals 250 feet

Environmental Alliance, Inc.

1812 Newport Gap Pike - Wilmington, DE 19808
Phone: (302) 995-7544 - Fax: (302) 995-0941

FORMER CHROMALLOY FACILITY
WEST NYACK, NY

Proposed Exterior Soil Vapor Points (ESVP)

DRAWN BY: MJA	FILE NAME: 1166-Prop ESVP	SCALE: SEE DRAWING	FIGURE NO: 2-1
APPROVED BY:	PROJECT NO: 1166	DATE: 3/30/07	

3.0 INJECTION MATERIALS MONITORING

Monitoring activities for the resurfacing of injection materials will be conducted at the northern portion of the Pine View Road neighborhood (residential properties #40 and #41) for injected materials applied to the regolith (unconsolidated sediment and lodgement till) above bedrock come to the ground surface. There is no potential for the resurfacing of the injection materials in basements at the #40 and #41 properties observations made at these properties indicate no basements exist (both residences are slab on grade construction). Residences further south of these locations are not foreseen to be effected by the potential resurfacing of injection materials to shallow groundwater from the groundwater remediation enhancements based on the following:

- The estimated ROI of RegenOx™ (15 feet maximum) and substrates for the ARD process (20 feet maximum) including any dispersion or migration along groundwater gradient, where the closest proposed shallow groundwater injection point is over 50 feet away from the #41 residence and over 125 feet away from the #40 residence.
- The RegenOx™ material is projected for a one time application as a batch injection via the active system at a low flow rate of up to 6 gpm with a maximum back pressure < 30 psi.
- The RegenOx™ material is depleted to benign byproducts by design after a maximum of 30 days in the subsurface environment.
- The ARD process substrates and groundwater mix are projected for continuous injection via the active system at a flow rate of 0.2 gallons with a back pressure < 10 psi.
- The substrates selected for potential injection for the ARD process (soybean oil, calcium magnesium acetate, methanol, sodium lactate, HRC™ -a sodium lactate product, and Newmanzone™ - emulsified soybean oil with sodium lactate, nutrients and surfactants) are all considered environmentally safe products that are mixed with groundwater (90% groundwater / 10% substrate) and break down to benign by products overtime within the groundwater table.

The potential for the resurfacing of injected materials by the implementation of the groundwater remediation enhancement activities to the deeper portion of the groundwater (deep groundwater) in bedrock is highly unlikely based on the following bedrock physical condition that would isolate the injected materials.

- Injection depths in bedrock greater than 40 feet below grade (bg).
- Impermeable nature of bedrock with groundwater presence controlled by fracturing (bedrock porosity estimate of 5% based on fractures).
- Bedrock is capped by approximately 30 feet (or more) of regolith consisting of compacted glacial "lodgement" till and unconsolidated sediment - clay soil.
- Minimum thickness of 30 feet of groundwater (saturated regolith and bedrock) from top of shallow groundwater table (estimate 10 feet bg) to minimum injection depth in bedrock (40 feet bg) above point where injected material enters bedrock.
- Absence of upward deep groundwater flow in the Study Area with the exception of the very north end of Pine View Road.
- The ARD process substrates mixed with groundwater (300 gallons) are projected for single well injection via the batch method of at a flow rate of approximately 2.5 gallons a pressure of 8 psi over a two hour time period.

The delivery methodology and subsurface environment physical condition in the Study Area strongly indicates the resurfacing of the injected materials is unlikely, especially beyond the immediate area of the north end of Pine View Road where the injections are conducted. However, to confirm that no materials injected return to the ground surface, monitoring of the #40 and #41 Pine View Road properties will be conducted as detailed in Sections 3.1 and 3.2 below.

In addition to the ground surface monitoring activities provided, existing ESVPs and two new monitoring wells are proposed for installation in the immediate vicinity of the injection gallery to evaluate the distribution of injected materials within the subsurface environment including the vadose zone and upper portion of groundwater. The use of existing monitoring wells MW-12A

MW-19A, MW-20A, MW-21A-S&I, MW-22A-S&I and MW-23A-S&I may also be incorporated in monitoring the subsurface environment as warranted based on field conditions observed. Details on the subsurface monitoring activities are provided in Section 3.3.

3.1 RegenOx™ Material Ground Surface Monitoring

RegenOx™ is a chemical oxidant consisting of sodium percarbonate and sodium carbonate monohydrate activated by ferrous sulfate used to enhance the oxidation process of chlorinated solvents dissolved in groundwater (MSDS's and product information are provided in Appendix V of the *Work Plan*). RegenOx™ is packaged in two parts (Part A and Part B). Part A is the RegenOx™ Oxidizer which has a physical characteristic of fine white powder. Part B is the RegenOx™ Activator which has a physical characteristic of a brown gel. Prior to injection, Part A is mixed with Part B and water. Once mixed and injected, the physical characteristics of the RegenOx™ material are of a chocolate brown liquid that is easily identified.

The manufacturers of the product (Regenesis) have two descriptions of what the RegenOx™ material looks like should it return to the ground surface. One description provided by Regenesis is that the material will have a brown to light brown coloration that has a bubbly/airy mousse-like consistency that easily disintegrates to a flaky ash like material when touched before completely dissipating leaving a wet spot on the ground surface with no residue. The other description provided is that the material will appear as a translucent pearly white thin (watery) liquid. Upon reaching the surface, the material was noted to dissipate quickly so that the ground appears to be wet with no residue.

During the projected one time application of RegenOx™ via the active injection system, Alliance personnel supervising/conducting the work will patrol the area of the #40 and #41 Pine View Road properties on a bi-hourly (two-hour) basis to evaluate the ground surface for injected materials. A log of this patrol including personnel conducting the patrol, time, and observations will be kept (refer to the ground surface observation form provided in Appendix I). If the injected RegenOx™ material is observed at the ground surface, injection activities will be temporarily halted and Alliance will notify the NYSDEC and NYSDOH. Onsite personnel will address the material that has resurfaced and then evaluate the situation and system operation data to adjust injection rates to the various points to prevent further resurfacing of the material. The system will then be restarted with notification provided to NYSDEC and NYSDOH. The area where resurfacing occurred as well as the rest of the injection area will continue to be monitored by onsite personnel to confirm the system adjustments have addressed the resurfacing issue. Once the injection of RegenOx™ is completed, there is little to no potential for the injected material to rise to the ground surface. A Remedial Enhancement Fact Sheet developed for the residents of #40 and #41 Pine View Road to provide general information on project activities, how to identify materials should they resurface, and contact information so that Alliance can respond to project related issues is discussed in Section 5.6.

3.2 Substrate (For ARD Process) Ground Surface Monitoring

The substrates to be injected into the groundwater system via the active system were selected based on their ability to induce an anaerobic environment that stimulates anaerobic microbial activity causing the ARD process (MSDS's and product information are provided in Appendix VI of the *Work Plan*). The substrates come as a solid pellet (calcium magnesium acetate) or fluid (methanol, sodium lactate, HRC™, and Newmanzone™) that are mixed with water. Once mixed and injected, the physical characteristics of the substrates generally can be described as a milky to oily whitish to grayish watery liquid. Should the substrate mix return to the surface, the material would continue to appear as a milky to oily whitish to grayish watery liquid. Upon reaching the surface, the material will evaporate (once active injection is halted) so that the ground appears to be wet with no residue.

During the projected continuous application of the substrate material via the active injection system onsite personnel will monitoring the system area on a daily basis for the first week of operation followed by monthly monitoring thereafter of the system area and the #40 and #41 Pine View Road properties. The monitoring will involve a minimum of two patrols of the remediation enhancement area per site visit to evaluate the ground surface for injected materials.

A log of the patrols per visit will be kept as noted in Section 3.1 (ground surface observation form provided in Appendix I). If the injected substrate material is observed at the ground surface, injection activities will be temporarily halted and Alliance will notify the NYSDEC and NYSDOH. Onsite personnel will address the material that has resurfaced and then evaluate the situation and system operation data to adjust injection rates to the various points to prevent further resurfacing of the material. The system will then be restarted with notification provided to the NYSDEC and NYSDOH. The area where resurfacing occurred as well as the rest of the injection area will be monitored by onsite personnel to confirm the system adjustments have addressed the resurfacing issue. As noted in Section 3.1, a Remedial Enhancement Fact Sheet for the #40 and #41 Pine View Road residents on general project information, resurfaced material identification, and contact information is discussed in Section 5.6.

3.3 Subsurface Material Movement Monitoring

In order to evaluate the movement of the injected material in the subsurface environment, select ESVPs and wells as well as proposed new monitoring wells MW-26A and MW-27A installed 10 and 20 feet from the southernmost injection galley towards the #41 Pine View Road dwelling will be monitored (installation details presented in Section 3.3.1). Use of other ESVPs and wells in the remediation enhancement area will be based on field observations from subsurface material monitoring activities and routine injection monitoring activities conducted as specified in Section 5.9.3 of the *Work Plan*. Refer to Figure 2-1 for proposed MW-26A and MW-27A locations and all other ESVP and well locations in the remediation enhancement area.

No baseline data is needed for evaluating the movement of the injected materials since no materials have previously been injected into the area where remediation enhancements are to be implemented. During the injection of RegenOx™, locations ESVP-4, ESVP-5, ESVP-7, MW-20A, MW-21A-S&I, MW-23-S&I, MW-26A, and MW-27A will be monitored on a daily basis during injection activities. Upon completion of the RegenOx™ injection, monitoring will be conducted on a weekly basis for one month, which is the maximum time RegenOx™ exists in the subsurface environment before depletion to benign by-products. Monitoring of the ESVPs and wells will be continued on a monthly basis thereafter and continue on a monthly basis with the implementation of substrate injection for the ARD process application.

The subsurface monitoring activities will consist of screening the ESVPs and wells with a PID for potential VOC vapors (as discussed in Section 2.2 for monthly monitoring) when first opened followed by an inspection of the location interior. First a visual inspection of the ESVP or well interior using a flashlight or other form of illumination to observe if any injected materials have collected within a location will be conducted. Subsequently, a bailer will be lowered to the bottom of an ESVP or just penetrating the top of the groundwater table in a well. The bailer will then be raised for examination to determine if injected materials are present within the location being monitored. A form for the monitoring of the ESVPs and monitoring wells is provided in Appendix I.

Should injected materials be observed at the perimeter locations being monitored, the monitoring network will be expanded to evaluate other viable locations in the remediation enhancement area (i.e. ESVP-3, ESVP-6, MW-12A, MW-19A, MW-22A-S&I, and MW-24A-S&I) as appropriate. Additionally, a field evaluation will be completed to determine if changes in the injection process could minimize movement of the injected materials or if the injection process should be halted for further evaluation.

Should Alliance's review of subsurface material monitoring data note persistent and significant increases towards dwellings in the remediation enhancement area, the NYSDOH and NYSDEC will be notified and the enhancement system will shut-down until a better evaluation of potential causes can be made. Upon discussing the findings of this evaluation with NYSDEC and NYSDOH, a determination will be made on modification (if any) of the remediation enhancement operation is needed. Potential modifications to be considered may include, but are not limited to: adjustment of injection process procedures, change in injection material, change in injection points, installation of additional monitoring wells, and change in monitoring frequency. Additionally, if the subsurface material monitoring data show no movement of materials towards dwellings in the remediation enhancement area, the need for continuing monitoring activities for ongoing ARD process application at the north end of Pine View Road as well as expansion of the ARD application process throughout the Pine View Road area and the Facility building area via batch injections should be considered. Prior to implementation of any such actions, NYSDEC and NYSDOH will be notified and consulted on a proposed plan of action.

The subsurface material monitoring data generated will be reported on the same schedule as the groundwater monitoring and soil vapor data in the quarterly update reports submitted in February, May, August, and November (i.e. January monitoring data is presented in the April report). Additionally, a Remedial Enhancement Fact Sheet has been developed for the residents of #40 and #41 Pine View Road providing general project information and contact information to address resident questions on the groundwater remediation enhancement activities (refer to Section 5.6).

3.3.1 Monitoring Well Installation

Two additional monitoring wells MW-26A and MW-27A are proposed for the #41 Pine View Road property to evaluate movement of injection materials and soil vapor quality in the area of the groundwater remediation enhancements (refer to Figure 2-1). Final placement of these wells will be dependent on field conditions encountered and access to the proposed locations. The installation activities will follow the procedures used to install existing wells in the area as presented in Section 5.3.1 of the *Work Plan* and the ESVP installation activities discussed in Section 2.1 of this document. In general, the well installation activities will involve the following.

A hollow-stem auger (HSA) or air-rotary drill rig will be used to install the wells. Before initiating installation activities, the locations will be cleared with the property owner for their approval and to locate underground utilities. The New York State utility mark out service will also be contacted to clear the locations for underground utilities. Placement and use of the drill rig, support truck, and miscellaneous equipment (e.g. soil cuttings, drilling tools, materials, Alliance support truck, work area security, etc.) will be coordinated to allow the property owners to maneuver at their respective properties and along Pine View Road in accordance with Section 5.0 of this document. The #41 Pine View Road property owner will receive advanced schedule notification for coordination purposes.

The proposed wells will be installed into the water table (typically 10 feet bg) to a depth of approximately 20 feet bg. The HSA drill rig will advance 41/4-inch inner diameter augers or the air rotary rig will advance a 6-inch diameter hammer/drill rods to the projected completion depth of 20 feet bg for each well. Upon confirmation of achieving depth to 20 feet bg, the well will be set within the borehole. During the installation activities, ambient air monitoring for dust and VOCs will be conducted in accordance with Section 4.0 of this document. Additionally, per the Alliance health and safety document for this project, monitoring of the work area and drill cuttings for VOCs will be conducted using a PID. No soil sampling is scheduled during the installation of the wells as impacted soil has not been previously identified by soil sampling conducted in this area. Should the PID soil screening indicate significant results (reading >25 ppm) a sample of the drill cuttings will be collected for VOC analysis via EPA method 8260B.

The wells will be constructed of 2 -inch diameter flush-threaded schedule 40 PVC with 15 feet of 0.01-inch slot screen from 20 to five feet bg and sufficient casing to approximately six inches bg. The top of the 2-inch PVC casing will be fitted with a locking well cap. The annulus will be completed with #2 sand from 20 to three feet bg, bentonite from three feet to one foot feet bg, and an appropriately sized flush surface irrigation box will be set in concrete (one foot to grade) to match the existing grade.

Upon completion, these wells will be developed to clear sediment form within the well screen and sand pack using a submersible pump. Development water generated by the drilling activities will be contained and treated as specified in Section 5.3.1 of the *Work Plan*, which is consistent with activities previously approved by NYSDEC.

4.0 COMMUNITY AIR MONITORING

A Community Air Monitoring Plan (CAMP) consistent with NYSDOH protocols will be implemented to provide real-time monitoring for VOCs and particulates (i.e., dust) at the downwind perimeter of each designated work area when ground intrusive activities (i.e. drilling and excavation) are in progress for the implementation of the groundwater remediation enhancements proposed in the *Work Plan.* The CAMP will not be used in establishing action levels for worker respiratory protection as Alliance's Health and Safety Plan (HASP) for the project will be enforced during implementation of the groundwater remediation enhancement activities. The CAMP will be used to provide protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of the remedial work activities proposed for the project. The action levels specified in this CAMP will require either increased monitoring, corrective actions to abate emissions, and/or work shutdown should those levels be exceeded. The details of the CAMP are provided below:

4.1 VOC and Dust Monitoring

VOCs monitoring will be conducted using a PID or equivalent device. Dust monitoring will be conducted using a DSI particulate monitor or equivalent device capable of monitoring particulate matter < 10 micrometers (PM-10) at concentrations < 100 mcg/m^3 and capable of integrating readings over a 15 minute (or less) time interval for comparison to the NYSDOH action levels. Before the start of each day, the monitoring equipment will be appropriately calibrated. Air monitoring action levels developed by NYSDOH and responses to be implemented by Alliance based on the air monitoring data collected in the field are summarized in Table 4-1.

Monitoring for VOCs and dust will be conducted at the downwind perimeter location of the immediate work area (exclusion zone) on a continuous basis during ground intrusive activities. Background (upwind) concentrations of VOCs and dust will be measured at the start of each workday and periodically thereafter during the course of the workday to establish and evaluate background conditions for the workday. Additionally, 15 minute readings for VOCs and dust will be recorded on an air monitoring form (presented in Appendix I). These forms will be available for NYSDEC and NYSDOH personnel to review if requested. Should any instantaneous readings collected be used for decision purposes, these readings will also be recorded on the air monitoring form. Should VOCs or dust levels approach action levels, the field activity will be halted and evaluated to determine if a change in approach could reduce or eliminate the situation. Upon determining the appropriate response, the field activity will resume. Typically, in response to elevated dust levels the following action items would be undertake: utilization of wetting devices to minimize dust, slowing excavation activitics and lifting levels to minimize air contact, and/or halting operations. In response to elevated PID readings, the field activity will be halted and a detailed investigation will be completed to identify the source as it is not anticipated VOCs are present in the effected area of field activities.

TABLE 4-1
COMMUNITY AIR MONITORING PROGRAM (CAMP)
ACTION LEVELS
FORMER CHROMALLOY FACILITY – WEST NYACK, NY

Instrument [1]	Function	Differential Readings [2,4]	Action
Particulate Monitor	Continuously measures particulate(s) PM-10 [3] in ambient air.	0-100 mcg/m^3	No action necessary.
		100-150 mcg/m^3	Institute dust suppression techniques. If visible dust from Alliance work activities is leaving work area, stop work.
		>150 mcg/m^3	Stop work. Re-evaluate dust suppression techniques, contact PM and HSR for guidance. Work can continue once levels are below 150 mcg/m^3 and no visible is leaving the work area.
Oxygen/Photoionization Detector (PID), and/or **Flame Ionization Detector (FID)**	Measures total organic vapors (VOCs)	< 5 ppm	Continue work and monitoring.
		> 5 ppm (initial breach)	Temporarily stop work, if results readily decrease below 5 ppm over background, work activities can proceed with continued monitoring.
		5 - 25 ppm	Stop work and identify source of vapors. Take corrective actions to abate emissions and continue monitoring. After corrective actions are taken, resume work provided total VOCs 200 feet downwind (or at nearest receptor, whichever is less but >20 feet) is below 5 ppm for 15 minute average.
		>25 ppm	Stop work. Contact PM and HSR for guidance.

Notes: 1. Instruments must be calibrated according to manufacturer's recommendations.
2. Differential Readings over a 15-minute period between the background (or upwind) and downwind perimeter readings.
3. PM-10 – Capable of measuring particulate matter less than micrometers in size.
4. Particulate monitor measures in micrograms per cubic meter 10 mcg/m^3.
5. The action levels apply to construction and sampling tasks performed on this site.

5.0 PROJECT OPERATIONS AND PROCEDURES

This section provides information on the project operations and procedures to be implemented to minimize disturbance to and be protective of the residents in the Pine View Road neighborhood. Additionally, Alliance will implement their site-specific HASP to ensure the protection of Alliance personnel, their contractors, and the public in general, which includes conducting morning tailgate meetings before the start of each workday to go over potential hazards associated with work anticipated for the day.

5.1 Project Workday Schedule

Project installation and operation and maintenance (O&M) activities for the groundwater remediation enhancements will be conducted Monday through Friday between the hours of 8 AM and 6 PM. Alliance does not anticipate working in the dark requiring the need for lighting. Project activities conducted beyond the above stated schedule would be in response to residents contacting Alliance to address system issues or other issues requiring Alliance's immediate attention. Onsite personnel will coordinate field activities with the residents of the #40 and #41 Pine View Road as necessary so as not to limit their access to the properties or impose upon their schedule.

5.2 Traffic Control

Traffic control for any heavy vehicles or equipment (i.e. drill rigs, support trucks, backhoe, etc.) traveling along Pine View Road to reach the very north end where the groundwater remediation enhancements are located will involve the following items:

- Before advancing along Pine View Road, onsite personnel will walk ahead of the vehicle or equipment to ensure the road is clear of traffic and insure no conflict with pedestrians and in particular with children at play.

- A maximum speed limit of 15 miles per hour for vehicles and equipment will be enforced.
- For a vehicle or equipment greater than 10 feet in height, a spotter looking at overhead utility lines and tree branches will accompany the vehicle along the road.
- Where appropriate, all traffic will yield to residential traffic along the road.

5.3 Work Zone Exclusion

Work zones where injection well installation, pipe trenching, remediation system building construction, and or other associated activities conducted will be identified via appropriate marking so that unauthorized personnel do not inadvertently enter the work zone. Typically, the work zones will be identified with traffic cones, barriers, and/or caution tape. Where appropriate, the use of support vehicles may be employed to block access to work zones. Onsite personnel will follow the HASP developed for the site and wear appropriate personal protective equipment (hard hat, safety glasses, steel-toe boots, and hearing protection-as appropriate). Only authorized personnel will be allowed to enter the work zones with unauthorized personnel attempting to enter the work zone to be civilly, but firmly asked to leave the work zone.

Upon the end of each workday, the work area will be cleaned up and any potential hazards (i.e. open excavation, drilling equipment, materials, etc.) will be minimized to the extent possible. The work area and any potential hazards will be cordoned off with safety eones, temporary fencing, caution tape, and/or support vehicles and equipment to limit access to the area.

5.4 Containment and Handling of Soil and Groundwater

Before commencement of drilling activities, containment units will be constructed of plastic and hay bales (or other appropriate material) to collect soil cuttings and groundwater for disposal and treatment, respectively. Contained groundwater will be pumped out of the containment units for transport via truck mounted poly-tank to the site remediation system for treatment (as implemented to collect and treat purge groundwater generated during quarterly groundwater sampling events). Soil cuttings (including plastic used for the containment liner) will be removed from each soil boring location and loaded into drums or a roll-off container to be placed at a central location approved by the Bradley Corporate Park property owner. Additionally, any additional soil remaining from construction activities (i.e. pipe trenching) will be removed from the area and loaded into drums or a roll-off container for appropriate disposal. Composite soil samples representative of the soil generated will be collected and submitted for laboratory analysis to characterize the material for appropriate disposal. The characterization analyses will consist of TCLP VOCs via method EPA 8260B, TCLP SVOCs via method EPA 8270C, TCLP pesticides/herbicides via methods EPA 8081A/8151A, and TCLP Metals via method EPA 6010B/7000, unless the selected disposal facility requires other analyses. The extraction method will be via method EPA 1311/1312.

5.5 Remediation System O&M

Once the system installation is completed, the #41 Pine View Road property at a minimum will be restored to a condition before which work was initiated. RegenOx™ injection operations are projected to be contained within the immediate area of the remediation building to be placed at the property. As implemented for the installation and construction activities, the work zone exclusion procedures specified in Section 5.3 will be implemented to prevent unauthorized personnel from entering the work area during activities conducted out side of the building. For the substrate injection activities, only the transport of additional substrate to the remediation building or implementation of general O&M activities (i.e. carbon drum change-out) will be conducted requiring some amount of caution mostly due to the weight of the items. All other O&M activities will be conducted within the building with distribution of substrate to the points through subsurface plumbing. However, should O&M activities require, the work zone exclusion procedures specified in Section 5.3 will be implemented as appropriate. The building itself will also have a placard providing contact information should there be an emergency associated with the building.

5.6 Remedial Enhancement Fact Sheet

Alliance has developed a Remedial Enhancement Fact Sheet providing a general description of the activities to be conducted and what the materials being injected look like should they return to the surface for distribution to the residents/property owners of #40 and #41 Pine View Road. This fact sheet also provides contact information for the residents should they observe materials resembling the injected material or other issues arise regarding the groundwater remediation system enhancements so that Alliance can respond to address such issues. A copy of this Remedial Enhancement Fact Sheet is provided in Appendix II.

Appendix I

Community Health and Safety Work Plan Forms

Soil Vapor Point Well Monitoring Form

Date:
Weather Conditions:

Location	Time	PID Reading	Observations	Action(s)

Material Resurfacing Monitoring Form

Date: Weather Conditions: Patrol Area/Observations	Time	Complete if Material is Observed			
		Location - Check One			Action Taken
		Up Gradient	Down Gradient	Injection Point	

Ground Intrusive Air Monitoring Form
Community Air Monitoring Program (CAMP)

Date: Weather Conditions: Location/Work Activity	Check One			Time	Dust	PID
	Up Gradient	Down Gradient	Work Zone			

Appendix II

Remedial Enhancement Fact Sheet

ENVIRONMENTAL ALLIANCE

Remedial System Enhancement Fact Sheet
Chromalloy Inactive Hazardous Waste Site # 3-44-039
Operable Unit I

West Nyack, Rockland County, New York
NYSDEC - DER, Region 3,

Introduction

Environmental Alliance, Inc. (Alliance) on behalf of Sequa Corporation (Sequa) for the respondent Chromalloy Gas Turbine Corporation is continuing to conduct ongoing Remedial Actions associated with the former Chromalloy American Corporation site ("Former Chromalloy Facility" or "Facility") under an Order on Consent ("Consent Order") with the New York State Department of Environmental Conservation (NYSDEC) signed on March 30, 2001. The Consent Order specified the Development and Implementation of a remedial program for Operable Unit I specified in the Record of Decision (ROD) issued by the NYSDEC on March 31, 1999. The remedial program consists of the construction and operation of a pump and treat (P&T) remedial system to address residual volatile organic compounds (VOCs) impacting groundwater in bedrock beneath the Facility and Pine View Road neighborhood and a Dual Phase Extraction (DPE) system to address residual VOC impact to soil and groundwater in overburden soil to the south of the Facility building (refer to Figure 1 for the entire Study Area). The DPE system has been operational since January 2003 and the P&T system has been operational since March 2003. Based on evaluation of P&T system operations, enhancements have been proposed to NYSDEC via the *Groundwater Remediation Enhancement Work Plan* (Alliance, October 2006) to improve the effectiveness of the existing P&T system in addressing residual VOCs in groundwater at the north end of Pine View Road and the Study Area.

Groundwater Remediation Enhancements Overview

The remediation enhancement activities described in the *Groundwater Remediation Enhancement Work Plan* include: continued operation of the existing P&T and DPE system; the installation and operation of an injection system using treated groundwater from well #41, mixing the treated water in a phased approach with RegenOx™ (to oxidize VOCs) followed by various substrates (to induce anaerobic reductive dechloronation – "ARD") for injection wells proposed for installation at the northern portion of the #41 Pine View Road property and conduct groundwater monitoring (pre- and post – injection phases) to evaluate the effectiveness of the enhancements. The injections will be into the aquifer system beneath the ground surface via the installed wells and will be monitored to insure no contact with the ground surface occurs. The area around the injection points will also be monitored for potential soil vapor. Monitoring points will be installed between the injection area and the residential dwellings to provide sufficient information regarding subsurface conditions prior to any concern with residential dwellings. Due to the depth of the injections and distance of the injection points from the residential dwellings; the concern for subsurface pathways to the ground surface are minimal, but will be monitored as a precaution. Upon determining the effectiveness of the groundwater remediation enhancements the program will be expanded into the Pine View Road area to include passive injections (batch injections) into existing bedrock wells and new well(s) to be installed.

ENVIRONMENTAL ALLIANCE

The remediation enhancement construction activities for the active injection system will include subsurface utilities location, equipment procurement, injection well installation, pump installation, trenching and installation of the piping system, building construction, utilities installations *(electric)*, equipment installation, piping connections, utilities hook-ups, inspections, equipment checks, site restoration activities, and system start-up. The active system will be contained within the remediation treatment building with all piping and connections between pumping and injection wells below the ground. No construction is required for the passive injections as this is a portable system transported on a daily basis to an injection well location.

Injection Material Technical Information

The RegenOx™ and various substrates (soybean oil, calcium magnesium acetate, methanol, sodium lactate, HRC™ -a sodium lactate product, and Newmanzone™ - emulsified soybean oil with sodium lactate, nutrients and surfactants product) proposed for injection for the groundwater remediation enhancement are not considered to be hazardous in their packaging for delivery and use at a site. Of these materials proposed for injection, only RegenOx™ and methanol requiring care in preparing a mix with water (maximum of 10 % material to 90 % water). Once injected into the groundwater system, these injected materials are further diluted and break down to benign by-products.

As there may be a potential chance for injected materials to resurface in the immediate area of the injection well locations, a physical description of the injected materials appearance is provided below so that the residents in this area can identify the material.

RegenOx™

RegenOx™ when prepared for injection will appear as a chocolate brown fluid. Should RegenOx™ injected into the groundwater system resurface, the material may appear in two different forms. 1) One is as a brown to light brown bubbly/airy (mousse-like consistency) fluid that easily disintegrates to a flaky ash like material before the material completely dissipates leaving a wet spot on the ground surface with no residue. 2) The second is as a translucent pearly white thin (watery) liquid that will completely dissipate leaving a wet spot on the ground surface with no residue.

Substrates for ARD

Substrates when prepared for injection will appear as a milky to oily whitish to grayish watery liquid. Should the substrate mixes return to the surface, the material will continue to appear as a milky to oily whitish to grayish watery liquid. The substrate mix will dissipate so that the ground appears to be wet with no residue.

Action if Injected Materials are Observed on the Ground Surface

Due to the depth of the injections and the care taken to monitor the injections, it is not anticipated that substrate or any related material should potentially be accessible to the residential populations. However as a precaution, should a resident observe materials as described above, do not touch the material (although the material is likely not a health concern), note the location where the material is observed and contact Alliance using the following information.

Contact: Mr. Andrew Applebaum
Environmental Alliance, Inc.
1812 Newport Gap Pike
Wilmington, DE 19080
Day Phone: (302) 995-7544
Night Phone: (302) 354-3859 (Joseph Zay)

The following NYSDEC regulatory contact information is provided below should the residents have questions regarding the implementation of the groundwater remediation enhancement project activities.

Contact: Ms. Michelle Tipple
Project Manager
NYSDEC, Region 3 Office
21 South Putt Corners Road
New Paltz, NY 12561-1696
Phone: (845) 256-3153

Contact: Mr. Ramanand Pergadia, P.E.
Project Director
NYSDEC Region 3 Office
21 South Putt Corners Road
New Paltz, NY 12561
Phone: (845) 256-3146

For health related concerns regarding the groundwater remediation enhancement project activities, call or write:

Contact: Ms. Fay Navratil
Public Health Specialist
Bureau of Environmental Exposure Investigation
NYSDOH
547 River Street
Troy, NY 12180-2216
Phone: (518) 402-7860

J:\EAI_files\1166_Nyack\Reports\Work Plans\Community H&S WP\Remedial Enhancement Fact Sheet 3-07.doc

CHROMALLOY GAS TURBINE CORPORATION
Hackensack, New Jersey

RECEIVED
AUG - 5 1994
R. IULIUCCI

FORMER CHROMOLLOY SITE

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

Health and Safety Plan

NYSDEC SITE No. 344039

July 1994

LAWLER, MATUSKY & SKELLY ENGINEERS
Environmental Science & Engineering Consultants
One Blue Hill Plaza
Pearl River, New York 10965

Project No. 685-001

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

SITE DESCRIPTION AND HAZARD ASSESSMENT

1.1 INTRODUCTION

This site-specific health and safety plan (HASP) addresses those field activities associated with the former Chromolloy (FC) site Remedial Investigation/Feasibility Study (RI/FS). The HASP has been prepared in conformance with the Lawler, Matusky & Skelly Engineers (LMS) health and safety program for hazardous waste sites, which in turn is in conformance with all appropriate Occupational Safety and Health Administration (OSHA) regulations (29CFR1910 and 1926). This generic program includes the safety regulations required by the Superfund Amendment and Authorization Act (SARA), 29CFR1910.120. A copy of the LMS generic HASP is attached and is considered an integral part of this HASP.

This site-specific HASP specifically addresses those problems unique to the FC site, and includes any modifications to the LMS generic HASP in response to these conditions. This document represents one of three plans that have been developed to establish guidelines for the performance of the RI/FS on the site. The remaining plans include the Quality Assurance Project Plan (QAPP) which includes field sampling procedures and quality assurance/quality control (QA/QC) procedures and the Citizen Participation Plan (CPC) which provides methods of keeping the public informed about the project. Each of the three plans should be reviewed by field and office personnel to provide them with the fullest understanding of the scope and guidelines of site operations. Compliance with this HASP is required of all workers and third parties who enter the site. The on-site Coordinator (OSC) and on-site Health and Safety Officer (HSO) are responsible for assuring compliance with this plan.

1.1.1 Study Objectives

The overall objective of this study is conduct an RI/FS for the FC site to define the nature and extent of the contamination at and around the site, evaluate potential remedial alternatives, and recommend a best alternative. The RI/FS will be conducted by LMS, with assistance from several subcontractors who will provide analytical, data validation, drilling, and surveying services. These subcontractors have not been selected to date.

This HASP covers the work to be conducted during the RI. Included in the RI field activities are all or some of the following:

- Monitoring well installation and sampling
- Soil boring drilling and sampling
- Soil gas survey
- Shallow soil sampling
- Septic tank sampling
- Surface water/sediment sampling
- Test pit digging and sampling
- Air sampling
- Concrete coring in building(s)

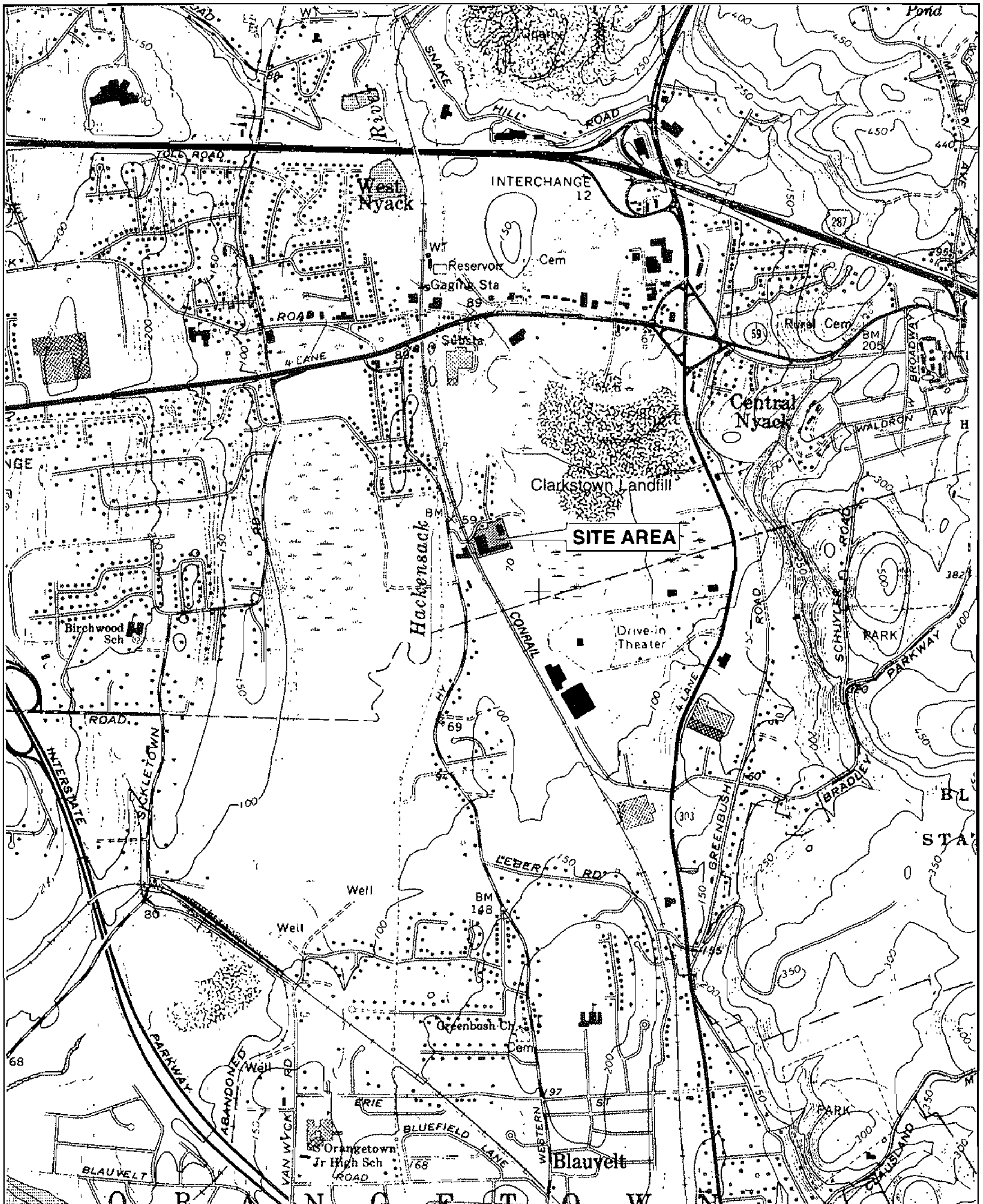
1.2 SITE LOCATION AND PHYSICAL DESCRIPTION

The FC site is located at 169 Western Highway, West Nyack, Rockland County, New York (see Figure 1-1). The site is approximately 50 acres in size and is situated between the Clarkstown Landfill to the northeast, the Hackensack River to the northwest, a residential area to the north on Pine View Road, a swampy area to the east, and woods and vacant land to the south and west. A ConRail line runs through the site in the northwest-southeast direction.

1.3 SITE RECONNAISSANCE

The site reconnaissance of the FC site took place on 15 April 1994. The purpose of the site reconnaissance was to acquaint personnel involved in the RI/FS with the layout of the site, to check out access problems for vehicles, to locate site work zones, and to obtain additional air monitoring information to be used in the development of the HASP.

All site reconnaissance work took place at Level D protection, i.e., safety shoes. At the time of the reconnaissance, the weather was 60-65°F, sunny, with no wind. Air monitoring readings were taken with an HNU Systems, Inc., photoionization detector (PID); readings were taken in the breathing zone throughout the site to determine whether additional protective gear would be required for the field work. In addition, readings were taken in the headspace over the existing monitoring wells.



0 2000 ft

SCALE
1 in. = 2000 ft

QUADRANGLE LOCATION

Map source: Nyack, NY-NJ, 7.5-min Quadrangle (USGS 1967).

V6006B5MAPS.ds4

FIGURE 1-1

SITE LOCATION MAP

Sequa Corp.
Former Chromalloy Site

LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

All readings in the breathing zone were at background levels. Figure 1-2 is a site map that shows the locations of the monitoring wells and the readings in the headspace. As can be seen, several positive readings were noted in the headspace. These readings were as high as 300 units in well MW-1B. Actual data and calibration information are contained in Appendix A.

1.4 HAZARD ASSESSMENT

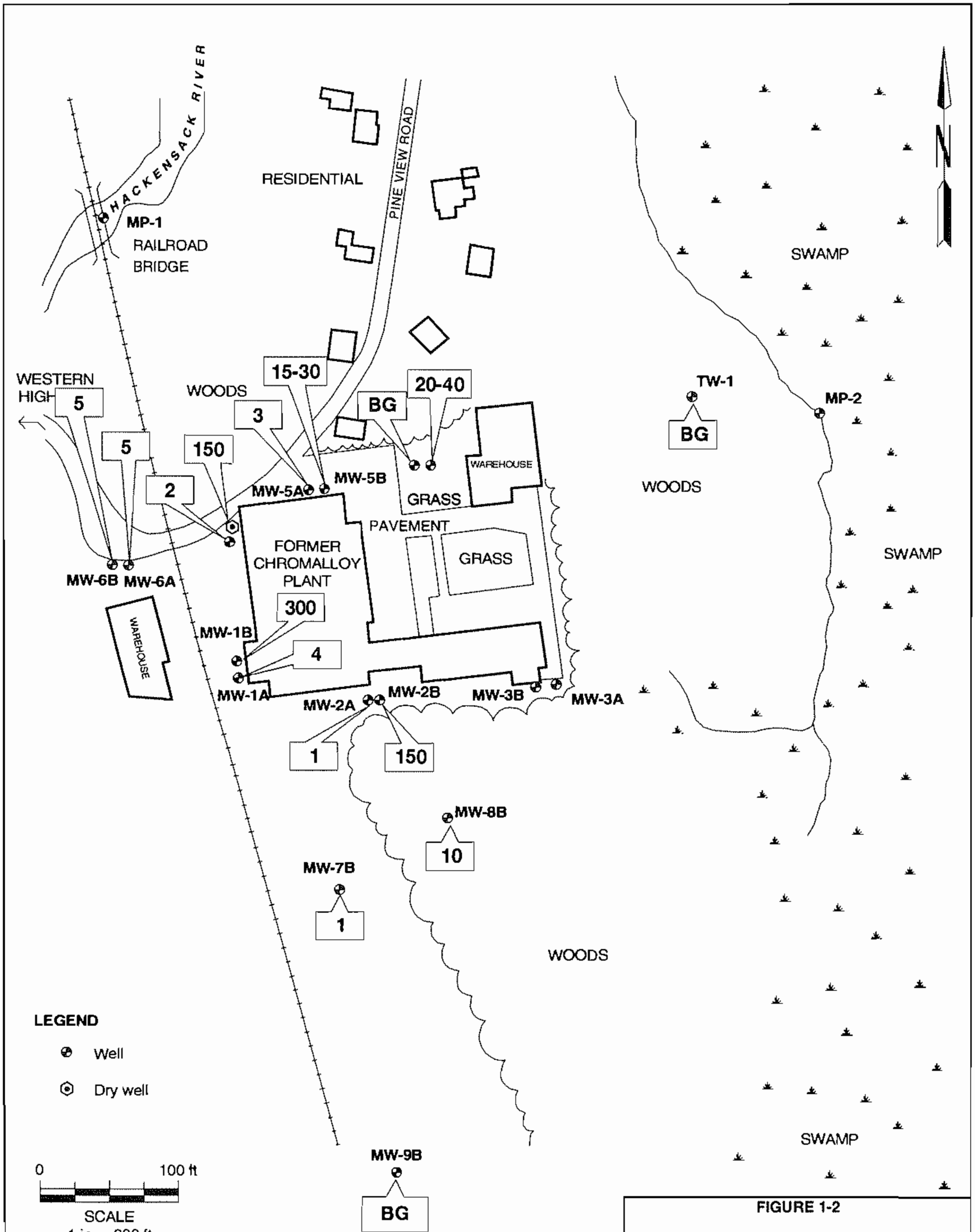
In 1978, the Rockland County Health Department (RCHD) sampled several of the residential wells located along Pine View Road after a resident had complained about a taste and odor in the well water. The analysis showed elevated concentrations of trichloroethylene (TCE) in some of the wells with one well containing 65,000 μg/l of TCE. As a result, all residents were connected to public water. A Phase II investigation was conducted by Wehran Engineering, P.C., for the New York State Department of Environmental Conservation (NYSDEC) in 1984, however, no new sampling was conducted.

Geraghty & Miller, Inc., conducted a Preliminary Hydrogeologic Investigation for Sequa Corporation (Sequa) in 1991. During the investigation six shallow and six bedrock monitoring wells were installed on the site. Split-spoon soil samples were collected during the installation of the shallow monitoring wells. The soils contained copper above ambient background concentrations, and TCE and 1,2-dichloroethylene (1,2-DCE) ranging from ND to 210 μg/kg and ND to 13 μg/kg, respectively. The groundwater had TCE in the water table wells ranging from 0.5 to 1,800 μg/l and in the bedrock wells ranging from 330 to 33,000 μg/l. Cis-1,2-dichloroethylene (Cis-1,2-DCE) ranging from ND to 130 μg/l, methylene chloride (MC) ranging from ND to 410 μg/l, and tetrachloroethylene (tetra) ranging from ND to 300 μg/l, were also found in the groundwater. Cis-1,2-DCE is a degradation product of TCE.

Table 1-1 lists the chemicals found on the FC site, their exposure limits [permissible exposure limit (PEL), recommended exposure limit (REL), time-weighted average threshold limit value (TWA/TLV), and immediately dangerous to life and health (IDLH)], flammability characteristics (lower explosive limits (LEL), upper explosive limit (UEL), flash point, and auto-ignition temperature], solubility, ionization potential, vapor pressure and density, odor threshold, toxic effects, and whether or not a respirator can be used.

On the basis of the air quality data collected during the site reconnaissance and data collected to date on the site, the chemical hazard assessment is low.

Major physical hazards include such items as slip-trip and overhead hazards during drilling. These hazards can largely be avoided by wearing safety shoes, hard hats, and safety glasses



NOTE: All HNU readings shown are in headspace of well.
All breathing zone readings were at background levels

Map source: Geraghty & Miller (1991).

\600\685MAPS.ds4

FIGURE 1-2

AIR MONITORING AT FORMER CHROMALLOY SITE

Sequa Corp.
Former Chromalloy Site

LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

TABLE 1-1

AIR LIMITS, EXPOSURE LIMITS, AND MISCELLANEOUS ADDITIONAL INFORMATION

COMPOUND	SYNONYMS	ACGIH TLV (ppm)	NIOSH REL (ppm)	OHSA PEL (ppm)	NIOSH IDLH (ppm)	LEL (% @ deg. F)	UEL (%)	FLASH POINT (F)	AUTOIG TEMP (F)	VP (mm)	VD	IP (eV)	SOLUBILITY (%)	ODOR THRESH. (ppm)	RESP. PROTC	TOXICEFFEC
Copper	Anac 110; Bronze Powder; 1721 Gold; CDA 101,102,110 and 122	1mg/m3	-	1mg/m3	NA	NA	NA	NA	-	0	-	-	insol.	-	yes	irrit muc. memb, pharynx; nas perf; eye irrit; metal taste; derm
Methylene chloride	Dichloromethane; Methylene dichloride	50 b	d	500	carcinogen	12	19	-	1033	350	2.9	11.35	1.3	25-320	no	Ftg, weak, sleep, light head; limb numb, tingle; nau; irrit eyes, skin; vertigo; worsen angina
Tetrachloroethylene	Perchloroethylene, tetrachloroethene	50	b	100	carcinogen	nc	nc	nc	-	14	-	9.32	0.015	4.7-50	no	Irrit eyes, nose, throat; nau; flush face, neck; vertigo, dizz, inco; head; som
Toluene	Toluol; Phenylmethane; Methyl benzene	100	100	200	2000	1.3	7.1	40	896	22	3.1	8.82	0.05	0.17-40	yes	Ftg, weak, conf, euph, dizz, head; dil pup; ner; musc ftg; insom; pares; derm; photo
Trichloroethylene	Trichloroethene; Ethylene trichloride; Tridene; TCE; tetrachloroethene	50	25	100	carcinogen	11	41	none	788	58	4.8	9.47	0.1	21.4-400	no	Head, vertigo; vis dist; tremors; somnol; nau, vomit; irrit eyes; derm; card arrest; pares

"-" : Unknown.
c : Ceiling limit.
NOTE: Under Respiratory Protection, yes/no indicates whether or not a respirator can be used.

during drilling and other field work. Major biological hazards include insect bites, especially ticks, and contact with poisonous plants such as poison ivy. To avoid tick bites, use of an insect repellant is recommended as well as a thorough checking of clothing for ticks.

The ConRail line that runs through the property is an active line. There is a stop sign where the road crosses the tracks; however, there are no flashing lights or gate to signal that a train is coming. Everyone must stop, look, and listen, at the crossing before proceeding to ensure that a train is not on the tracks.

CHAPTER 2

SITE-SPECIFIC HEALTH AND SAFETY GUIDELINES AND PROCEDURES

2.1 SITE CONTROL

2.1.1 Site Security

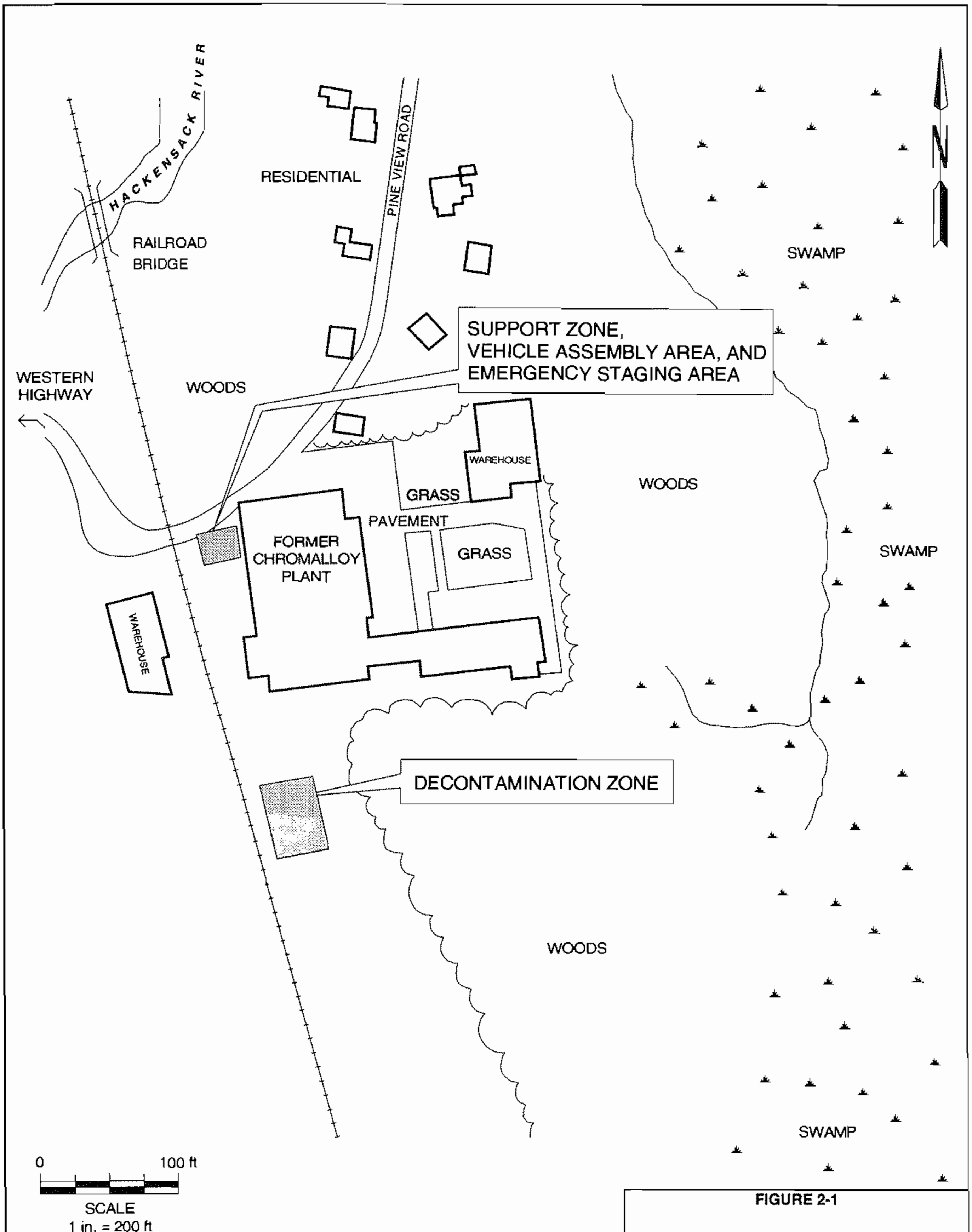
Currently the FC site is an active facility, leased by Alloy Technology International (ATI). The south side of the site is fenced in, however, the gate is unlocked. A guard booth is on the site but is currently unmanned. ATI will be notified at the outset of each phase of the field work. No site trailer will be provided, however, personnel can use the facilities, i.e., telephone and rest rooms in the ATI building. All personnel entering and leaving the site must sign-in and sign-out of the log book maintained by LMS. This log book will provide a record of who is on-site at all times in case of an emergency.

2.1.2 Site Work Zones

The site work zones are shown on Figure 2-1. The staging area used in case of an emergency is also shown on the figure. The exclusion zone is defined as a 10-ft radius around each sample point on the site. All equipment and personnel decontamination will take place at the area shown on Figure 2-1. If additional data collected during the field work indicate otherwise, this decision may change.

2.2 ON-SITE HEALTH AND SAFETY OFFICER

The on-site Health and Safety Officer (HSO) will be responsible for determining the level of protection required for all tasks each day. It will be his/her responsibility to conduct all air monitoring, prepare daily health and safety reports, and record all data. The on-site HSO will also have the qualifications and responsibilities listed in Section 2.2 of LMS' generic HASP. He/she will also have an additional 8 hrs of training in the supervision of hazardous waste site operations. It will also be his/her responsibility to verify that all worker have the appropriate level of training required (as described in Section 4.2 of the generic HASP), the proper medical surveillance (as described in Section 4.1 of the generic HASP), and that all personnel have read the site-specific HASP and have acknowledged this by signing the affidavit in Section 5. The on-site HSO will also be well-versed in monitoring workers for symptoms of heat or cold stress, and will record such information as temperature, humidity, wind speed, and wind direction in the log book. He/she, or a designated alternate, will also have at least 8 hrs of standard first



NOTE: Exclusion zone is defined as 10-ft radius around each sampling point or area.

FIGURE 2-1

SITE WORK ZONES

Sequa Corp.
Former Chromalloy Site

LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

aid and cardiopulmonary resuscitation (CPR) training. It is also the responsibility of the on-site HSO to supervise any emergency evacuation that may take place.

2.2.1 Key Personnel

The following personnel may serve as the on-site HSO:

PERSON	COMPANY	TELEPHONE No.
Joseph Condello	LMS	(914) 735-8300
John Guzewich	LMS	(914) 735-8300
Donald Henshaw	LMS	(914) 735-8300
Donald Kassell	LMS	(914) 735-8300
James Morrison	LMS	(914) 735-8300
Karen Wright	LMS	(914) 735-8300
Michael Lehtinen	LMS	(914) 735-8300
Kevin McCarty	LMS	(914) 735-8300
Richard Donofrio	LMS	(914) 735-8300
Sara Handy	LMS	(914) 735-8300
Joseph Mastromarchi	LMS	(914) 735-8300
Tarik Zarrouk	LMS	(914) 735-8300
Seth Piker	LMS	(914) 735-8300
Christina Fern	LMS	(914) 735-8300
Christopher O'Gorman	LMS	(914) 735-8300
Louis Baerga	LMS	(914) 735-8300
Vincent Carbone	LMS	(914) 735-8300
Tarik Zarrouk	LMS	(914) 735-8300
Stuart Bassell	LMS	(914) 735-8300

This list is subject to change depending on personnel availability.

2.3 AIR MONITORING

The on-site HSO will prepare a daily health and safety report (see Table 2-1) and will record all air monitoring data (see Table 2-2). Calibration data sheets for all field instruments will also be prepared daily (see Table 2-3).

TABLE 2-1

DAILY HEALTH AND SAFETY REPORT

Former Chromalloy Site

Date: ______________________________

Background HNU Reading (Measured at Emergency Staging Area): ______________

Background OVA Reading (Measured at Emergency Staging Area): ______________

Background EXP Reading (Measured at Emergency Staging Area): ______________

Background OXY Reading (Measured at Emergency Staging Area): ______________

Work Area and Task: ______________

Level of Protection Required: ______________

Work Area and Task: ______________

Level of Protection Required: ______________

Comments: ____

On-Site Health and Safety Officer: ______________________________

Note: Readings at work site are recorded on separate table.

TABLE 2-2

LAWLER, MATUSKY & SKELLY ENGINEERS
DAILY HEALTH & SAFETY REPORT
DATA SHEET

Job No.:______________
Site:______________
Oper.:______________
Crew:______________

HNu Meter:__________
OVA Meter:__________
Explosimeter:__________
Date:______________

TIME	SAMPLE LOCATION	HNU READING	EXPLOSIMETER READING	OVA READING	COMMENTS

On-Site Health & Safety Officer and/or Crew Chief:

(Signature)______________________

(Date)______________________

TABLE 2-3

JOB No. ______

SITE: ______

CREW: ______

LAWLER, MATUSKY & SKELLY ENGINEERS

AIR MONITORING METER FIELD

CALIBRATION AND MAINTENANCE LOG

Page ____ of ____

DATE/ TIME	INITIALS	METER No.	BATT. CHECK	CALIB. GAS TYPE	EXPECTED		OBSERVED		ADJUSTMENTS		HNu/OVA SPAN SETTING OR PHOTOVAC LT. INTENSITY	MAINTENANCE/ CALIBRATION
					ZERO/ AMB.	CALIB. GAS	ZERO/ AMB.	CALIB. GAS	ZERO/ AMB.	METER/ SPAN		

Generally, a photoionization detector (PID), or specifically an HNU and explosimeter or combustible gas indicator (CGI), will be used to determine the levels of protection. A flame ionization detector (FID) such as the Century organic vapor analyzer (OVA) can also be used in conjunction with the HNU. The area around the emergency staging area will be surveyed with each of the instruments in the morning to determine background conditions. The areas of the site to worked on that day will be initially monitored before work begins and periodically during the day. During any invasive type work, i.e., drilling and installation of monitoring wells, continuous air monitoring with the HNU and/or OVA will be performed in the breathing zone (i.e., 4-6 ft above the ground surface). A felt tip marker will be used in the field to check the response of the meters. The CGI will be used to monitor explosive levels of gas which may possibly come from the borehole. If visible dust is observed which may exceed the PEL during any activities, the RAM-1 particulate monitor will be used; data sheets for the RAM-1 are provided on Table 2-4.

2.4 PERSONNEL PROTECTIVE EQUIPMENT

2.4.1 Determination of Level of Protection Requirements

Pertinent information on each of the chemicals of concern found on the site including American Conference of Governmental Industrial Hygienists (ACGIH) TWA/TLV, OSHA PELs, National Institute of Occupational Safety and Health (NIOSH) RELs, toxic effects, and respiratory protection have already been described in Table 1-1. Most of these chemicals can be filtered with some efficiency by a respirator fitted with an organic vapor cartridge. However, based on the data collected by Geraghty & Miller, an air respirator will not be required for most of the work on-site.

Air monitoring done during the course of the field work will ultimately determine the levels of protection. Since TCE is the major compound found in the highest concentrations, the HNU span setting should be set at 8.2 for a better reading of the TCE concentration. TCE has a REL of 25 ppm, therefore, the following guideline should be used to upgrade from Level D to Level C: if the HNU reading is > 20 ppm above background in the breathing zone, upgrade to Level C is warranted. If the reading is > 500 ppm above the background level in the breathing zone then upgrade to Level B is required. This number is based on the IDLH of Tetra of 500 ppm. Since the IDLH for TCE is 1000 ppm, using 500 ppm as the action level to upgrade to Level B is conservative. In addition, if the reading on the OVA exceeds 20 ppm and the reading is not due to methane (as determined by using the methane filter), upgrade to Level C is warranted.

TABLE 2-4

Page ___ of ___

Project:	LAWLER, MATUSKY & SKELLY ENGINEERS	Operator:	
Project No:	FIELD DATA SHEET RAM-1	Date:	Unit Serial No.:

Survey I.D.: ___________

STATION	TIME (Hrs)	READING (mg/m³)										COMMENTS

Whenever the action level of 20 ppm is exceeded, readings at the site perimeter downwind of the location and closest to the residences will be taken. If the 20 ppm action level is exceeded at the site perimeter all site operations will cease until the levels decrease.

During drilling operations, the CGI will be used to monitor the level of explosive gases. If the level exceeds 10% of the LEL, work will cease until the readings subside.

A wet coring procedure will be used during concrete coring in the building to eliminate dust levels. If visible dust is observed, work will cease and LMS will be contacted regarding procedures to be used to continue coring.

2.4.2 Task-Specific Personnel Protective Equipment

In accordance with LMS' HASP requirements for minimum safety equipment to be worn on a hazardous waste site, all employees will use the following:

- Hard hat (only if overhead hazard exists)
- Safety glasses or goggles (only if eye hazard exists)
- Safety shoes

All noninvasive tasks, i.e., walking on the site, air sampling, septic tank sampling, surface water/sediment sampling, and surveying, will require the above protection. Latex gloves will also be worn if contact with equipment that may have contaminated material on it is possible. For invasive-type activities where disturbance of the soil is possible, i.e., during soil gas point installation, drilling, collection of the soil samples, and/or when contact with groundwater is possible as when sampling, etc., modified Level D protection will be required. In addition to the minimum described above this modified Level D attire will include nitrile gloves worn over latex gloves, overboots, and uncoated Tyvek. Full-face air purifying respirators fitted with organic vapor cartridges and HEPA filters will be available for all on-site personnel in case the HNU readings exceed 20 ppm above background in the breathing zone. If there is a danger of splash, the Tyvek will be upgraded to coated Tyvek (suit or apron and sleeves). If a boat is needed to acquire surface water and sediment samples, a life preserver must also be worn. Table 2-5 summarizes the task-specific levels of protection to be used.

Daily air monitoring will be used to upgrade or downgrade the levels of protection. The on-site HSO has the authority to dictate the levels of protection to be worn each day. As additional

TABLE 2-5

TASK-SPECIFIC LEVELS OF PROTECTION[a]

TASK	LEVEL OF PROTECTION
Surveying	Level D
Soil Gas Installation and Sampling	Modified Level D
Monitoring Well Installation and Sampling	Modified Level D
Soil Boring and Sampling	Modified Level D
Shallow Soil Sampling	Modified Level D
Air Sampling	Level D
Test Pit Digging and Sampling	Modified Level D
Septic Tank Sampling	Level D
Surface Water/Sediment Sampling	Level D[b]
Concrete Coring in Building	Level D

[a]See text for definition of attire.
[b]If a boat is used, a life preserver must also be worn.

data become available from the analyses of the site samples, the level of protection may also be upgraded or downgraded.

As noted in Chapter 1, biological hazards from tick bites exist and can be prevented by the wearing of white Tyvek, overboots, and a hardhat. Insect repellant is recommended, except during sampling.

2.5 EMERGENCY PROCEDURES AND EMERGENCY RESPONSE PLAN

At least one person on-site at all times must have a minimum of 8 hrs of first aid training and CPR training. Each crew will be equipped with an air horn and walkie-talkie for communication purposes, if appropriate; other emergency equipment, such as a first-aid kit, fire extinguisher, and flashlight, will be on-site at all times. In the case of a medical emergency, indicated by one long blast on the air horn, the crews will communicate by walkie-talkie, if required, to determine the nature of the emergency and location. After the first aid person ascertains the location and the degree if emergency, he/she will instruct someone to call for an ambulance, if needed. The site building is equipped with a phone which can be used to call for emergency help. Most injuries at hazardous waste sites result from physical hazards such as tripping over a piece of equipment or stepping on a nail. The use of safety shoes should minimize this type of injury.

If there is an accidental overexposure to any substance at the site, the person will be moved to fresh air as soon as possible. A check for airway, breathing and pulse will be done, and rescue breathing or CPR will be performed, if required. In case of accidental contact of skin with contaminated material, the area will be thoroughly washed for at least 5 min. If the eye is affected, it will be rinsed for 15 min., making sure that the chemical does not wash into the other eye. In case of accidental ingestion of contaminated material, the poison control center will be called, before giving anything to the victim. In the event of any of the above incidents, the local emergency medical service must be contacted. Before transporting the victim, decontamination will be done, if possible. When the call is made for medical help, information will be provided as to whether or not the injury is due to exposure to toxic substances. In the case of a serious injury such as a broken bone, unless the victim is in a position which is life-threatening such as in the middle of a road, he/she should not be moved until emergency medical personnel arrive.

If an emergency evacuation of the site must take place (signalled by 10 short blasts on the air horn), all personnel on-site will immediately stop work, shut off all equipment, and assemble at the site emergency staging area (Figure 2-1). The on-site HSO will check the sign-in/sign-out list to make sure everyone is at the staging area. After assembly of all personnel, the site will be evacuated using the vehicle(s) parked in the vehicle assembly area. All vehicles will be parked facing out to enable a quick exit from the site. If time permits, as determined by the HSO, emergency decontamination will take place. This will consist of a wash and rinse of overboots, removal of disposable clothing, and washing of hands and face. After exiting the site, all personnel will reassemble at the LMS laboratory in Nyack, New York. If the head count reveals someone is still on-site, the on-site HSO and his/her assistant will look for the person(s), using appropriate personnel protection, i.e., Level B if the IDLH is exceeded. If a fire has occurred, or there is a potential for explosion, rescue will not be attempted until the appropriate emergency response unit arrives, i.e., the fire department or local hazmat unit.

The emergency evacuation plan will be rehearsed initially during the start-up of activities and thereafter as often as the on-site HSO deems necessary. In all cases of emergency, the HSO will be the person in charge, and will have the authority to direct all personnel. The local fire and rescue departments and local hospital(s) will be informed of the emergency evacuation plan. All three will also be provided with a list of the pertinent chemicals found on the site with appropriate safety and technical information, including fire hazard.

The relevant emergency telephone numbers are as follows:

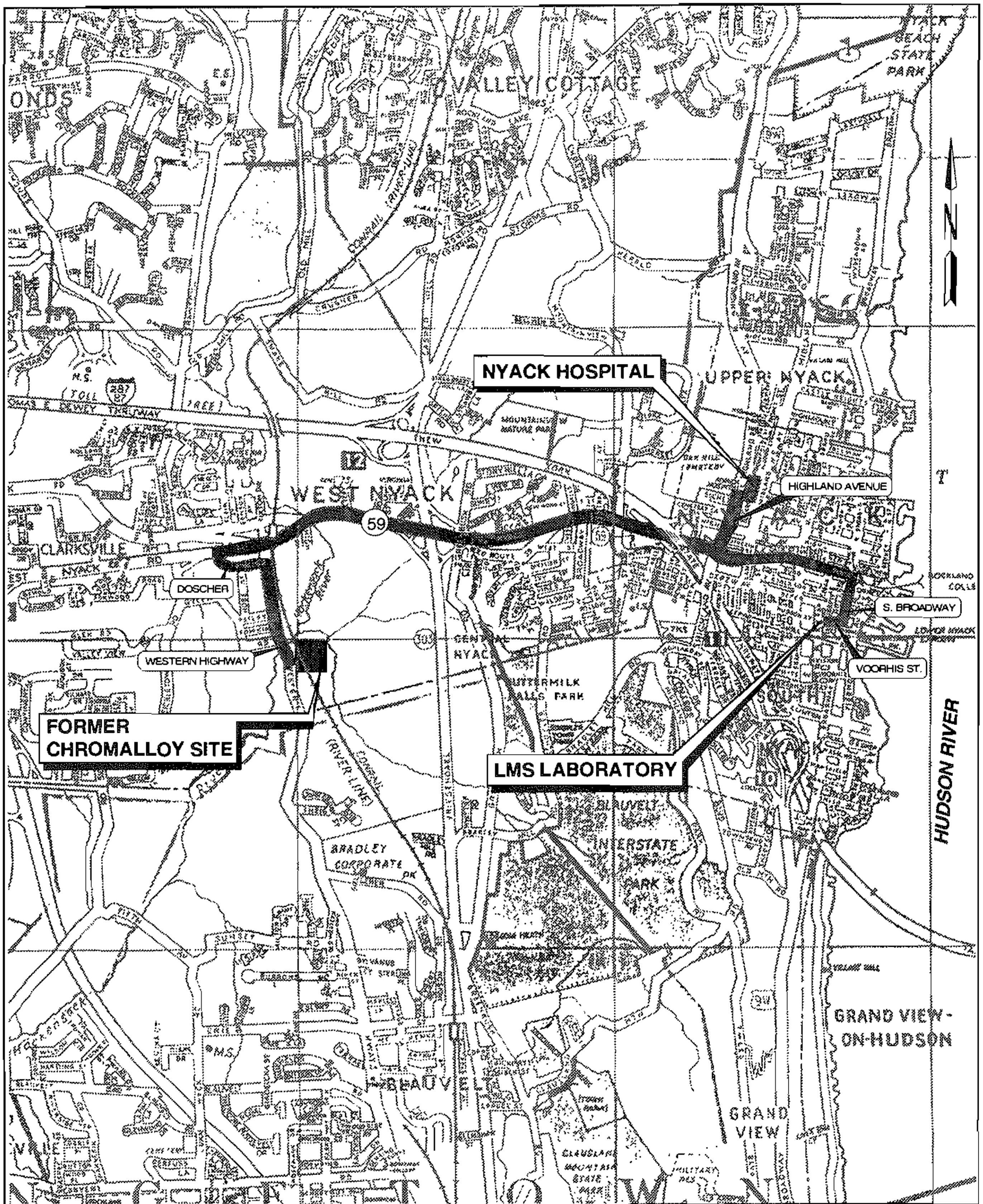
Hospital	Nyack Hospital North Midland Avenue Nyack, NY	(914) 358-6200
Ambulance Service	Nyack Community Ambulance Corp. 251 North Midland Avenue Nyack, NY	(914) 358-2424
Fire Department	Valley Cottage Fire Dist. Lake Road Valley Cottage, NY	(914) 354-9000
Police Department	Clarkstown Police Dept. 10 Maple Avenue New City, NY	(914) 634-2400
Poison Control Center		(914) 353-1000
US Government Chemical Toxin Spills, Oil Spills, and Pollutant Discharges		(800) 424-8802

National Response Center (for all emergencies)	(800) 424-8800
NYSDEC Oil & Chemical Spills/24 hr Hotline	(800) 457-7362
LMS Physician Dr. Frank Franklin	(201) 767-8400
NYSDEC Community Relations Coordinator - Ms. Erin O'Dell-Keller	(914) 255-5453

Note: dial 911 for all emergencies.

These numbers will be prominently posted in the on-site vehicle. The NYSDEC hotline will be called if there is an explosion, fire, chemical spill or some other life-threatening situation occurs. Figure 2-2 shows the route to the hospital and route to the LMS laboratory. The directions to the hospital are as follows: from the site turn right onto Western Highway; go approximately 1/2 mile and will see sign to Route 59 eastbound on left side. Take Route 59 east to Route 9W and turn left; hospital will be on the right hand side about 1/4 mile down Route 9W. The directions to the LMS laboratory are as follows: from the site turn right onto Western Highway; go approximately 1/2 mile and will see sign to Route 59 eastbound on left side. Take Route 59 east to South Broadway; turn right and go approximately 1/2 mile to Hudson Avenue and turn right. Laboratory is about 100 yds up street on left hand side.

The NYSDEC Community Relations Coordinator (CRC) will be contacted at the signal of an emergency evacuation. If the NYSDEC on-site coordinator is present, he/she will directly contact the CRC. After details are provided, it will be the CRC's responsibility to inform any nearby residents of the status of the emergency. If the situation is sufficiently serious, the nearby residents will be telephoned by the CRC and asked to evacuate immediately and assemble at the LMS laboratory. The local residents will be informed of the evacuation plan after the first informal briefing held on the project, if required by the NYSDEC.



0 2000 4000 6000 ft

APROXIMATE SCALE IN FEET

Map source: Hagstrom Map of Rockland County, NY 1989.

V600\685MAPS.ds4

FIGURE 2-2

ROUTE TO HOSPITAL AND LMS LABORATORY

Sequa Corp.
Former Chromalloy Sity

LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

CHAPTER 3

DECONTAMINATION PROCEDURES

3.1 PERSONNEL DECONTAMINATION

Personnel decontamination (decon) for all work will take place in the area shown on Figure 2-1. Personnel decontamination will consist of:

- Soap and potable water wash and potable water rinse of outer boots and outer (nitrile) gloves.
- Outer boot removal.
- Outer glove removal.
- Tyvek removal.
- Inner glove removal.
- Field wash of face and hands.

For any work requiring an upgrade of Level C respiratory protection, decontamination will consist of the steps described above, except that the respirator is removed after the Tyvek is removed. All disposable clothing will be bagged and bought back to the Nyack Laboratory for proper disposal. Water used for decontamination will collected and disposed of on-site.

3.2 EQUIPMENT DECONTAMINATION

Sampling equipment, such as stainless-steel trowels, spoons, split-spoon samplers, core samplers, bailers or the like will be decontaminated as described in the QAPP. Casing for the monitoring wells will be steam cleaned before installation. Drill rigs, backhoes, and any other heavy equipment will be steam cleaned upon entering and before leaving the site. Augering equipment will be decontaminated between each borehole at the decon pad. Likewise, the backhoe bucket will be decontaminated between test pits at the decon pad. All decontamination water will be collected and disposed of on-site. Well purge water and development water will be disposed of on-site, or off-site as provided in Chapter 15 of the RI/FS work plan. Decontamination solvents and nitric acid will be collected and bought back to the Nyack laboratory for disposal.

Since the soil on the site appears to be nonhazardous, there will be no need to decontaminate the vehicles used for transporting equipment and personnel over the site, i.e., pick-up trucks and sampling vehicles.

CHAPTER 4

GENERAL HEALTH AND SAFETY GUIDELINES

4.1 MEDICAL SURVEILLANCE

Medical surveillance for the FC site RI/FS will consist of that described in LMS' generic HASP. This is consistent with the OSHA requirements (29 CFR 1910.120 B). Records are kept for the minimum required by OSHA 29 CFR 1910.20, that is, for the duration of employment plus 30 years. If warranted, i.e., if high levels of TCE are detected in the breathing zone, additional tests beyond that prescribed in the normal physical will be done, e.g., urine screen for trichloroacetic acid and trichloroethanol or a blood screen for free trichloroethanol. Overexposure to TCE causes central nervous system depression with symptoms of dizziness, headache, vertigo, tremors, nausea and vomiting, irregular heartbeat, sleepiness, fatigue, blurred vision, and intoxication similar to alcohol. Alcohol consumption may make the symptoms of TCE overexposure worse. If alcohol has been consumed, the overexposed worker may become flushed, therefore, the consumption of alcohol is to be avoided if there is any possibility of overexposure to TCE.

4.2 SAFETY TRAINING

Safety training will consist of that described in LMS' generic HASP, and will be consistent with all OSHA requirements (29 CFR 1910.120 E).

4.3 GENERAL WORK PRACTICES

These will be as described in LMS' generic HASP. The buddy system will be employed at all times, i.e., all workers must work in pairs and remain in visual contact with each other.

CHAPTER 5

RECORDKEEPING AND REPORTING

The affidavit shown on Figure 5-1 must be signed by each person entering the site to indicate that he/she has read the site-specific HASP and will comply with it. The original will be given to the project HSO. At all times a copy of the site-specific and generic HASP will be available on-site, as will the list of emergency telephone numbers.

The daily health and safety report and air monitoring data will be kept by the project HSO.

FIGURE 5-1

AFFIDAVAT

FORMER CHROMOLLOY SITE

I, ______________________________ , (name) of ____

(company name) have read the Health and Safety Plan (HASP) for the Former Chromolloy Site Remedial Investigation/Feasibility Study. I agree to conduct all on-site work in conformity with the requirements of the HASP. In addition, I acknowledge that failure to comply with the designated procedures in the HASP may lead to my removal from the site.

Signed ____

Date____

STANDARD OPERATING PROCEDURES MANUAL

FOR

HEALTH AND SAFETY

October 1986

(Revised July 1987)
(Revised May 1989)
(Revised August 1989)
(Revised March 1990)
(Revised May 1994)

by

LAWLER, MATUSKY & SKELLY ENGINEERS
Environmental Science & Engineering Consultants
One Blue Hill Plaza
Pearl River, New York 10965

APPROVED BY:

Michael J. Skelly, P.E., Ph.D.
Partner

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Lawler, Matusky & Skelly Engineers (LMS) has company-wide policies and procedures to ensure safe work practices. In addition, there are specific procedures relating to work at sites where there may be risk of exposure to chemicals or hazardous wastes due to the nature of the project. The overall health and safety program at LMS includes the activities of in-house staff who monitor and control health and safety policies and procedures, employee physicals to monitor employee health and detect any adverse reactions or toxicity associated with hazardous work, and site-specific precautions and procedures designed to protect employees during field assignments. This document summarizes all three elements of the company's program. The document has been prepared so that it fulfills the requirements of 29 CFR Part 1910.120 (Occupational Safety and Health Administration Hazardous Waste Operations and Emergency Response - Final Rule published 6 March 1989, effective date 6 March 1990). This amendment to Subpart H of 29 CFR Part 1910 was mandated by Section 126 of the Superfund Amendments and Reauthorization Act of 1986 (SARA) (PL 99-499). Sections of 29 CFR 1910.1200 on Hazard Communications applicable to hazardous waste work were adhered to. The NIOSH/OSHA/USCG/EPA report "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" has been used as a guideline in preparing LMS' Health and Safety Plan (HASP).

1.1 SITE CHARACTERIZATION

The first step in formulating any HASP involves characterization of the site in terms of its hazards. These potential hazards include, but are not limited to, the following:

- Chemical exposure - through inhalation, skin absorption, ingestion, or puncture wounds; exposure can be acute or chronic

- Explosion and fire - caused by chemical reactions, ignition, or agitation and sudden release of materials under pressure

- Oxygen deficiency - low oxygen (< 16%) causes impaired attention, judgment, and coordination, and increased breathing and heart rate

- Ionizing radiation - three types of radiation are of concern: alpha, beta, and gamma

- Biological hazards - caused by disease-causing organisms found in, or waste from, hospital and research facilities, or contact with poisonous plants, insects, animals, and indigenous pathogens

- Normal safety hazards - holes or ditches, precariously positioned objects, sharp objects, slippery surfaces, steep grades, uneven terrain, and unstable surfaces

- Electrical hazards - overhead power lines, downed electrical wires, and buried cables pose danger of shock or electrocution

- Heat stress - caused by working in hot weather and wearing protective clothing that does not dissipate body heat and moisture effectively

- Cold exposure - working in cold weather can cause hypothermia and/or frostbite

- Noise - excessive noise caused by machinery may startle workers, be annoying or distracting, cause physical damage to the ear, and interfere with communication

To characterize any site, the type and quantity of hazard must be determined. Previous investigations of the site and available maps are reviewed. Previous investigators, government agencies, and/or previous or current owners/operators of the site are all potential sources of information, which can include hazardous waste uses and disposal operations; types and quantities of hazardous waste; cleanup or remediation measures undertaken; sampling results on groundwater, surface water, air, soil, sediment, etc.; and any drums or other hazardous waste containers used or disposed of on-site.

This information is reviewed before entry onto the site and a preliminary health and safety plan is developed. A preliminary plan generally consists of the wearing of safety shoes, hard hat, and safety glasses on the site, the use of an air monitoring device to monitor the air, and access to a respirator if needed. If the hazards are largely unknown, a reconnaissance of the perimeter of the site can be made to determine off-site conditions and to identify possible conditions that may be immediately dangerous to life and health (IDLH). As a general rule, LMS does not act as an emergency responder.

Visible indicators of possible IDLH conditions are:

- Enclosed spaces or large containers or tanks that must be entered (confined spaces)
- Potentially explosive or flammable situations indicated by bulging drums, effervescence, gas generation, or instrument readings
- The presence of extremely hazardous materials indicated by labels or other information
- Vapor clouds and evidence of dead animals or plants

The preliminary site reconnaissance can be used to evaluate air quality, collect off-site samples, and visually observe any unusual conditions. Air quality can be evaluated by several methods, including the use of portable air monitoring equipment such as radiation dosimeters, photo-ionization detectors (PIDs), flame ionization detectors (FIDs), combustible gas indicators (CGIs), instrumental GC/MS sample collection, and indicator tubes. Data previously collected and any data obtained as a result of the perimeter survey or on-site survey can be used to help determine health and safety procedures and personnel protection equipment (PPE) needs for the field work.

Where no background data are available or there is cause to suspect that data do not correctly reflect site hazards, initial reconnaissance surveys of suspected hazardous waste sites should be done under Level B personnel protection (see Section 2.4). Otherwise, the needs for personnel protection can be determined by examination of existing information. At the very least, each worker shall have the equipment available described previously (hard hat, safety shoes, safety glasses, air monitoring equipment, and respirator). If the situation dictates, each worker shall also have available a 5-min escape self-contained breathing apparatus (SCBA).

On-site reconnaissance is generally performed before the initiation of fieldwork to locate sampling points and to further assess site hazards. This information is used to develop the field sampling plan (FSP) and site-specific HASP. Depending upon the site, activities during the site reconnaissance may include:

- Monitoring for possible chemical exposures, oxygen deficiencies, and explosive atmospheres

- Monitoring for ionizing radiation

- Visual observation of other hazardous conditions

  - types of containers, impoundments, or other storage systems

  - condition of waste container and storage systems

  - physical condition of materials

  - natural wind barriers

  - potential pathways of dispersion

  - indicators of potential exposure to hazardous substances, such as dead plants and animals, pools of liquid

  - safety hazards

  - reactive, incompatible, flammable, or highly corrosive wastes

  - land features

  - presence of naturally occurring skin irritants or dermatitis-inducing agents

  - tags, labels, markings, or other identifying indications of hazardous waste

- Collection of samples for analysis

- Observation of prevailing wind direction

- Assessing access to the site and locating potential sample locations

Geophysical survey methods can be used during the site reconnaissance or prior to fieldwork to aid in locating buried drums or contaminant plumes and sampling locations, such as monitoring wells, test pits, and/or soil borings.

1.2 HAZARD ASSESSMENT

Once the presence and concentrations of specific chemicals or classes of chemicals have been determined based on review of previous investigations and any perimeter or site reconnaissances, the hazards associated with these chemicals must be determined to decide PPE to be used for all fieldwork.

The guidelines used to aid in this assessment are as follows:

- Threshold Limit Values (TLVs) - These are published annually by the American Conference of Governmental Industrial Hygienists (ACGIH) and can be used to determine the appropriate level of worker protection. Three categories are described:

  - TLV-TWA - The time-weighted average, for a normal 8-hr work day and 40-hr work week, during which nearly all workers may be repeatedly exposed without adverse effects.

  - TLV-STEL - A short-term exposure limit during which workers can be exposed continuously (15 min TWA that should not be exceeded at any time during the work day; this exposure should not be repeated more than four times per day, and at least 60 min must elapse between exposures) to ensure no suffering from (1) irritation, (2) chronic or irreversible tissue damage, or (3) narcosis of sufficient degree to increase likelihood of accidental injury, impair self-rescue, or materially reduce work efficiency.

  - TLV-C - A ceiling concentration that should not be exceeded at any time.

- Permissible Exposure Limit (PEL) - The 8-hr TWA or ceiling concentration above which workers may not be exposed. PELs are published in 29 CFR Part 1910, subpart Z, and promulgated by the Occupational Safety and Health Administration (OSHA).

- Recommended Exposure Limit (REL) - An exposure limit from the National Institute for Occupational Safety and Health (NIOSH) recommended for promulgation by OSHA as a PEL but not enforceable.

- Immediately Dangerous to Life and Health (IDLH) - Concentrations established by the NIOSH/OSHA Standards Completion Program (SCP) as a guideline for selecting respirators for some chemicals. IDLH values indicate those concentrations of toxic substances from which escape is possible without irreversible harm should a worker's respiratory protection equipment fail.

- Potential Skin Absorption and Irritation - Provided by ACGIH and OSHA (29 CFR Part 1910.1000), these documents identify substances that can be readily absorbed through the skin, mucous membranes, and/or eyes by either airborne exposure or direct contact with a liquid.

- Explosion and Flammability Ranges - The lower explosive limit (LEL) or lower flammable limit (LFL) of a substance is the minimum concentration of gas or vapor in air below which the substance will not burn when exposed to a source of ignition. The upper explosive limit (UEL) or upper flammable limit (UFL) of a substance is the maximum concentration of gas or vapor above which the substance will not burn when exposed to a source of ignition. The flash point is the minimum temperature at which a substance gives off sufficient vapor to form an ignitable mixture with air just above the surface of the substance. The ignition temperature is the minimum temperature required to initiate or cause self-sustained combustion without an ignition source.

- Flash Point (FP) - The minimum temperature at which a substance produces sufficient flammable vapors to ignite.
- Ionization Potential (IP) - The energy required to remove the outermost electron from the molecule.
- Vapor Pressure (VP) - The pressure exerted by a vapor against the sides of a closed container.
- Vapor Density (VD) - The density of the vapor is its mass per unit volume.

Table 1-1 is a hazardous substance data sheet that can be used to evaluate the hazards associated with the site in question. The New York State Department of Health (NYSDOH) publishes chemical fact sheets that summarize some of the above information.

In addition to the chemical hazards listed above, other hazards (physical, biological, electrical, etc.) may be identified. The major biological hazard is from the deer tick, which can cause Lyme disease. To avoid contact with ticks all personnel should wear Tyvek taped to overboots, gloves, and a hat. Insect repellent specially designed for ticks should also be utilized. After fieldwork is completed each person should examine himself or herself for ticks and remove. Other biological hazards such as snakes, mosquitos, and poisonous plants can be controlled effectively by careful site observations.

TABLE 1-1 (Page 1 of 2)

HAZARDOUS SUBSTANCE DATA SHEET

NAME OF SUBSTANCE:

COMMON: ________________ CHEMICAL: ________________

I. PHYSICAL/CHEMICAL PROPERTIES

Property	Value	Units	SOURCE
Normal Physical State: ______	Gas______ Liquid______	Solid______	______
Molecular Weight	______	g/ml	______
Density	______	°F/°C	______
Specific gravity	______ @ ______	°F/°C	______
Solubility: Water (ppm)	______ @ ______	°F/°C	______
Solubility: ______	______ @ ______	°F/°C	______
Boiling Point	______	°F/°C	______
Melting Point	______	°F/°C	______
Vapor Pressure (mmHg)	______ @ ______	°F/°C	______
Vapor Density	______ @ ______	°F/°C	______
Flash Point OC/CC	______	°F/°C	______
Other: ______	______	______	______
______	______	______	______

II. HAZARDOUS CHARACTERISTICS

A. TOXICOLOGICAL HAZARD	HAZARD	CONCENTRATIONS	SOURCE
Inhalation	Yes No	______	______
Ingestion	Yes No	______	______
Skin/Eye Absorption	Yes No	______	______
Skin/Eye Contact	Yes No	______	______
Carcinogenic	Yes No	______	______
Teratogenic	Yes No	______	______
Mutagenic	Yes No	______	______
Aquatic	Yes No	______	______
Other: ______	Yes No	______	______

B. FIRE HAZARD	HAZARD	CONCENTRATIONS	SOURCE
Combustibility	Yes No	______	______
Toxic Byproducts:	Yes No	______	______
Other: ______	Yes No	______	______
______	Yes No	______	______
Flammable/Explosive	Yes No		
LFL/LEL		______	______
UFL/UEL		______	______

C. REACTIVITY HAZARD	HAZARD	CONCENTRATIONS	SOURCE
Water	Yes No	______	______
Other: ______	Yes No	______	______

HAZARDOUS SUBSTANCE DATA SHEET

D. CORROSIVE HAZARD	HAZARD	pH	SOURCE
Acid	Yes No	________	________
Base	Yes No	________	________
Neutralizing agent:	Yes No	________	________

E. RADIOACTIVE HAZARD	HAZARD	EXPOSURE RATE	SOURCE
Background	Yes No	________	________
Alpha Particles	Yes No	________	________
Beta Particles	Yes No	________	________
Gamma Radiation	Yes No	________	________

III. INCIDENT RELATED:

Quantity Involved ____________________

Release Information ____________________

____

Monitoring/Sampling Recommended ____________________

____

IV. RECOMMENDED PROTECTION:

Public ____________________

____

Environment ____________________

____

Worker ____________________

____

V. RECOMMENDED SITE CONTROL:

Exclusion Zone ____________________

____

Contamination Reduction Zone ____________________

____

Support Zone ____________________

____

CHAPTER 2

SITE HEALTH AND SAFETY GUIDELINES AND PROCEDURES

2.1 SITE CONTROL

2.1.1 Site Security

Depending on the location and current use of a particular site, access may be limited to further reduce the potential for contaminant transport. Access and site control may include the following restrictions:

- Unnecessary personnel should be excluded from the general areas.
- The number of people and amount of equipment on-site should be kept to a minimum.
- Work zones should be well managed to control access of people and equipment.

Site security can be maintained by:

- Erection of a fence or locked gate.
- Establishing a system (such as sign-in sheets) to keep track of individuals on-site.
- Posting warning signs around perimeter of site.
- Employing a security guard service.
- Enlisting help of local enforcement agencies.
- Locking equipment in a trailer, shed, or other storage facility.

2.1.2 Site Work Zones

Work zones are developed and mapped as part of the characterization and hazard assessment of any site. Typical zones that may be established, depending on health and safety hazards, include:

- Exclusion Zone - The area where contamination occurs or could occur. Most of the field sampling is conducted in this zone. The outside boundary of the Exclusion Zone, called the Hotline, is established by the criteria outlined in Table 2-1. This Hotline should be clearly marked by lines, placards, hazard tape and/or signs, or a physical barrier. Access control points should be established at the periphery of the Exclusion Zone to regulate flow of personnel and equipment into and out of the zone. The buddy system should be used by anyone who enters the Exclusion Zone, and a communication system should be developed for all work done within the Exclusion Zone.

- Contamination Reduction Zone (CRZ) - The transition area between the contaminated area and the clean area, designed to reduce the probability that the clean Support Zone will be contaminated or affected by other site hazards. Decontamination procedures take place in a designated area within the CRZ called the Contamination Reduction Corridor. The boundary between the CRZ and Support Zone, called the Contamination Control Line, separates the possibly low contamination area from the clean Support Zone.

- Support Zone - Located outside the CRZ, this zone includes the location of support facilities, such as a trailer or storage shed. Support facilities should be located upwind of the Exclusion Zone if possible. This zone is a nonrestrictive work zone within which normal work clothes can be worn.

Figure 2-1 is a schematic of the site work zones. The level of protection needed for the Exclusion Zone and/or CRZ at any site is established during the reconnaissance and hazard assessment phases of the work.

2.2 ON-SITE HEALTH AND SAFETY OFFICER

The on-site Health and Safety Officer (HSO) determines safety procedures and levels of personnel protection necessary for each activity performed at a site. The on-site HSO is designated by the LMS project manager for each site, and has the qualifications listed below:

TABLE 2-1

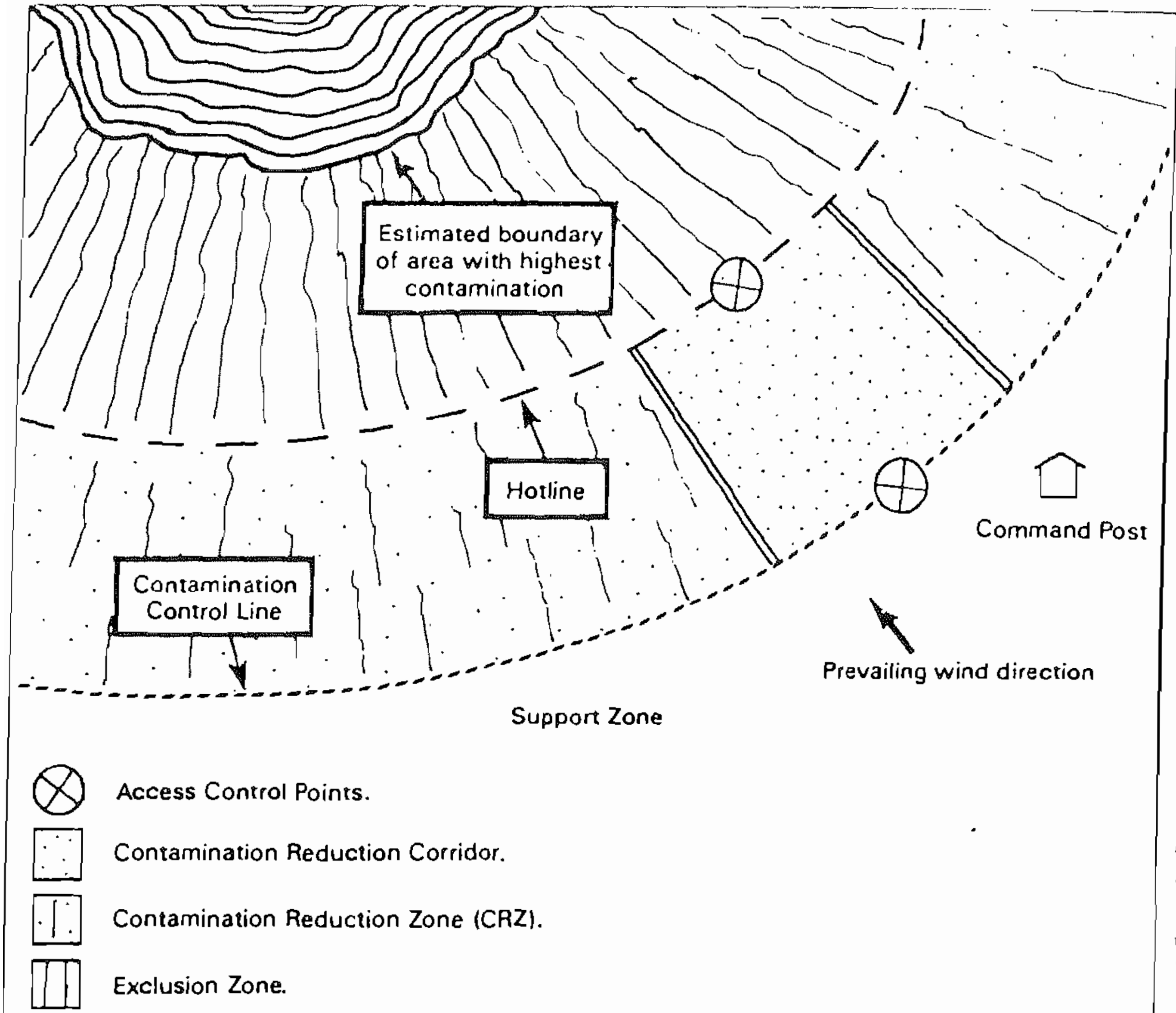
ESTABLISHING THE HOTLINE

- Visually survey the immediate site environs.
- Determine the locations of:
  - hazardous substances
  - drainage, leachate, and spilled material
  - visible discolorations
- Evaluate data from the initial site survey indicating the presence of:
  - combustible gases
  - organic and inorganic gases, particulates, or vapors
  - ionizing radiation
- Evaluate the results of soil and water sampling.
- Consider the distances needed to prevent an explosion or fire from affecting personnel outside the Exclusion Zone.
- Consider the distances that personnel must travel to and from the Exclusion Zone.
- Consider the physical area necessary for site operations.
- Consider meteorological conditions and the potential for contaminants to be blown from the area.
- Secure or mark the Hotline.
- Modify its location, if necessary, as more information becomes available.

FIGURE 2 - 1

SITE WORK ZONES

(Note that decontamination facilities are located in the Contamination Reduction Zone.)



Note: Area dimensions not to scale. Distances between points may vary.

1. At least 8 hrs of Red Cross (or equivalent) training in first aid and cardiopulmonary resuscitation (CPR) training (if he/she does not have the above, someone else on site will have it).

2. At least 40 hrs of training or the equivalent and 3 days of actual field experience in hazardous waste work. Of the 40 hrs, at least 2 hrs of SCBA training will be required and, at minimum, equivalent working use of Level B and Level C equipment.

3. A knowledge of site hazards (physical and chemical dangers of materials previously found on site).

4. Familiarity with the contents and objectives of the site-specific HASP.

5. A working knowledge of the capabilities and limitations of the air monitoring equipment.

6. Familiarity with the methods used in the performance of each work activity at the site and support areas (necessary to provide a perspective on safety-related implications associated with the work).

7. Medical surveillance requirements, including the recognition of symptoms and signs that might indicate overexposure to hazards.

2.2.1 **Responsibilities and Duties**

The HSO has the following responsibilities:

1. Establish, on a daily (or immediate) basis, levels of personnel protection for each work activity that are necessary to fulfill the requirements of the work plan. Levels of protection will be established on the basis of daily or more frequent air monitoring results or the specific provisions of the work plan, whichever provides the highest safety factor. The site specific HASP will have generalized levels of protection preestablished for each task and action guidelines to upgrade or downgrade levels of protection. The HSO will have the authority to change the generalized levels of protection based on daily air monitoring readings.

2. Assure that the established safety guidelines are implemented.

3. Assure that air monitoring and safety equipment is in proper working order.

4. Assure that personnel are using the safety equipment properly.

5. Assure that decontamination procedures are carried out effectively.

6. Hold preentry briefings and any additional meetings regarding health and safety.

7. Conduct safety and health inspections to ascertain that the HASP is being followed.

It is within the authority of the HSO to refuse individuals access to the site, eject personnel from the site, or cease operations because of noncompliance with the objectives and guidelines established herein or contamination levels beyond the scope of personnel preparedness.

2.2.2 Additional Training in Management of Hazardous Waste Operations

In addition to the above, the on-site HSO will have 8 hrs of training in managing hazardous waste operations. All personnel supervising one or more people will also have 8 hrs of supervisory training. The requirement is not dependent on levels of protection needed on the site.

2.3 AIR MONITORING

On-site air monitoring is necessary to identify and quantify the levels of contaminants found at a site. These measurements are used to:

- Select PPE
- Delineate areas where protection is needed
- Assess potential health effects
- Determine need for specific medical monitoring

Previous chemical observations may not necessarily reflect levels of contamination present at the site under constantly changing environmental conditions, such as wind velocity and direction, atmospheric pressure, or precipitation. Sole reliance on previous air monitoring is thus unacceptable in establishing safety guidelines. When possible, conditions in the working environment should be reassessed constantly to provide adequate levels of personnel protection. The use of selected air monitoring equipment throughout on-site operations will provide information from which levels of protection can be established. The types of air monitoring equipment generally used by LMS are described in Table 2-2.

If site conditions warrant, additional instruments (e.g., OVA with GC mode) are available to measure particulates or to identify and quantify organic compounds. If necessary, quantitative air samples can also be collected in the field and analyzed in the laboratory. The volatile air fraction is collected on sorbent tubes, usually Tenax or charcoal, and the nonvolatile air fraction is collected either on filters or tubes. Personnel can also be monitored with the use of personal sampling equipment carried by each worker. Direct-reading colorimeter tubes, available for a wide variety of chemicals, can measure the presence and concentrations of certain gases and vapors where site conditions warrant. For most sites the HNU PID, OVA FID, and combustible gas indicator (CGI) are the primary instruments used for air monitoring.

The HNU PID detects concentrations of organic gases as well as a few inorganic gases based on ionization potential. In a PID gas molecules are subject to ultraviolet (UV) radiation, which ionizes many gaseous compounds. Each molecule is transformed into charged ion pairs, creating a current between two electrodes. Every molecule has a characteristic ionization potential (IP), which is the energy required to remove an electron from the molecule, yielding a positively charged ion and the free electron. The primary use of the PID is as a quantitative instrument, but it can be used to detect specific contaminants while masking, i.e., not detecting, other compounds such as methane. This ability is dependent on the UV lamp utilized. The manufacturer's manual should be consulted before use to determine whether a site-specific compound in question can be detected by that lamp. Appendix A contains information on the best lamps to use with the HNU PID for various compounds, the ionizing potential for some compounds, and scan potentiometer readings for some compounds. The latter is used when calibration to a specific compound is desired. Other PIDs are available, including the Photovac Tip.

At sites where methane may be found in high concentrations, the HNU PID is the instrument of choice to measure organic gases as it will not record methane; high levels of methane can

TABLE 2-2

AIR MONITORING EQUIPMENT

	INSTRUMENT	MANUFACTURER	MODEL No.	CALIBRATION PROCEDURE	HAZARDOUS MATERIAL	COMMENTS
1.	Portable Photoionization tion Analyzer (PID)	HNU System, Inc.	PI 101	Calibrate with each use	Many organic and some inorganic gases and vapors	10.2 eV lamp
		HNU System, Inc.	HW 101	Calibrate with each use	Many organic and some inorganic gases and vapors	10.2 eV lamp
2.	Flame Ionization Detector (FID)	Foxboro	Century OVA-128	Calibrate with each use	Many organic and some inorganic gases and vapors	survey mode only
3.	Combustible Gas Indicator (CGI)	Gas Tech	GX-3	Calibrate with each use	Combustible gases and vapors	-
4.	Oxygen Meter	Gas Tech	GX-3	Calibrate with each use	Oxygen concentration	-
5.	Combustible Gas Indicator (CGI)	Neotronics	Exotox 40	Calibrate with each use	Combustible gases and vapors	-
		Neotronics	Exotox 60	Calibrate with each use	Combustible gases and vapors	-
6.	Oxygen meter	Neotronics Neotronics	Exotox 40 Exotox 60	Calibrate with each use Calibrate with each use	Oxygen concentration Oxygen concentration	- -
7.	Hydrogen Sulfide Meter	Neotronics	Exotox 40	Calibrate with each use	Hydrogen sulfide concentration	-
		Neotronics	Exotox 60	Calibrate with each use	Hydrogen sulfide concentration	-
8.	Carbon Monoxide	Neotronics	Exotox 60	Calibrate with each use	Carbon monoxide concentration	-
9.	Radiation Detector	Dosimeter	3700	Manufac. Calb.	Radiation	-
10.	Haz-mat kit Colorimetric Tube	National Draeger	4054208	-	Detection of gases & vapors	-
11.	Aerosol/Particulate Monitor	MIE	MiniRam PDM-3	Manuf. calib. check zero	Real time aerosol monitor	
		MIE	RAM-1	Check zero calib. before use	Real time aerosol monitor	

mask the presence of other volatile organics. An explosimeter can be used to measure methane if there is a possibility of explosion. On the other hand, an OVA FID can detect many more organic species than the HNU PID and may be preferable in atmospheres contaminated with organic species (particularly unsaturated, paraffinic, and ammonia hydrocarbons). The OVA FID also has a methane filter that filters out all organics but methane.

In situations where high, potentially explosive levels of methane may occur, such as during intrusive investigations at a landfill (e.g., drilling), increased surveillance with air monitoring equipment, particularly an explosimeter, may be necessary. The specific air monitoring procedures, appropriate instrumentation, and levels of personnel protection to be used in these circumstances are detailed on a site-by-site basis.

The frequency, location, and type of air monitoring must be determined for each site. Site air monitoring should be done at least once daily before work begins to ascertain whether conditions have changed since the development of the HASP or since the previous work day's measurements. Each sampling location should be monitored before and during sampling to determine whether any changes in protection levels are needed. Any significant changes in the operation or type of contaminant being handled will indicate a need for additional or more frequent air monitoring.

Detector tubes may also be used to identify and isolate specific compounds in the air. A hand pump is used to draw air into the tube. A colorimetric indicator in the tube determines the approximate concentration of the compound. These tubes are particularly important to identify specific constituents when the nature of hazardous wastes on the site is largely unknown.

Depending on the situation, workers at a high risk of exposure, i.e., those in the Exclusion Zone, may be equipped with personal air monitors. Depending on the personnel protection selected, these monitors should be located outside the respirator or near the mouth. Collection of a sample over an 8-hr period enables comparison to ACGIH TWA-TLV values.

2.4 PERSONNEL PROTECTIVE EQUIPMENT

The appropriate level of protection required by workers on-site will be determined from information gathered from the background data review and observations made during the initial site reconnaissance. The various levels of protection are designed to protect workers at the site against external and internal body exposure to hazardous materials. The levels of protection range from Level A, the highest, to Level D, the minimum. These levels are described in Appendix B of the final OSHA regulations on Hazardous Waste Operations and Emergency Response, 29 CFR 1910.120. Personnel protection equipment appropriate for a site may overlap two or more general protective categories, e.g., a site may require Level D respiratory protection but Level C dermal protection. Table 2-3 lists the personnel protection equipment available for use by LMS employees. (Appendix B contains respirator approval documents.)

2.4.1 **Level A Protection**

Level A protection should be worn when a high level of respiratory, skin, eye, and mucous membrane protection is needed. It should also be used when skin contact with the hazardous substance may result in an IDLH situation. Readings on a PID or FID instrument 500 to 1000 ppm above background may indicate a need for Level A. Some or all of the following types of equipment are appropriate for Level A (in accordance with 29 CFR Part 1910.120):

- Positive-pressure (pressure-demand), full-faced, self-contained breathing apparatus, or pressure-demand supplied-air respirator with escape SCBA, approved by NIOSH
- Fully encapsulating chemical-resistant suit capable of maintaining positive pressure and preventing inward test gas leakage of more than 0.5%
- Inner, chemical-resistant gloves
- Outer, chemical-resistant gloves
- Chemical-resistant boots, with steel toe and shank depending on suit boot construction, worn over or under suit boot
- Cotton long-john type underwear (optional)

TABLE 2-3

PERSONNEL PROTECTIVE EQUIPMENT

BODY PART PROTECTED	EQUIPMENT	TYPE OF CLOTHING OR ACCESSORY	MANUFACTURER	PART No. MASK	PART No. CARTRIDGE	MSHA/MOSM APPROVAL No.	OSHA STANDARDS REGULATION	OSHA STANDARDS SOURCE	MAINTENANCE PART	MAINTENANCE REGULATION
Respiratory	Respirator with cartridges	Ultra-Twin mask with GMC-H certridges	MSA	471286	464027	TC-23C-153	29CFR1910.134	ANSI 2288.2 - 1969 Standard Practice for Respiratory Protection	Mask	CFR1910.134 (F)
		Ultra-Twin mask with GMA-H cartridges	MSA	471286	464024	TC-23C-155	29CFR1910.134		Certridges	Replace if excessive breathing resistence upon inhalation or odor, taste, or irritation is noted
		Comfo II half mask with GMC-H cartridges	MSA	466486	464027	TC-23C-159	29CFR1910.134			
		Comfo II half mask with GMA-H certridges	MSA	466486	464024	TC-23C-161				
			North	76008A	N7500-83 (7683)	TC-23C-210	29CFR1910.134			
			American Optical	50358-0000	101388	TC-23C-417				
Full Body	Protective clothing	Tyvek coverall - uncoated Tyvek coverall - poly-ethylene coated Tyvek Apron - poly-ethylene coated Tyvek coverall - Saranex coated	Charkate	6001H 8001H 8201 HEW		Not applicable	29CFR1910.132	41CFR Part 50-204.7 General Requirement for Personnel Protec-tive Equipment	Coverall	Replace when torn or chemical permeation is noted
Head	Hard hat	Safety hard hat	Willson	82AC-Blue			29CFR1910.135	ANSI 289.1-1969 Safety Requirements for Industrial Head Protection	Hard hat	ANSI 289.1 - 1969
Eyes/Face	Face shield Safety glasses	Clear propionate visor Cleer Spectre safety glasses	Willson Willson	M86 Cleer 11130031			29CFR1910.133 (a)	ANSI 287.1-1968 Eye and Face Protec-tion	Shield Glasses Goggles	CFR1910.133 (a 2vii)
	Safety goggles	Encon chemical splash and impact goggles	Midland	01-4002-67						
Hands	Gloves	Flexam latex disposable Sol-vex nitrile Scorpio neoprene N-Dex Nitrile disposable	Pharmaseal Edmont Edmont Best	8852 37-155 8-352 7005			29CFR1910.132	41CFR Part 50.204.7 General Requirement for Personnel Protec-tive Equipment	Gloves	Dispose of when torn or chemical permeation has occurred
		Silver Shield	North	SS104						
Foot	Safety boots	Leather boot with steel toe and shank	Knapp	K 586, K 588, K 365			29CFR1910.136	ANSI 241.1 - 1967 Men's	Safety boot	Wash after each field use
		Latex Disp. Booties Super-tuff pullover rubber boot	La Crosse Rainfair	2400-9070						
		Winter Steel Toes Polyo disposable poly-ethylene booties	Edmont	35-350				Safety Toe Footwear	Boot liner	Dispose of after use

- Hard hat (under suit) (optional)
- Coveralls (under suit) (optional)
- Disposable protective suit, gloves and boot covers

2.4.2 **Level B Protection**

Level B protection should be selected when the highest level of respiratory protection is needed, but a lower level of skin and eye protection are required. Level B protection is the minimum level recommended for initial site entries when hazards have not been positively identified and defined by monitoring, sampling, and other reliable methods of analysis. It should be used in IDLH conditions and may need to be used in cases when instrument readings (PID and FID) are 5-500 ppm above background. Some or all of the following types of equipment are appropriate for Level B (in accordance with 29 CFR Part 1910.120):

- Positive-pressure (pressure-demand) full-face, self-contained breathing apparatus or pressure-demand supplied-air respirator with escape SCBA (NIOSH-approved)
- Hooded chemical-resistant clothing (overalls and long-sleeved jacket, hooded two-piece chemical-resistant splash suit, disposable chemical-resistant coveralls)
- Coveralls, under splash suit (optional)
- Outer, chemical-resistant gloves
- Inner, chemical-resistant gloves
- Outer, chemical-resistant boots with steel toe and shank
- Disposable, chemical-resistant outer boot covers (optional)
- Hard hat (optional)
- Face shield (optional)

2.4.3 Level C Protection

Level C protection should be selected when the type and approximate concentrations of airborne substances are known, the criteria for using air-purifying respirators have been met, and skin and eye exposure is likely. The air must be monitored periodically. Instrument readings (PID and FID) 0.5-5 ppm above background may indicate a need for Level C. Some or all of the following types of equipment are appropriate for Level C (in accordance with 29 CFR Part 1910.120):

- Full-face or half-mask air-purifying canister-equipped respirator (NIOSH-approved)
- Hooded chemical-resistant clothing (one-piece coverall, hooded two-piece chemical splash suit; disposable chemical-resistant coveralls)
- Outer, chemical-resistant gloves
- Inner, chemical-resistant gloves
- Steel toe and shank, chemical-resistant boots (optional)
- Disposable, chemical-resistant outer boot covers (optional)
- Cloth coveralls (inside chemical-protective clothing) (optional)
- Hard hat (optional)
- Escape mask (optional)
- Coveralls (optional)
- Face shield (optional)

2.4.4 Level D Protection

Some or all of the following types of equipment are appropriate for Level D (in accordance with 29 CFR Part 1910.120):

- Coveralls or work clothing
- Gloves (optional)

- Boots, shoes, chemical-resistant steel toe and shank
- Disposable, chemical resistant outerboot covers (optional)
- Safety glasses or chemical splash goggles (optional)
- Hard hat (optional)
- Escape mask (optional)
- Face shield (optional)

All LMS employees entering a hazardous waste site must use, as a minimum, the following safety equipment:

- Hard hat (if danger from overhead hazard exists)
- Safety shoes
- Safety glasses or goggles (if danger from splash or other eye hazard exists)

2.4.5 **Determination of Level of Protection**

The level of protection to be used is based on an analysis of the analytical data compared to the TLV, PEL, REL, and IDLH concentrations. The concentrations can be identified by direct reading instruments, including detector tubes. Other information used to evaluate the level of protection include LEL, UEL, relative breakthrough time of respirator, odor threshold, and whether a cartridge is available to filter the appropriate compound. Use of a respirator is indicated if the chemical has an adequate warning property (such as an odor) to indicate breakthrough and can be filtered out by the appropriate cartridge. Table 2-4 lists common chemicals with their TLV, breakthrough value, odor threshold, maximum use concentration (MUC), and IDLH value. NIOSH recommendations for respirator usage are found in the NIOSH Pocket Guide to Chemical Hazards. Full-face respirators have a protection factor (PF) of 50, half-face respirators, 10, and SCBA pressure-demand apparatus, 10,000+. The PF multiplied by the TLV gives the MUC for a respirator. Appendix C contains the OSHA PELs (29 CFR Part 1910.1000) and the NIOSH RELs. The lowest TLV (ACGIH, PEL or REL) should be used when evaluating levels of protection.

TABLE 2-4 (Page 1 of 4)

WARNING CONCENTRATIONS IN AIR AS COMPARED TO THRESHOLD LIMIT VALUES, BREAKTHROUGH VALUES, MAXIMUM USE CONCENTRATION VALUES, AND IDLH VALUES

COMPOUND	WARNING CONCENTRATIONS (ppm)	ODOR DESCRIPTION	ACGIH[a] ADOPTED VALUES TWA (ppm)	ACGIH[a] ADOPTED VALUES TWA (mg/m^3)	ACGIH[a] ADOPTED VALUES STEL (ppm)	ACGIH[a] ADOPTED VALUES STEL (mg/m^3)	TIME TO REACH 1% BREAK-THROUGH (10 ppm) (minutes)	MAXIMUM USE CONCENTRATION (ppm)	NIOSH[b] IDLH (ppm)
Acetaldehyde	0.031-2.3	Green, sweet	C25,A3	C45,A3	-	-	-	-	10000 Ca
Acetic acid	0.2-24	Sour	10	25	15	37	-	500	1000
Acetone	100.0	Chemical sweet, pungent	750	1780	1000	2380	37	20000	20000
Acrolein	0.1-16.6	Burnt sweet, pungent	0.1	0.23	0.3	0.69	-	5	5
Acrylonitrile - skin	19-100, fatigue	Onion-garlic pungency	2,A2	4.3,A2	-	-	49	100	500 Ca
Allyl chloride	0.47	Garlic-onion pungency, green	1	3	2	6	31	50	300
Amine, dimethyl	0.021-6	Fishy	5	9.2	15	27.6	-	250	2000
Amine, monomethyl	0.021-10, fatigue	Fishy, pungent	5	6.4	15	19	12	100	100
Amine, trimethyl	0.00021-1.7	Fishy, pungent	5	12	15	36	-	-	-
Ammonia	0.32-55	Pungent	25	17	35	24	-	500	500
Aniline - skin	0.5-70	Pungent	2	7.6	-	-	-	100	100
Benzene	4.68	Solvent	(10,A2)	(32,A2)	-	-	73	500	3000 Ca
Benzyl Chloride	0.04-0.31	Solvent	1	5.2	-	-	-	10	10
Benzyl sulfide	0.0021-0.07	Sulfidy	-	-	-	-	-	-	-
Bromine	0.05-3.5	Bleach, pungent	0.1	0.66	(0.3)	(2)	-	5	10
Butyric acid	0.00056-0.001	Sour	-	-	-	-	-	-	-
Carbon disulfide - skin	0.0011-7.7	Vegetable sulfide	10	31	-	-	-	500	500
Carbon tetrechloride (chlorination of CS_2)-skin	21.4-200	Sweet, pungent	5,A3	31,A3	10,A3	63,A3	-	250	300 Ca
Carbon tetrachloride (chlorination of CH_4)	100.0								
Chloral	0.047	Sweet	-	-	-	-	-	-	-
Chlorine	0.01-5	Bleach, pungent	0.5	15	1	2.9	-	25	30
M,O-Cresol	0.25-0.68	Tarlike pungent	5	22	-	-	-	250	250
P-Cresol - skin	0.00042-0.0455	Tarlike pungent	5	22	-	-	-	250	250
Dimethylacetamide - skin	46.8	Amine, burnt, oily	10	36	-	-	-	400	400
Dimethylformamide - skin	100.0	Fishy, pungent	10	30	-	-	-	500	3500
Dimethyl sulfide	0.001-0.02	Vegetable sulfide	-	-	-	-	-	-	-
Diphenylether (perfume grade)	0.001-0.1		-	-	-	-	-	-	-
Diphenyl sulfide	0.0021-0.0047	Burnt rubbery	-	-	-	-	-	-	-
Ethanol (synthetic)	10.0-5100	Sweet	1000	1880	-	-	28	-	-
Ethyl acrylate - skin	0.00024-1	Hot plastic, earthy	5,A2	20,A2	15,A2	61,A2	-	250	2000 Ca
Ethyl merceptan	0.00051-0.075	Earthy, sulfidy	0.5	1.3	-	-	-	25	2500
Formaldehyde	0.1-1.0	Hay (strawlike), pungent	C 0.3, A2	C 0.37,A2	2,A2	3,A2	-	-	30 Ca
Hydrochloric acid gas	1-10.0	Pungent	C5	C7.5	-	-	-	-	100
Hydrogen sulfide (from Ne S)	0.0047	Eggy sulfide	10	14	15	21	-	300	300

A2 - Suspected human carcinogen.
A3 - Animal carcinogen.

( ) - Indicates a change has been proposed.
[a] - 1993 - 1994 values.
[b] - 1990 values.

Ca - Potential human carcinogen.
C - Ceiling limit.

TABLE 2-4 (Page 2 of 4)

WARNING CONCENTRATIONS IN AIR AS COMPARED TO THRESHOLD LIMIT VALUES, BREAKTHROUGH VALUES, MAXIMUM USE CONCENTRATION VALUES, AND IDLH VALUES

COMPOUND	WARNING CONCENTRATIONS (ppm)	ODOR DESCRIPTION	ACGIH[a] ADOPTED VALUES TWA (ppm)	ACGIH[a] ADOPTED VALUES TWA (mg/m³)	ACGIH[a] ADOPTED VALUES STEL (ppm)	ACGIH[a] ADOPTED VALUES STEL (mg/m³)	TIME TO REACH 1% BREAK-THROUGH (10 ppm) (minutes)	MAXIMUM USE CONCENTRA-TION (ppm)	NIOSH[b] IDLH (ppm)
Hydrogen sulfide gas	0.00001-0.8, fatigue							-	-
Methanol - skin	53.3-5900	Sweet	200	262	250	328	0.2	10000	25000
Methyl chloride - skin	10-100		50	103	100	207	0.05	2500	10000 Ca
Methylene chloride	25-320		50,A2	174,A2	-	-	10	2500	5000 Ca
Methyl ethyl ketone	4.8-25	Sweet	200	590	300	885	82	3000	3000
Methyl isobutyl ketone	0.28-8	Sweat	50	205	75	307	-	2500	3000
Methyl marcaptan	0.0021-1.1	Sulfidy, pungent	0.5	0.98	-	-	-	25	400
Methyl methacrylate	0.05-0.34	Pungent, sulfidy	100	410	-	-	-	4000	4000
Monochlorobenzene	0.21-60	Chlorinatad, moth balls	10	46	-	-	107	500	2400
Nitrobenzene - skin	0.0047-6	Shoe polish, pungent	1	5	-	-	-	50	200
Perchloroethylene (tetrachloroethylene)	4.68-50	Chlorinated solvent	25,A3	170,A3	100,A3	685,A3	107	500	500 Ca
Phenol - skin	0.047-5	Medicinal	5	19	-	-	-	250	50
Phosgene	0.125-1.0	Haylike	0.1	0.4	-	-	-	2	2
Phosphine	0.02-3	Oniony, mustard	0.3	0.42	1	1.4	-	7.5	200
Pyridine	0.012-5	Burnt, pungent, diamine	5	16	-	-	119	250	3600
Styrene (inhibited)	0.1	Solventy, rubbery					-	-	-
Styrene (uninhibited) - skin	0.047-200	Solventy, rubbery, plasticy	50	213	100	426	-	2500	5000
Sulfur dichloride	0.001	Sulfidy	-	-	-	-	-	-	-
Sulfur dioxide	0.47-5		2	5.2	5	13	-	100	100
Toluene (from coke) - skin	4.68	Floral, pungent, solventy	50	188	-	-	94	2000	2000
Toluene (from petroleum)	0.17-40, fatigue	Moth balls, rubbery	-	-	-	-	-	-	-
Toluene diisocyanate	0.2-2.14	Medicated bandage, pungent	0.005	0.036	0.02	0.14	-	0.25	10 Ca
Trichloroethylene	21.4-400	Solventy	50,A5	269,A5	100,A5	537,A5	55	1000	1000 Ca
M - Xylene	1.1-3.7	Sweet	100	434	150	651	-	1000	1000
O - Xylene	1.8, fatigue	Sweet	100	434	150	651	-	1000	1000
P - Xylene	0.47-0.53	Sweet	100	434	150	651	-	1000	1000
Ethyl benzene	0.25-200		100	434	125	543	5.6	2000	2000
Cumene - skin	0.047-1.2		50	246	-	-	81	2500	8000
Isophorone	0.54		5C	28C			-	250	800
Allyl alcohol - skin	0.75-7.2		2	4.8	4	9.5	66	100	150
N-propanol - skin	0.08-200		200	492	250	614	70	4000	4000
Sec-butanol	43		100	303	-	-	96	5000	10000
Butanol - skin	1-15		50C	152C	-	-	115	-	8000
2-methoxyethanol - skin	-		5	16	-	-	116	-	-

C - Ceiling Limit.
A5 - Not suspected as a human carcinogen.
A3 - Animal carcinogen.
A2 - Suspected human carcinogen.

Ca - Potential human carcinogen.
[a] - 1993-1994 values.
[b] - 1990 values.

A1 - Confirmed Human Carcinogen.

( ) - Indicetes a change hes been proposed.

TABLE 2-4 (Page 3 of 4)

WARNING CONCENTRATIONS IN AIR AS COMPARED TO THRESHOLD LIMIT VALUES, BREAKTHROUGH VALUES, MAXIMUM USE CONCENTRATION VALUES, AND IDLH VALUES

COMPOUND	WARNING CONCENTRATIONS (ppm)	ODOR DESCRIPTION	ACGIH[a] ADOPTED VALUES TWA (ppm)	ACGIH[a] ADOPTED VALUES TWA (mg/m³)	ACGIH[a] ADOPTED VALUES STEL (ppm)	ACGIH[a] ADOPTED VALUES STEL (mg/m³)	TIME TO REACH 1% BREAK-THROUGH (10 ppm) (minutes)	MAXIMUM USE CONCENTRA-TION (ppm)	NIOSH[b] IDLH (ppm)
Isoamyl alcohol	10-35		100	361	125	452	97	5000	10000
Vinyl chloride	260		5,A1	13,A1	-	-	3.8	-	Ca
Ethyl chloride	-		(1000)	(2640)	-	-	5.6	20000	20000
O-chlorotoluene	-		50	259	-	-	102	-	-
Trans-1,2-dichloroethylene	0.085-500		200	793	-	-	33	4000	4000
1,1-dichloroethylene	-		5	20	20	79	-	-	-
Cis-1,2-dichloroethylene	0.085-500		200	793	-	-	30	4000	4000
1,2-dichloroethane	-		10	40	-	-	54	500	1000 Ca
1,2-dichloropropane	50		75	347	110	508	65	2000	2000
O-dichlorobenzene	2-50		50C	300C	-	-	109	1700	1000
p-dichlorobenzene	15-30		75	450	110	675	-	1000	1000 Ca
Chloroform	50-307		10,A2	49,A2	-	-	33	500	1000 Ca
1,1,1-trichloroethane (methyl chloroform)	20-400		350	1910	450	2460	40	1000	1000
1,1,2-trichloroethane - skin	-		10	55	-	-	72	500	Ca
1,2,3-trichloropropane - skin	100		10	60	-	-	111	500	1000 Ca
1,1,2,2-tetrachloroethane - skin	3-5		1	6.9	-	-	104	50	150 Ca
Pentachloroethane	-		-	-	-	-	93	-	-
Methyl acetate	200		200	606	250	757	33	10000	10000
Vinyl acetate	0.056-50		10	30	20	60	55	-	-
Ethyl acetate	0.12-0.55		400	40	-	-	67	10000	10000
Isopropyl acetate	0.9-400		250	1040	310	1290	65	10000	16000
Propyl acetate	0.15-200		200	835	250	1040	79	8000	8000
Sec-butyl acetate	4-7		200	950	-	-	83	10000	10000
Butyl acetate	0.037-20		(150)	(713)	(200)	(950)	77	7500	10000
2-methoxyethyl acetate - skin	-		5	24	-	-	93	-	-
Amyl acetate	0.00090-0.08		100	532	-	-	73	4000	4000
2-ethoxyethyl acetate - skin	0.056-50		5	27	-	-	80	-	-
Sec-Hexyl acetate	100		50	295	-	-	67	2500	4000
2-pentanone (methyl propyl ketone)	8		200	705	250	881	104	5000	5000
Mesityl oxide	0.051-12		15	60	25	100	122	750	5000
3-heptanone (ethyl butyl ketone)	-		50	234	-	-	91	2500	3000
2-heptanone (methyl n-amyl ketone)	-		50	234	-	-	101	2500	4000
Cyclohexanone - skin	0.12-0.24		25	100	-	-	126	1250	5000
5-methyl-3-haptanone (ethyl amyl ketone)	-		25	131	-	-	86	1250	3000

C - Ceiling limit.
[a] - 1993-1994 values.
[b] - 1990 values.

Ca - Potential human carcinogen.

A1 - Confirmed human carcinogen.
A2 - Suspected human carcinogen.

TABLE 2-4 (Page 4 of 4)

WARNING CONCENTRATIONS IN AIR AS COMPARED TO THRESHOLD LIMIT VALUES, BREAKTHROUGH VALUES, MAXIMUM USE CONCENTRATION VALUES, AND IDLH VALUES

COMPOUND	WARNING CONCENTRATIONS (ppm)	ODOR DESCRIPTION	ACGIH[a] ADOPTED VALUES TWA (ppm)	ACGIH[a] ADOPTED VALUES TWA (mg/m^3)	ACGIH[a] ADOPTED VALUES STEL (ppm)	ACGIH[a] ADOPTED VALUES STEL (mg/m^3)	TIME TO REACH 1% BREAK-THROUGH (10 ppm) (minutes)	MAXIMUM USE CONCENTRATION (ppm)	NIOSH[b] IDLH (ppm)
Mathyl cyclohexane	500		400	1610	-	-	69	10000	10000
Diisobutyl ketone	0.31		25	145	-	-	71	1250	2000
4-methyl cyclo hexanone	-		50	229	75	344	111	2500	2500
Pentane	2.2-1000		600	1770	750	2210	61	15000	15000
Hexane	1400-1500		50	176	-	-	52	2500	5000
Cyclohexane	0.41-300		300	1030	-	-	69	10000	10000
Heptane	50-220		400	1640	500	2050	78	5000	5000
5-ethylidene-2-norbornene	0.007-0.073		5C	25C	-	-	87	-	-
Nonane	-		200	1050	-	-	76	-	-
Ethyl amine	0.021-0.83		5	9.2	15	27.6	40	250	4000
Isopropylamine	0.71-10		5	12	10	24	66	250	4000
Propyl amine	-		-	-	-	-	90		
Diethlylemine - skin	0.06-0.498		5	15	15	45	88	250	2000
Butyl amine - skin	0.24-5		5C	15C	-	-	110	-	2000
Triethyl amine	0.28		(10)	(41)	(15)	(62)	81	500	1000
Diisopropyl amine - skin	0.38-0.85		5	21	-	-	77	250	1000
Cyclo hexyl amine	-		10	41	-	-	112	-	-
1-nitropropane	300		25	91	-	-	143	1250	2300
Methyl iodide - skin	4300		2,A2	12,A2	-	-	12	100	800 Ca
1,2-dibromoethane - skin	-		A2	A2	-	-	141	-	-
Acetic anhydride	0.14-81.2		5	21	-	-	124	250	1000
Bromobenzene	-		-	-	-	-	142	-	-
Dichlorodifluoro methane	-		1000	4950	-	-	-	-	-
1,1-dichloroethane	120		100	405	-	-	-	4000	4000
Dibromochloromethane	-		-	-	-	-	-	-	-
PCB-1242 - skin	-		-	1	-	(2)	-	10 mg/m^3	10 mg/m^3 Ca
PCB-1254 - skin	-		-	0.5	-	(1)	-	5 mg/m^3	5 mg/m^3 Ca
Arsenic	0.21-<1		-	0.1, A1	-	-	-	5 mg/m^3	100 mg/m^3 Ca
Gasoline	0.005-10		300	890	500	1480	-	-	-
Petroleum Distillates (naptha)	<500		300	1370	-	-	-	10000	10000

Ca - Potential human carcinogen.
A1 - Confirmed human carcinogen.

C - Ceiling limit.
[a] - 1993-1994 values.
[b] - 1990 values.

A2 - Suspected human carcinogen.

( ) - Indicates a change has been proposed.

In areas where there is an oxygen-deficient atmosphere, or where the MUC exceeds the IDLH concentration, a SCBA or pressure-demand supplied-air respirator must be used. Respirators must be fit-tested before use (fit-testing procedures are described in Appendix D).

In areas where several compounds are known to be present, a matrix of all available information is developed. Data used for comparison include any air, water, or soil/sediment data. The highest numbers in any medium for each compound are extracted and a level of protection identified for each compound. Table 2-5 presents the partition coefficient for several common chemicals. These numbers for both soil-air and water-air can be used to derive the theoretical maximum concentration in the air for a given concentration in water or soil. The highest level of protection identified will be used at the site. This can be modified by predetermining action levels, i.e., concentration of the substance at which lower levels of protection can be utilized. On-site direct instrument readings and detector tubes can be used to determine concentrations of the substance. If possible, the HNU should be calibrated to the specific compound in question. As long as the reading is less than the TLV for that compound, Level D protection may be used. Level C is used up to the IDLH level (or maximum level read by the instrument), and if a cartridge is available and there is an adequate warning property. Level B is used above the IDLH or above the maximum level read by the instrument. Figure 2-2 outlines a decision flowchart that can be used when respirator use is considered. Other references that can be used are NIOSH Personnel Protective Equipment for Hazardous Materials Incidents: A Selection Guide, and NIOSH Respirator Decision Logic.

The splash and dermal hazards associated with each chemical must also be evaluated together. Depending on this evaluation, protective clothing is selected. The permeability of the clothing with respect to the chemical is used to determine whether a type of clothing is appropriate. The same is true of glove selection.

The LMS personnel protection equipment program, in addition to the above selection criteria, consists of the following:

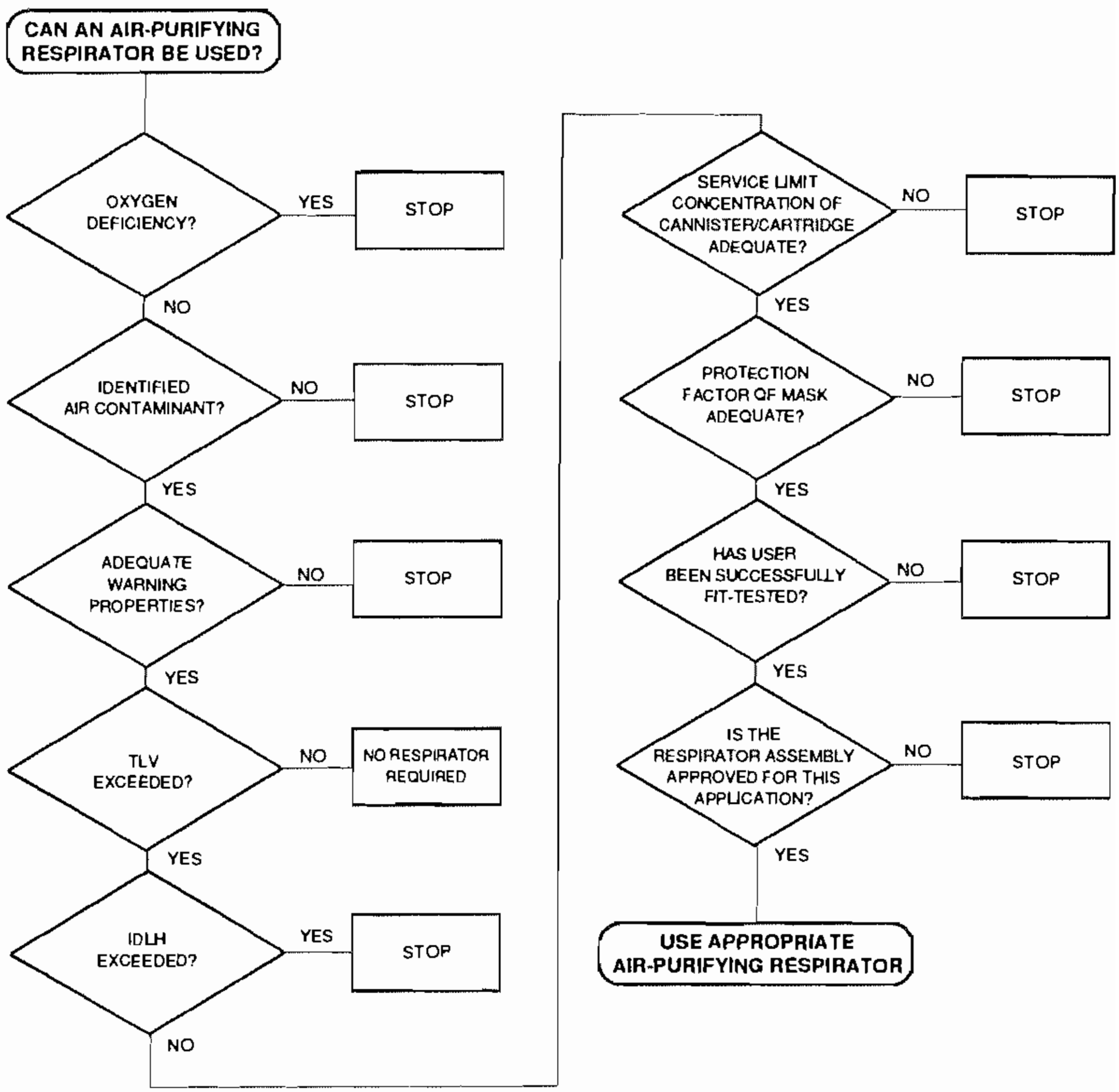
TABLE 2-5

PARTITION COEFFICIENTS

CHEMICAL	SOIL/AIR	WATER/AIR
VOLATILES		
Benzene	1.21	0.19
Carbon tetrachloride	2.72	1.0
Chlorobenzene	0.98	0.17
Chloroethane		0.62
Chloroform	1.14	0.14
1,1-dichloroethane	2.33	0.21
1,2-dichloroethane	0.85	0.046
1,1-dichloroethylene		7.1
Ethylbenzene	0.28	0.24
Methylene chloride	2.7	0.1
Tetrachloroethylene	2.8	0.96
Toluene	0.6	0.24
Trans-1,2-dichloroethylene	4.4	0.24
1,1,1-trichloroethane	0.53	0.15
Trichloroethylene	2.02	0.42
Vinyl chloride		270
Meta-xylene	0.49	0.22
Ortho-xylene	0.13	0.11
Para-xylene	0.12	0.11
BASE/NEUTRALS		
Anthracene	0.0067	0.058
Benzo (a) pyrene	1.38 x 10	2.7 x 10
Bis(2-ethylhexyl)phthalate	4 x 10	3.2 x 10
Chrysene	8.9 x 10	6.1 x 10
1,2-dichlorobenzene	0.056	0.071
1,3-dichlorobenzene	0.087	0.11
1,4-dichlorobenzene	0.068	0.087
Diethylphthalate	0.00073	0.0007
Di-n-butylphthalate	0.0043	0.11
Di-n-octylphthalate	0.0001	1.4
Naphthalene	0.012	0.015
PCBs		
Aroclor 1242	0.0055	0.023
Aroclor 1254	0.0011	0.12
Aroclor 1260	0.0005	0.295
Aroclor 1248	0.0023	0.145
Aroclor 1232	0.038	0.035
Aroclor 1221	0.01	0.005
Aroclor 1016	0.02	0.013

FIGURE 2-2

SELECTION CONSIDERATIONS FLOW CHART



Reference: Safety & Operations at Hazardous Material Sites
Geo Environmental Consultants, Inc.

- Facilities for storage of equipment, routine maintenance of equipment, and inspection of equipment

- Sanitizing of respirators after use

- Annual fit-testing for respirators and instruction on their use

- Instruction in donning and doffing equipment

2.5 SAFETY EQUIPMENT

Table 2-6 lists the basic safety equipment available for use by LMS employees. Depending on site requirements, other safety equipment may be rented or purchased.

2.6 EMERGENCY PROCEDURES

2.6.1 Emergency Procedures and Notifications

For each site, an emergency response plan will be developed. As part of this plan, the following elements will be included:

- Site typography, layout, and prevailing weather conditions

- Procedures for reporting incidents to local, state, and Federal agencies

- Coordination with disaster, fire, and/or other emergency response teams

- Rehearsal of plan and emergency evacuation procedures

- Appointment of person or persons responsible for providing guidance during emergency response

In the event of personnel exposure to potentially toxic or hazardous contaminants by skin contact, inhalation, or ingestion, the following procedures are employed:

- Wash and rinse the affected area with copious amounts of soap and water for at least 15 min. Decontaminate the person, then transport, if necessary, to the nearest hospital or poison control center.

TABLE 2-6

SAFETY EQUIPMENT

EQUIPMENT	MANUFACTURER	MODEL No.	EXPIRATION DATE	COMMENTS
1. First aid kit	ACME/Chaston Hazco	9053 #50 (#H2050)	Weekly inspection. Refill as needed.	Enables field worker to provide preliminary first aid care.
	America LaFrance	PCD-20R BC		
2. Fire extinguisher	Pemall Sears Badger World Fire	PA57, ABC 90.6462, ABC 5 MB-5M, ABC W-10, ABC	Yearly inspection. Refill after discharge.	To extinguish small fires (e.g., generators, truck).
3. Two-way radio	Midland International		Not applicable.	Enables field workers to communicate with personnel at site headquarters.
4. Safety belts, harnesses, and lifeline	Atlas Safety Equipment Co., Inc.	244-belt 510-lifeline	Not applicable.	Enables personnel to work in elevated areas or to enter confined areas. Prevents falls.
	Miller Retrieval System Miller Safety Harness (Full Body)	58-50G 8428		

- In the case of inadvertent inhalation of high (potentially toxic) levels of contaminants, the person should be moved to fresh air, decontaminated (if necessary), and transported to a medical facility.
- If a potentially toxic or hazardous substance, or an unidentified substance, has been ingested, the person should be decontaminated if necessary and transported to the nearest poison control center or emergency medical facility.

In the event of a personal injury, emergency first aid should be applied on-site as needed. At least one individual trained in first aid is on-site during all operations. The injured person should be decontaminated and transported to the nearest medical facility, if necessary.

In the event of a fire or explosion, the site should be evacuated immediately and local fire, police, and other appropriate emergency response groups should be notified as soon as possible. For each site, a centralized evacuation location is developed where the HSO will check that all personnel are accounted for (by use of the sign in/sign out log book). In the event of inferred or actual ionizing radiation exposure, the exposed individual should be decontaminated and transported immediately to an emergency medical facility.

In the event of an environmental incident caused by a spill or other spread of contamination outside the Exclusion Zone, personnel should attempt to secure the spread of contamination if possible. Local authorities should be notified and the immediate area may be evacuated. The on-site HSO is in charge of contacting the emergency response groups, directing first aid procedures, and securing the site.

2.6.2 Routes to Emergency Facilities and Evacuation Plan

The emergency route to the nearest hospital from the site is determined prior to field mobilization. This information and pertinent emergency telephone numbers are provided to all personnel prior to site entry and are conspicuously displayed at the command post.

In the event of an emergency situation such as a fire, explosion, significant release of toxic gases, etc., a horn or other predetermined signal is used for approximately 30 sec to indicate the initiation of evacuation procedures. All personnel in both restricted and nonrestricted areas evacuate and assemble near the command post or other safe area as identified by the on-site HSO. This safe location is selected on a daily basis depending on the direction of the wind. The on-site HSO, task coordinator, or other appropriate designee has the authority to initiate proper action for efficient and safe site evacuation and assessment of emergency situations. Under no circumstances are incoming personnel or visitors allowed to proceed into the area once the emergency signal has been given. The on-site HSO must see that access for emergency equipment is provided, and that all field equipment has been shut down and vacated once the alarm has been sounded.

CHAPTER 3

DECONTAMINATION PROCEDURES

Decontamination, the process of removing or neutralizing contaminants that have accumulated on personnel and equipment, is critical to health and safety at hazardous waste sites. It protects the worker from hazardous substances that may contaminate and eventually permeate protective clothing, respirator equipment, tools, vehicles, and other equipment used on-site. Decontamination also minimizes the transfer of harmful materials into clean areas. It helps prevent mixing of incompatible chemicals and prevents uncontrolled transportation of contaminants from the site.

The two primary decontamination procedures are physical and chemical removal. Physical removal is done by such means as dislodging/displacement, rinsing, wiping off, evaporation, high pressure, and heat. Chemical removal dissolves the contaminant, reduces the adhesion forces, solidifies the liquid or gel, and rinses and/or disinfects/sterilizes.

All personnel decontamination operations are performed inside the Contamination Reduction Corridor and are supervised by the on-site HSO or designee. The decontamination area will be equipped as needed with sprayers, brushes, basins, plastic bags, and storage areas for used disposable outerwear (bagged). Water used in decontamination will be collected in basins and disposed of in accordance with site-specific requirements.

The level and types of decontamination procedures required depend on several site-specific factors, including:

- The chemical, physical and toxicological properties of the wastes
- The pathogenicity of any infectious wastes
- The amount, location, and containment of contaminants
- The potential for, and level of, exposure based on assigned worker duties, activities, and functions

- The potential for wastes to permeate, degrade, or penetrate material used for personnel protection clothing and equipment, vehicles, tools, buildings, and structures

- The proximity of incompatible waste

- The movement of personnel and/or equipment among different zones

- The type and nature of possible emergency situations

- The methods available for protecting workers during decontamination

- The impact of the decontamination process and components on workers' safety and health

The on-site HSO inspects personnel protection equipment or clothing that will be reused to determine whether decontamination procedures are sufficient to allow passage into other support areas. Any equipment that cannot be adequately cleaned will be double-bagged and marked as such until more thorough decontamination can be performed. (The Support Zone could be the vehicle used to store sampling equipment.)

The following facilities will be provided in the support zone:

- Potable water storage facility or potable water tap (near command post)

- Handwashing facilities

- First aid kit, eyewash station, fire extinguisher, and possibly emergency shower facilities

- Storage for unused or decontaminated work clothes and safety equipment (respirators, etc.)

3.1 PERSONNEL DECONTAMINATION PROCEDURES

Decontamination procedures to be employed for various levels of personnel protection are, in order of their occurrence, as follows:

- Level D decontamination consisting of, as appropriate:

  1. Wash boots with soap and potable water; rinse with potable water.

2. Bag all disposable clothing.

3. Field-wash hands and face.

- Level C decontamination consisting of, as appropriate:

1. Wash boots and outer gloves with soap and potable water; rinse with potable water.

2. Remove tape.

3. Wash and rinse rubber boot.

4. Remove outer glove.

5. Remove Tyvek (bag).

6. Remove rubber boot.

7. Remove respirator.

8. Remove inner glove.

9. Field-wash hands and face with potable water.

- Level B decontamination consisting of, as appropriate:

1. Wash disposable boot and outer glove with soap and potable water; rinse with potable water.

2. Remove tape.

3. Remove outer disposable boot.

4. Remove outer glove.

5. Wash and rinse rubber boot.

6. Remove and rinse SCBA.

7. Remove Tyvek (bag).

8. Remove rubber boot.

9. Remove and rinse respirator.

10. Remove inner glove.

11. Field-wash hands and face with potable water.

Depending on the site situation, the effectiveness of the decontamination procedure can be tested by one of the following methods:

- Visual observation to see whether there is any sign of contamination. This can be done with natural light and ultraviolet light.
- Wipe sampling can be conducted on selected surfaces. These samples can then be analyzed for the suspected chemical.
- The final rinse solution can be analyzed to determine whether high levels of chemicals are in the solution.
- The protective clothing can be analyzed for permeability.

A commercial laundry needed to clean any clothing must be informed of any potentially harmful effects of exposure to hazardous substances.

3.2 EQUIPMENT DECONTAMINATION

Under most circumstances, support vehicles used in the Exclusion Zone must be cleaned thoroughly before they leave the site; the level of cleaning is determined by specific site conditions. In general, vehicle cleaning consists of high-pressure hot water or steam wash and potable water rinse of the underbody, frame, and tires. Devices that tend to concentrate airborne contaminants, such as the air cleaner of the vehicle, may require treatment as hazardous materials (i.e., placed in plastic bags and left on-site or disposed of at a designated facility). Vehicle interiors and cargo exposed to potentially contaminated materials may be hand-washed, rinsed with potable water (sponge-wash), and dried with paper towels. Vehicle decontamination procedures will be performed in the Contamination Reduction Corridor.

Other support equipment, such as tools, pumps, and generators, may be cleaned with high-pressure hot water or steam, as needed, during the field effort and as described in the Field Sampling Plan (FSP) for each site.

Personnel protection during equipment decontamination is similar to that required in the work area where the equipment is used. For example, a drilling rig used in a task requiring Level C protection may need to be cleaned under the decontamination guidelines for Level C depending on the reasons for selection of the equipment for the level of protection.

3.3 EMERGENCY DECONTAMINATION

Emergency decontamination should be performed on a individual who has been exposed to hazardous materials and needs transportation to a medical facility. If the victim's life is at stake, decontamination should be delayed until the victim's condition has stabilized. If however, the contamination could also endanger a rescuer or firstaider, decontamination must be done immediately. In the event the victim has been transported to the medical facility without decontamination, medical personnel must be alerted for their own protection.

3.4 DECONTAMINATION DISPOSAL

The appropriate procedures for disposing of decontamination liquids and disposable clothing will be determined for each site on a case-by-case basis.

CHAPTER 4

GENERAL HEALTH AND SAFETY GUIDELINES

4.1 MEDICAL PROGRAMS

4.1.1 Physical Examinations and Testing

A medical surveillance program is established for each hazardous waste work site to ensure the safety of LMS employees. It is based on the specific site needs, location of contaminants, waste materials, estimated duration of site work, and potential exposures to hazardous materials. This program complements the existing medical examination program required for all personnel who are or may be involved in hazardous waste site investigations, and is in compliance with current regulations prescribed by appropriate governmental agencies and client requirements.

Employees engaged in hazardous waste site investigations are required to undergo a prescribed annual medical examination developed and designed in conjunction with Dr. F.A. Franklin, an occupational health physician and medical director of Company Medical Associates of Northvale, New Jersey. The examination is in accordance with currently prescribed governmental regulations. Dr. Franklin, a member of the American Occupational Medical Association, is a graduate of Seton Hall University and the University of Rome, Italy. He interned at Maryland Medical Center and has been director of Company Medical Associates since 1980. Company Medical Associates offers a full range of services, and provides industrial customers with accurate, up-to-date, and certifiable physical examinations, support services, and 24-hr emergency service.

The annual employee physical examination consists of:

1. A medical history that includes past work exposure to hazardous chemicals or any other history of blood, nerve, or inherited medical problems. This includes a history of renal or liver dysfunction, drugs routinely taken, alcohol intake, and systemic infections. Exposure to other materials such

as cleaning agents, insecticides, and other toxins outside the current work situation, will also be documented.

2. Laboratory testing, including:

   a. A complete blood count (SMAK-23) with red cell count, white cell count with differential platelet count, hematocrit, hemoglobin, red cell indices (MCU, MCH, MCHC, serum, bilirubin, and reticulocyte count), and additional tests where, in Dr. Franklin's opinion, abnormalities in the components of the blood are detected

   b. Urinalysis with microscopic report

   c. Chest X ray (frequency at the discretion of Dr. Franklin)

   d. Electrocardiogram with cardiologist interpretation

   e. Pulmonary function test, including tests of lung ventilation to measure forced expiratory volume in 1 sec and forced vital capacity; other factors such as FEF, MMEFR, FRC, RV, and TLC may be included

   f. Complete physical examination of all body systems

   g. Vision examination and Titmus vision test

   h. Audiometric screening

   i. Narrative report by Dr. Franklin on all findings and fitness for the job

   j. Copies of all technical material sent with narrative; originals to be on file with Company Medical Associates

During the project, and after its completion, the individual receives periodic examinations equal in content to the original physical examination. Additional exams may be done in cases of abnormal conditions found in the initial or baseline exam, real or possible exposure on the site due to spill, sudden release of chemicals or failure of personnel protection equipment, complaints from the individuals indicating a potential problem, or as part of a routine medical examination surveillance program as required under 29 CFR Part 1910. Dr. Franklin will certify in writing the worker's fitness for work on the site and provide a copy of certification to the employee. LMS may require additional fitness tests for specific work assignments.

In addition to the above, if the hazards at a specific site warrant, additional testing will be done before commencement and after completion of work on the site. Table 4-1 lists common chemical toxicants found at hazardous waste sites, their health effects, and recommended medical monitoring. In addition, the ACGIH publishes biological exposure indices for several compounds and their testing procedure. This reference is also utilized when additional monitoring is required. Upon termination of employment, the employee is given an exit physical examination equivalent to the annual exam.

LMS and Dr. Franklin maintain all medical records in a confidential manner, accessible only by authorized personnel. Authorized persons include designated senior management of LMS, medical staff of Company Medical Associates, the individual and his/her representative, and governmental representatives. Upon request, the individual may obtain a copy of his medical file from LMS or Company Medical Associates. Upon death, retirement, resignation, or other termination of service, the records are retained by LMS and Company Medical Associates according to prescribed governmental regulation. LMS retains employee medical records for at least 30 years after the employment period.

4.1.2 **Emergency Medical Treatment**

Provisions for emergency treatment will be made at each site. Site conditions will determine the design of the emergency medical plan. The following is LMS' standard emergency treatment plan, used to guide all site HASPs:

a. At least one employee on-site must be trained in first aid and cardiopulmonary resuscitation (CPR) and be so certified by the American Red Cross (or equivalent).

b. All site employees must be trained in emergency decontamination procedures.

c. Predesignated roles and responsibilities as defined by the on-site Health and Safety Officer must be assumed in an emergency.

d. An emergency/first aid station capable of providing (1) stabilization for patients requiring off-site treatment and (2) general first aid, must be established on-site. This station must be located in a clean area adjacent to the decontamination area to facilitate emergency decontamination. A

TABLE 4-1 (Page 1 of 3)

COMMON CHEMICAL TOXICANTS FOUND AT HAZARDOUS WASTES SITES, THEIR HEALTH EFFECTS, AND MEDICAL MONITORING

HAZARDOUS SUBSTANCE OR CHEMICAL GROUP	COMPOUNDS	USES	TARGET ORGANS	POTENTIAL HEALTH EFFECTS	MEDICAL MONITORING
Aromatic Hydrocarbons	Benzene Ethyl benzene Toluene Xylene	Commercial solvents and intermediates for synthesis in the chemical and pharmaceutical industries	Blood Bone marrow CNS* Eyes Respiratory system Skin Liver Kidney	All cause: CNS* depression: decreased alertness, headache, sleepiness, loss of consciousness, defatting dermatitis. Benzene suppresses bone marrow function, causing blood changes. Chronic exposure can cause leukemia. Note: Because other aromatic hydrocarbons may be contaminated with benzene during distillation, benzene-related health effects should be considered when exposure to any of these agents is suspected.	Occupational/general medical history emphasizing prior exposure to these or other toxic agents. Medical examination with focus on liver, kidney, nervous system, and skin. Laboratory testing: CBC° Platelet count Measurement of kidney and liver function
Asbestos (or asbestiform particles)		A variety of industrial uses, including: Building Construction Cement work Insulation Fireproofing Pipes and ducts for water, air, and chemicals Automobile brake pads and linings	Lungs Gastrointestinal system	Chronic effects: Lung cancer Mesothelioma Asbestosis Gastrointestinal malignancies Asbestos exposure coupled with cigarette smoking has been shown to have a synergistic affect in the development of lung cancer.	History and physical examination should focus on the lungs and gastrointestinal system. Laboratory tests should include a test for occult blood evaluation as a check for possible hidden gastrointestinal malignancy. A high quality chest Xray and pulmonary function test may help to identify long-term changes associated with asbestos diseases; however, early identification of low-dose exposure is unlikely.
Dioxin (see Herbicides)					
Halogenated Aliphatic Hydrocarbons	Carbon tetrachloride Chloroform Ethyl bromide Ethyl chloride Ethylene dibromide Ethylene dichloride Methyl chloride Methyl chloroform Methylene chloride Tetrachloroethane Tetrachlorethylene (perchloroethylene) Trichloroethylene Vinyl chloride	Commercial solvents and intermediates in organics synthesis	CNS* Kidney Liver Skin	All cause: CNS* depression: decreased alertness, headaches, sleepiness, loss of consciousness. Kidney changes: decreased urine flow, swelling (especially around eyes), anemia. Liver changes: fatigue, malaise, dark urine, liver enlargement, jaundice. Vinyl chloride is a known carcinogen; several others in this group are potential carcinogens.	Occupational/general medical history emphasizing prior exposure to these or other toxic agents. Medical examination with focus on liver, kidney, nervous system, and skin. Laboratory testing for liver and kidney function; nervous system, carboxyhemoglobin where relevant.

*CNS = Central nervous system.
°CBC = Complete blood count.

TABLE 4-1 (Page 2 of 3)

COMMON CHEMICAL TOXICANTS FOUND AT HAZARDOUS WASTES SITES, THEIR HEALTH EFFECTS, AND MEDICAL MONITORING

HAZARDOUS SUBSTANCE OR CHEMICAL GROUP	COMPOUNDS	USES	TARGET ORGANS	POTENTIAL HEALTH EFFECTS	MEDICAL MONITORING
Heavy Metals	Arsenic Beryllium Cadmium Chromium Lead Mercury	Wide variety of industrial and commercial uses	Multiple organs and systems, including: Blood Cardiopulmonary Gastrointestinal Kidney Liver Lung CNS[a] Skin	All are toxic to the kidneys. Each heavy metal has its own characteristic symptom cluster. For example, lead causes decreased mental ability, weakness (especially hands), headache, abdominal cramps, diarrhea, and anemia. Lead can also affect the blood-forming mechanism, kidneys, and the peripheral nervous system. Long-term effects[c] also vary. Lead toxicity can cause permanent kidney and brain damage; cadmium can cause kidney or lung disease. Chromium, beryllium, arsenic, and cadmium have been implicated as human carcinogens.	History-taking and physical exam; search for symptom clusters associated with specific metal exposure, e.g., for lead look for neurological deficiency, anemia, and gastro-intestinal symptoms. Laboratory testing: Measurements of metallic content in blood, urine, and tissue (e.g., blood lead level; urine screen for arsenic, mercury, chromium, and cadmium). CBC[b] Measurement of kidney and liver function where relevant. Chest X ray or pulmonary function testing where relevant.
Herbicides	Chlorophenoxy compounds: 2,4-dichloro-phenoxyacetic acid (2,4-D) 2,4,5-tri-chlorophen-oxyacetic acid (2,4,5-T) Dioxin (tetra-chloro-dibenzo-p-dioxin, TCDD), which occurs as a trace contami-nant in these compounds, poses the most serious health risk.	Vegetation control	Kidney Liver CNS[a] Skin	Chlorophenoxy com-pounds can causa chloracne, weakness or numbness of the arms and legs, and may result in long-term nerve damage. Dioxin causes chloracne and may aggravate pre-existing liver and kidney diseases.	History and physical exam should focus on the skin and nervous system. Laboratory tests include: Measurement of liver and kidney function where relevant. Urinanalysis
Organochlorine Insecticides	Chlorinated ethanes: DDT Cyclodienes: Aldrin Chlordane Dieldrin Endrin Chlorocyclo-hexanes Lindane	Pest control	Kidney Liver CNS[a]	All cause acute symp-toms of apprehension, irritability, dizziness, dis-turbed equilibrium, tremor, and convulsions. Cyclodienes may cause convulsions without any other initial symptoms. Chlorocyclohexanes can cause anemia. Cyclodienes and chlorocyclohexanes cause liver toxicity and permanent kidney damage.	History and physical exam should focus on the nervous system. Labora-tory tests include: Measurement of kidney and liver function. CBC[b] for exposure to chlorocyclohexanes.

[a]CNS = Central nervous system.
[b]CBC = Complete blood count.
[c]Long-term effects generally manifest in 10 to 30 years.

TABLE 4-1 (Page 3 of 3)

COMMON CHEMICAL TOXICANTS FOUND AT HAZARDOUS WASTES SITES, THEIR HEALTH EFFECTS, AND MEDICAL MONITORING

HAZARDOUS SUBSTANCE OR CHEMICAL GROUP	COMPOUNDS	USES	TARGET ORGANS	POTENTIAL HEALTH EFFECTS	MEDICAL MONITORING
Organophosphate and Carbamate Insecticides	Organophosphate: Diazinon Dichlorvos Dimethoate Trichlorfon Malathion Methyl parathion Parathion Carbamate: Aldicarb Baygon Zectran	Pest control	CNS[a] Liver Kidney	All cause a chain of internal reactions leading to neuromuscular blockage. Depending on the extent of poisoning, acute symptoms range from headaches, fatigue, dizziness, increased salivation and crying, profuse sweating, nausea, vomiting, cramps, and diarrhea to tightness in the chest, muscle twitching, and slowing of the heartbeat. Severe cases may result in rapid onset of unconsciousness and seizures. A delayed effect may be weakness and numbness in the feet and hands. Long-term, permanent nerve damage is possible.	Physical exam should focus on the nervous system. Laboratory tests should include: RBC[b] cholinesterase levels for recent exposure (plasma cholinesterasa for acute expoeures). Measurements of delayed neurotoxicity and other effects.
Polychlorinated Biphenyls (PCBs)		Wide variety of industrial uses	Liver CNS[a] (speculative) Respiratory system (speculative) Skin	Various skin ailments, including chloracna; may cause liver toxicity; carcinogenic to animals.	Physical exam should focus on the skin and liver. Laboratory tests include: Serum PCB levels. Triglycerides and cholesterol. Measurement of liver function.

[a]CNS = Central nervous system.
[b]RBC = Complete blood count.

standard first aid kit, or equivalent supplies as required by site conditions, must be available for use. Additional equipment could include emergency deluge shower, stretchers, ice, emergency eyewash, decontamination solutions, and fire-extinguishing blankets.

e. Company Medical Associates provides an on-call physician on a 24-hr basis. If the site is out of the immediate area, other trained medical personnel must be made available.

f. On-site Health and Safety Officer(s) and sampling crew chiefs must be trained in monitoring heat stress (see Section 4.1.2.1).

g. Emergency transportation to, treatment at, and contamination control procedures with the local medical facility are to be established. Site location is the determining factor regarding the scope of this provision of our emergency medical treatment.

4.1.2.1 ***Heat Stress***. Wearing personnel protection equipment can cause heat stress. The same properties of PPE that prevent chemicals from contacting the skin also severely limit the body's ability to dissipate heat. There are six major categories of heat-related disorders:

1. Transient heat fatigue, a state of discomfort and psychological strain arising from prolonged heat exposure, is usually developed by workers unused to heat. Task performance, concentration, alertness, and vigilance decline. Gradual acclimation to heat can lessen the stress.

2. Heat rash, also known as prickly heat, is caused by the body's inability to remove sweat by evaporation. The sweat ducts become plugged, sweat glands are inflamed, and a rash that can become infected develops. Resting in a cool place at regular intervals and showering after each work shift prevent the condition.

3. Fainting is usually caused by a worker's standing erect and immobile in the hot sun. Blood pools in the lower section of the body, thereby reducing the amount of blood pumped to the brain. Moving around prevents the blood from pooling.

4. Heat cramps are painful spasms of the working muscles of individuals who sweat profusely in heat, and who drink large quantities of water but fail to replace the body's salt loss. The lack of salt causes painful cramps that can be relieved by drinking half a glass of water containing half a teaspoon of salt every 15 min. Muscles should be massaged gently to relieve spasm. Cramps can also be prevented by drinking an electrolite mixture (such as Gatorade®) while working. Persons with heart problems or low-sodium diets must consult a physician for relief of heat cramps.

5. Heat exhaustion is caused by excessive sweating. The worker will continue to sweat but experience extreme weakness, fatigue, giddiness, nausea, or headache. The worker may vomit or faint in severe cases. The skin is clammy and moist, complexion is pale or flushed, and body temperature is normal or slightly higher. The victim should lie down in a cool place, with feet elevated 8-12 in. Lightly salted liquids, i.e., half a glass of water with half a teaspoon of salt, should be administered every 15 min. (See above caution on heart patients.) Cool, wet cloths can also be applied. If vomiting occurs, discontinue fluids and take victim to nearest hospital.

6. Heat stroke, the most dangerous form of heat-related injury, is life threatening. Help must be obtained immediately or the worker may die. Heat stroke is caused by the breakdown of the body's thermoregulating system under stress and results in disruption of the sweating mechanism. Body temperature will rise significantly and rapidly, i.e., >105°F; the skin will be hot, dry, and usually red in spots; pulse will be rapid and strong. An ambulance should be summoned, but the victim should be moved immediately to a cool place, his/her clothes soaked with water, and his/her body vigorously fanned to promote cooling and quickly reduce body temperature. Alternatively, the victim can be undressed and placed in a tub of cold (not ice) water, sponged with cool water or rubbing alcohol, or given continuous applications of cold packs. Although high body temperature can cause permanent brain damage and/or death, the victim must not be overchilled.

Prevention is the first and foremost means of handling heat stress problems. Monitoring workers' temperatures, adjusting their schedules, providing shelter and cooling devices, and encouraging workers to maintain optimal physical fitness all help prevent heat stress. Workers should drink 1-1.6 gal of fluid per day (a cup or two every 15-20 min) to maintain body fluids and body weight. Measurements of worker heart rate and oral temperature are other ways to monitor heat stress. Heart rate should not exceed 110 beats/min at the beginning of the rest period and temperature should not exceed 100.6 F. ACGIH has adopted TLVs for heat exposure. The Wet Bulb Globe Temperature Index (WBGT) must be calculated and compared to the TLVs, which are calculated as follows:

- Outdoors with solar load:

  WBGT = 0.7 NWB + 0.2 GT + 0.1 DB

- Indoors or outdoors with no solar load:

  WBGT = 0.7 NWB + 0.3GT

where

NWB = National Wet-Bulb Temperature Index
DB = Dry-Bulb Temperature
GT = Globe Temperature

The TLVs are listed in Table 4-2. The ACGHI TLVs cannot be used when impermeable or semi-impermeable clothing is worn. Therefore, Table 4-3 gives a suggested work/rest period for various adjusted temperatures, for both normal and impermeable work ensembles. The level of effort required to perform the specific work will further modify this table.

4.1.2.2 ***Cold Stress.*** Exposure to cold can cause frostbite-crystals to form in the skin or hypothermia (lowering of body temperature). Temperature, humidity, and wind velocity can affect the degree of hazard from cold exposure. The wind chill factor estimates the combined cooling effect of wind and low air temperatures on exposed skin. The ACGIH provides a chart of the wind chill factor and also TLVs for cold exposure (see Table 4-4). In general the TLVs only take effect when the temperature is -15 F (-26°C) or below and are used to prevent hypothermia. Frostbite can usually be prevented by ensuring that the extremities (ears, nose, toes, and fingers) are kept warm.

In case of frostbite, noted where the skin is white to grayish yellow in color, the affected part should be rapidly warmed in running or circulating water that is between 102-105°F. Do not rub or massage frozen part. In the case of hypothermia, the victim should be moved to a warm room as quickly as possible and wrapped in blankets or placed in a tub of warm (102-105°F) water.

4.2 TRAINING

Anyone who enters a hazardous waste work site must recognize and understand the potential hazards to health and safety. All workers at the site will be required to fulfill a minimum safety training program.

TABLE 4-2

PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUES
(VALUES ARE GIVEN IN °C WBGT)

WORK - REST REGIMEN	WORK LOAD		
	LIGHT	MODERATE	HEAVY
Continuous work	30.0	26.7	25.0
75% Work - 25% Rest, each hour	30.6	28.0	25.9
50% Work - 50% Rest, each hour	31.4	29.4	27.9
25% Work - 75% Rest, each hour	32.2	31.1	30.0

TABLE 4-3

SUGGESTED FREQUENCY OF PHYSIOLOGICAL MONITORING
FOR FIT AND ACCLIMATIZED WORKERS[a]

ADJUSTED TEMPERATURE[b]	NORMAL WORK ENSEMBLE[c]	IMPERMEABLE ENSEMBLE
90°F (32.2°C) or above	After each 45 min of work	After each 15 min of work
87.5-90°F (30.8-32.2°C)	After each 60 min of work	After each 30 min of work
82.5-87.5°F (28.1-30.8°C)	After each 90 min of work	After each 60 min of work
77.5-82.5°F (25.3-28.1°C)	After each 120 min of work	After each 90 min of work
72.5-77.5°F (22.5-25.3°C)	After each 150 min of work	After each 120 min of work

[a]For work levels of 250 kilocalories/hour.

[b]Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F = ta °F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percentage of time the sun is not covered by clouds thick enough to produce a shadow. (100% sunshine = no cloud cover and a sharp, distinct shadow; 0% sunshine = no shadows.)

[c]A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

TABLE 4-4

COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED AS EQUIVALENT TEMPERATURE (UNDER CALM CONDITIONS)

ESTIMATED WIND SPEED (in mph)	ACTUAL TEMPERATURE READING (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	EQUIVALENT CHILL TEMPERATURE (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect).	*LITTLE DANGER* In < hr with dry skin. Maximum danger of false sense of security				*INCREASING DANGER* Danger from freezing of exposed flesh within one minute.				*GREAT DANGER* Flesh may freeze within 30 seconds.			
	Trenchfoot and immersion foot may occur at any point on this chart.											

Reference: 1993-1994 ACGIH Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.

The objective of the training program will be:

- To make workers aware of the potential hazards they may encounter.
- To provide the knowledge and skills necessary for the worker to perform the work with minimal risk to health and safety.
- To make workers aware of the purpose and limitations of safety equipment.
- To ensure that workers can safely avoid or escape from emergencies.

This program is in accordance with 29 CFR 1910.120 (e) (3) and personnel successfully completing the course are issued a certificate of training.

At a minimum, the training consists of 40 hrs of instruction (or equivalent experience) plus 3 days of actual field experience under the direct supervision of a trained, experienced supervisor. Equivalent experience must be applicable experience using equipment, clothing, etc. A maximum of 16 of the 40 hrs of required training can be equivalent experience. Field experience from 1984 to the current year can be used in the calculation of equivalent experience.

Training consists of instruction, lectures, or hands-on experience as appropriate in the following categories:

- Personnel responsible for site safety and health
- Safety, health, and other hazards present on-site
- Use of PPE
- Work practices by which the employee can minimize risks from hazards
- Safe use of engineering controls and equipment on-site
- Medical surveillance requirements, including symptoms and signs that might indicate overexposure to hazards
- Site control measures
- Decontamination procedures

- Site's standard operating procedures
- Contingency plans for emergencies
- Confined space entry procedures

In addition, each person shall receive 8 hrs of refresher training annually in the above areas.

At least one person on-site (if he or she is supervising others) must have received an additional 8 hrs of instruction in supervision of health and safety. One person on-site must also have at least 8 hrs of first aid and CPR. Personnel who do not regularly work on hazardous waste sites, such as section directors, design engineers etc., but have occasional reason to visit a site, must have 24 hrs of training and 1 day of actual field experience under the direct supervision of a trained experienced supervisor. The training consists of the above itemized list.

4.2.1 **Hazard Evaluation**

Site-specific training is based on the evaluation of field and laboratory results collected during the preliminary site investigations and a risk assessment of on-site hazards. Training consists of an overview of site hazards (both physical and chemical) and the appropriate steps to control these hazards.

4.2.2 **Equipment Use, Operations, Limitations**

Hands-on instruction is used to familiarize workers with the safe and proper operation of field equipment (e.g., purge pumps, coring equipment). Specific equipment limitations will be emphasized.

4.2.3 **Decontamination**

Decontamination training includes:

- A review of the specific site decontamination plan.

- A review of standard operating procedures established to minimize contact with waste and thus the potential for contamination.

- A review of the types of contamination monitored at the site and the appropriate decontamination procedures. Training includes a walk-through demonstration of the decontamination methods, including:

  - Removal of physical contaminants from clothing and equipment.

  - Removal of chemical contaminants from clothing and equipment by using a wash/rinse process with cleaning solutions.

  - Appropriate disposal techniques for equipment and personnel gear.

4.2.4 **Safety Plans and Emergency Procedures**

Training includes the review of the generic and site-specific HASP with all on-site workers, with emphasis on safe practices, standard operating procedures, and site safety maps. Methods to reduce the possibility of contamination of workers include:

- Working upwind of the contamination

- Reducing dust by watering down the work area (provided that contaminants are not water-active)

- Ventilating confined spaces

- Use of pressurized cabs or control booths on equipment

- Use of remote-operated materials handling equipment

- Reducing number of employees in contaminated areas

Emergency procedures training includes how to request emergency assistance, self-rescue, personnel response to emergencies, and emergency drills.

4.3 GENERAL WORK PRACTICES

- Eating, drinking, chewing gum or tobacco, smoking, or any other practice that increases the probability of hand-to-mouth transfer and ingestion of material are prohibited except in predesignated areas on-site.

- Workers must wash hands and face thoroughly upon leaving the work area and before eating, drinking, or any other such activities.

- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.

- Facial hair that interferes with satisfactory fit of the mask-to-face seal is not allowed on personnel required to wear respiratory protective equipment.

- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, workers should avoid personal and equipment contact with puddles, mud, and other discolored surfaces.

- Medicine and alcohol can exaggerate the effects of exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on response operations where the potential for absorption, inhalation, or ingestion of toxic substances exists, unless specifically approved by a qualified physician.

- Eyeglasses are not compatible for use with full-face respiratory equipment. Contact lenses tend to trap vapors between the eyes and the lenses, thus allowing vapor absorption to the body via eye tissue. In addition, dislodged contacts cannot be readjusted without wash removal. Therefore, instead of contacts, prescription lens inserts, which are available for most full-face respirators, should be used.

- Hearing protection should be worn when excessive noise is present, particularly when using the Acker Soil Mechanic or working around an air rotary drill rig.

- The buddy system should always be used, and each buddy should watch for signs of fatigue, exposure, etc.

- No work is to be conducted on-site without appropriate supervision and air quality monitoring.

- On sites requiring drum handling or where buried drums are suspected, a site-specific HASP is to be written to incorporate drum handling and opening procedures. This must be written in accordance with 29 CFR 1910.120 (y) (1-9).

- Illumination must be provided at each site and the intensity will be the minimum required by 29 CFR 1910.120 (m).

- Unless transportation to toilet facilities is readily available, all sites must be provided toilet facilities in accordance with 29 CFR 1910.120 (n). Also to be provided are an adequate supply of potable water and washing facilities.

4.4 ADDITIONAL GUIDELINES FOR IMPLEMENTING A HEALTH AND SAFETY PROGRAM FOR INVESTIGATION WORK

The LMS Safety Department consists of a Safety Director and two or more Safety Officers. The following describes the job description of each category and Figure 4-1 depicts the organization.

SAFETY DIRECTOR

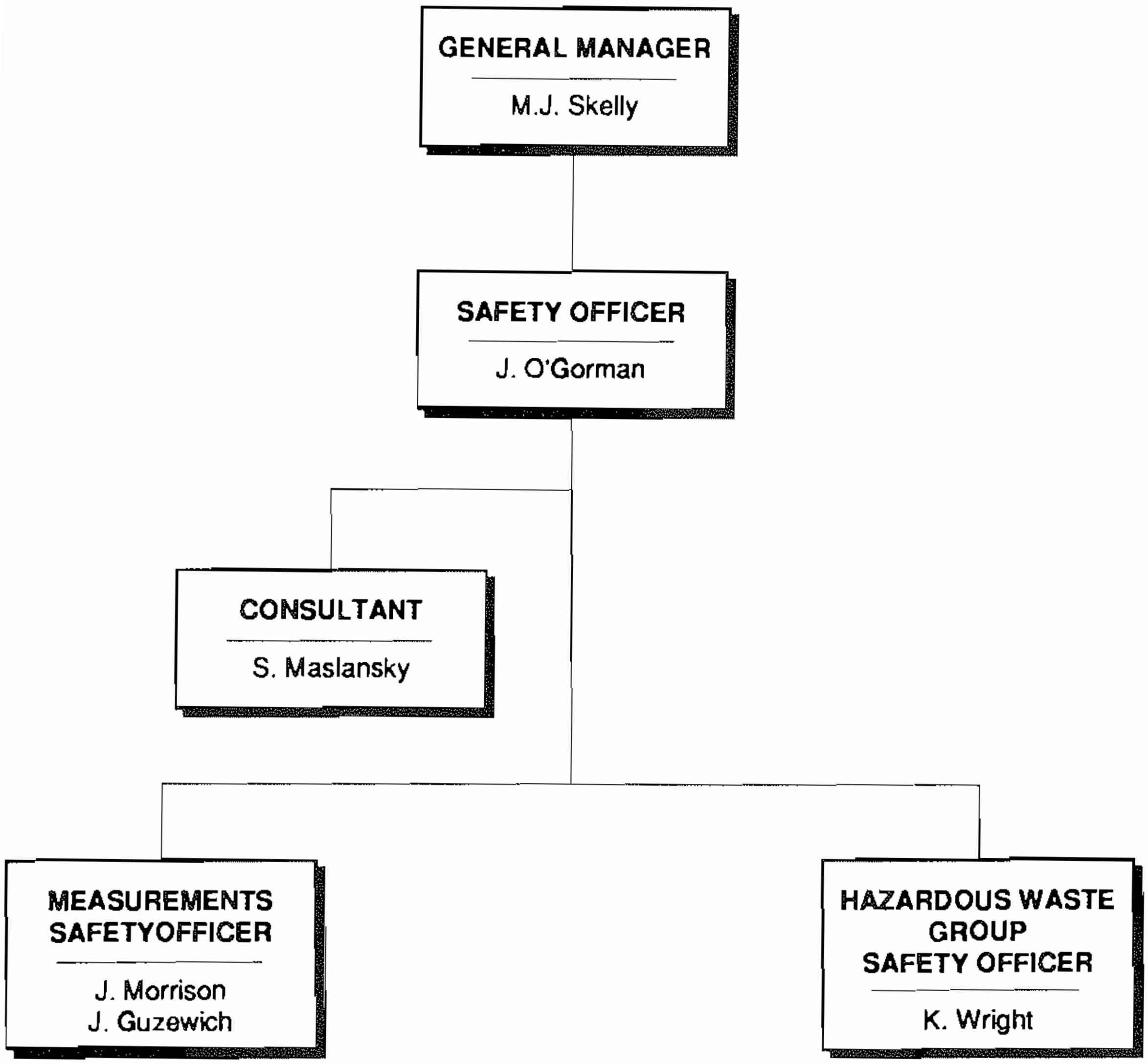
- Prepares policy manual and guidelines with input from Safety Officers
- Defines administrative procedures
- Coordinates outside safety activities, physical, training courses, and safety consultants
- Reviews and approves safety plans after input from Safety Officers and Project Manager
- Monitors regulations and insurance changes
- Ensures involvement of Safety Officers with operations decisions

SAFETY OFFICER

- Provides technical and practical input to policies and procedures
- Reviews operations to ensure compliance with policies and definition of appropriate safety measures (degree of involvement will depend upon size and complexity of project or activity - needs to be informed of all potentially hazardous site activity)
- Prepares or reviews site-specific HASPs
- Reviews in-house procedures and recommends changes to increase efficiency or improve safety
- Ensures that current and appropriate information is included in site-specific decisions
- Recommends training programs, participates in or runs same
- Ensures all necessary equipment is available and functioning

FIGURE 4-1

HEALTH AND SAFETY ORGANIZATION



- Conducts periodic safety audits

Additional guidelines for health and safety include:

- Procedures for on-site activities at hazardous waste sites such as the drilling and installation of monitoring wells, collection of soil, sediment, groundwater and surface water samples. must be reviewed by an LMS Section Director and by a Safety Officer.

- The Safety Officer(s) determines, based on existing information, the level of protection to be utilized and instrumentation needed for on-site sampling or investigative work. The Safety Officer(s) is to be kept informed of any new data or information affecting the level of protection as it is acquired.

- The personnel assigned to do field work involving hazardous waste must have successfully completed all the prescribed safety training, the minimum which is a 40-hr HazMat Training program, plus 3 days of actual field experience (equivalent experience up to 16 hrs can be substituted for part of the 40 hrs HazMat Training). Acceptable equivalent training must be approved by a Safety Officer. When instrumentation is to be utilized in the field, the person or persons assigned must have the necessary training to use the equipment properly and interpret the results correctly.

- All employees must have read this LMS Standard Operating Procedures Manual for Health and Safety.

- All personnel performing field work must wear the minimum safety equipment of work shoes. Safety glasses/goggles may also be part of the minimum equipment required at a particular site. Hard hats are required in areas where an overhead hazard exists. Contact lenses are not to be worn with a respirator or self-contained breathing apparatus (SCBA).

- A specific HASP must be prepared for each site by a Safety Officer or his/her designee that defines measures for each level and type of activity and is read by all site-assigned employees. At a minimum this must be equivalent to the attached LMS site-specific health and safety plan form (Appendix E). The designated Safety Officer must be provided with an approved copy of the site-specific HASP.

- Large jobs, any CERCLA or RCRA projects, or those involving special safety concerns, require a specific HASP and must be reviewed by the Group Manager, Section Director(s) and LMS Safety Department.

- Employees must familiarize themselves with all safety procedures for the particular site and seek advice from Safety Officers if they are unclear on any health or safety issues.

- For all investigations on hazardous waste sites, including sampling, all work must be done by at least two trained personnel at all times, without regard to levels of protection required.

- Pump tests done for a residential water supply development project require only one person, provided that the physical hazards are minimal.

- Work performed for a private industrial client where a sign-in and sign-out system is employed, can be done by one person, provided that the work is not considered hazardous. In some instances a subcontractor, such as a drilling company, can provide the second person coverage, but this procedure must be reviewed by the Safety Department.

- Any person working by themselves should check in with his/her supervisor upon leaving the work site and/or completing the work.

CHAPTER 5

RECORD KEEPING AND REPORTING

LMS maintains records of all health and safety-related matters that occur during the course of the investigation for a minimum of 30 years. The records include field analytical data collected using field instruments (e.g., HNU, OVA), employee health monitoring data, health and safety planning documentation, and contingency plan communications and contacts, employee training records, and hazardous waste experience and exposure levels. The records will be provided to the client upon request. Table 5-1 is an example of a site health and safety report, which is prepared daily to ascertain the level of protection to be used. Table 5-2 is a data sheet that can be used to record air monitoring data. Additional logs or data sheets can be designed for each specific location depending on the need.

TABLE 5-1

DAILY HEALTH AND SAFETY REPORT

Date: ____________________

Background HNU Reading (Measured in Support Zone or at Command Post)	
Background OVA Reading (Measured in Support Zone or at Command Post)	
Background EXP Reading (Measured in Support Zone or at Command Post)	
Background OXY Reading (Measured in Support Zone or at Command Post)	
Background RAD Reading (Measured in Support Zone or at Command Post)	

Work Area and Task: ____________________

Ambient HNU Readings (Measured in Working Area):	
Ambient OVA Readings (Measured in Working Area):	
Ambient EXP Readings (Measured in Working Area):	
Ambient OXY Readings (Measured in Working Area):	
Ambient RAD Readings (Measured in Working Area):	

Level of Protection Required: ____________________

Comments: ____________________

On-Site Health and Safety Officer: ____________________

TABLE 5-2

Job No.: __________
Site: __________
Oper.: __________
Crew: __________

LAWLER, MATUSKY & SKELLY ENGINEERS
DAILY HEALTH & SAFETY REPORT
DATA SHEET

HNu Meter: __________
OVA Meter: __________
Explosimeter: __________
Date: __________

TIME	SAMPLE LOCATION	HNu READING	EXPLOSIMETER READING	OVA READING	COMMENTS

On-Site Health & Safety Officer and/or Crew Chief:

(Signature) __________

(Date) __________

APPENDIX A

INFORMATION ON SENSITIVITY OF THE HNU PID TO VARIOUS COMPOUNDS

TABLE A-1 (Page 1 of 4)

HNU MODEL 101 PORTABLE GAS ANALYZER

COMPOUND	LAMP	PREFERRED RANGE (ppm)[a]
acetaldehyde residues	10.2	0-200
acetic acid	10.2	0-20
acetic anhydride	11.7	0-2000
acetone	10.2	0-20
acetylene	11.7	0-20
acids (organic)	10.2/9.5	0-20[b]
acrolein	10.2	0-20
acrylonitrile	11.7	0-20
alcohol in mouthwash	10.2	0-200
alcohols	11.7/10.2/9.5	0-20[b]
aldehydes	11.7/10.2	0-20[b]
aliphatics	11.7/10.2	0-20[b]
alkyl halides	11.7/10.2	0-20[b]
allyl alcohol	10.2	0-20
amides	10.2	0-20[b]
amines	10.2/9.5	0-20[b]
ammonia	10.2	0-200
aniline	10.2/9.5	0-20
aromatics	10.2/9.5	0-20[b]
arson	10.2	0-20[b]
asphalt plant emissions	10.2	0-20[b]
benzene	10.2/9.5	0-20
butane from aerosol cans	11.7/10.2	0-20[b]
boron tribromide	10.2/9.5	0-20
carbon disulfide	10.2	0-20
carbon tetrachloride	11.7	0-20
chlorinated aromatics	10.2/9.5	0-20[b]
chlorinated hydrocarbons	11.7/10.2	0-20[b]
chloroform	11.7	0-200
coffee aroma	10.2	0-20
cyclohexanone	10.2	0-20
dibromochloropropane	10.2	0-20
dichloropropylene	10.2	0-20
dimethyl disulfide	10.2/9.5	0-20
dimethyl sulfide	10.2/9.5	0-20
epichlorohydrin	10.2	0-20
essential oil emissions	10.2	0-20[b]
esters	10.2	0-20[b]
ethane	11.7	0-20[b]
ethanol	10.2	0-200
ethyl methacrylate	10.2	0-20
ethylene	10.2	0-20
ethylene dibromide	10.2	0-20
ethylene dichloride	11.7	0-50
ethylene imine	10.2	0-20
ethylene oxide	10.2	0-50

[a]Best range for determining if value is less than TWA-TLV.
[b]Preferred range for leak detection and survey work.

HNU MODEL 101 PORTABLE GAS ANALYZER

COMPOUND	LAMP	PREFERRED RANGE (ppm)[a]
food and feed processing industry (hexane)	10.2	0-2000
formaldehyde	11.7	0-20
formic acid	11.7	0-20
fumigants:		
carbon disulfide	10.2	0-20
carbon tetrachloride	11.7	0-20
ethylene dibromide	10.2	0-20
phosphine	10.2	0-20
furan	10.2	0-20
grain fumigation	11.7/10.2	0-20[b]
grain storage and transportation	11.7/10.2	0-20[b]
hazardous waste disposal sites	11.7/10.2/9.5	0-20[b]
headspace	10.2/9.5	0-20[b]
heterocyclics	10.2	0-20[b]
hydrazine	10.2	0-20
hydrogen sulfide	10.2	0-20
hydrogen selenide	10.2	0-20[b]
industrial hygiene for:		
Determining sampling locations for charcoal tubes	11.7/10.2/9.5	0-20[b]
General Lab and Plant Surveys	11.7/10.2/9.5	0-20[b]
Leak Detection	11.7/10.2/9.5	0-20[b]
industrial hygiene surveys in air:		
acetaldehyde oxime	10.2	0-20
acrylates	10.2	0-20[b]
aircraft fuel vapor	10.2	0-20[b]
bromine	10.2	0-20
ethylene oxide	10.2	0-50
iodine vapor	10.2	0-20
phosphine	10.2	0-20
styrene from fiberglass production	10.2/9.5	0-200
toluene	10.2/9.5	0-200
trichloroethylene	10.2	0-200
inorganic gases:		
AsH_3	10.2	0-20
H_2S	10.2	0-20
NH_3	10.2	0-200
PH_3	10.2	0-20
ketones	10.2/9.5	0-20[b]

[a]Best range for determining if value is less than TWA-TLV.
[b]Preferred range for leak detection and survey work.

TABLE A-1 (Page 3 of 4)

HNU MODEL 101 PORTABLE GAS ANALYZER

COMPOUND	LAMP	PREFERRED RANGE (ppm)[a]
leaks from valves and flanges	11.7/10.2/9.5	0-20[b]
leaks in respiratory protection masks	11.7/10.2	0-20[b]
lutidines	10.2	0-20[b]
menthol in tobacco	10.2/9.5	0-20[b]
methanol	11.7	0-20
methyl bromide	10.2	0-20
methyl isocyanate	10.2	0-20
methyl mercaptan	10.2	0-20
methyl methacrylate	10.2	0-200
methylene chloride	11.7/10.2	0-2000
mineral spirits	10.2	0-2000
monitoring	11.7/10.2/9.5	0-20
naphtha	10.2	0-200
nitrates	11.7/10.2	0-20[b]
nitrites (C_2+)	11.7/10.2	0-20[b]
nitro alkanes	11.7 10.2	0-20[b]
nitro benzene	10.2	0-20
n-octane	10.2	0-2000
odors	11.7/10.2/9.5	0-20[b]
oil vapor residues on aluminum foil	10.2	0-20[b]
olefins	10.2	0-20[b]
organic gases	11.7/10.2/9.5	0-20[b]
pesticides:		
phostoxin	11.7/10.2	0-20[b]
weevilcide	11.7/10.2	0-20[b]
serafume	11.7/10.2	0-20[b]
ethylene dibromide	11.7/10.2	0-20[b]
phenol	10.2/9.5	0-20
phosphine	10.2	0-20
phosphorous trichloride	10.2	0-20
phostoxin	10.2	0-20
picolines	10.2	0-20[b]
-pinene	10.2	0-20
propane	11.7	0-2000
propylene	10.2	0-20[b]
pyridine	10.2/9.5	0-20
pyrole	10.2	0-20[b]
quality control	11.7/10.2/9.5	0-20[b]
railroad car leaks - derailments	11.7/10.2/9.5	0-20[b]
reduced sulfur compounds	10.2	0-20[b]

[a]Best range for determining if value is less than TWA-TLV.
[b]Preferred range for leak detection and survey work.

TABLE A-1 (Page 4 of 4)

HNU MODEL 101 PORTABLE GAS ANALYZER

COMPOUND	LAMP	PREFERRED RANGE (ppm)[a]
residual hexane	10.2	0-20[b]
residual solvents in can liners and food	10.2	0-20[b]
residual solvents on computer tape	10.2	0-20[b]
residual solvents on paper products	10.2	0-20[b]
residual solvents from printing ink	10.2	0-20[b]
respirator cartridge breakthrough	11.7/10.2	0-20[b]
serafume	11.7	0-20[b]
solvents in air:		
carbon disulfides	10.2	0-20
chloropropenes	10.2	0-20
dimethyl formamide	10.2	0-20
doping gases:		
arsine	10.2	0-20
phosphine	10.2	0-20
hydrogen selenide	10.2	0-20
boron tribromide	10.2	0-20
ethylene dibromide	10.2	0-20
hexamethyl phosphoric	10.2	0-20
triamide	10.2	0-20
hydrogen sulfide	10.2	0-20
isopropanol	10.2	0-20
methyl methacrylate	10.2	0-200
styrene	10.2/9.5	0-200
tetrahydrofuran	10.2	0-200
tetraethyl lead	10.2	0-200
thionyl chloride	10.2	0-20
TLV monitor	11.7/10.2/9.5	0-20[b]
toluene in air	10.2/9.5	0-200
total fumigant concentrations	11.7/10.2	0-20[b]
total reduced sulfur	10.2	0-20[b]
toxicology chamber monitoring	10.2	0-20[b]
vinyl acetate	10.2	0-20[b]
vinyl bromide	10.2	0-20[b]
vinyl chloride	10.2	0-20
vinylidene	10.2	0-20[b]

[a]Best range for determining if value is less than TWA-TLV.
[b]Preferred range for leak detection and survey work.

TABLE A-2 (Page 1 of 2)

SELECTED LIST OF SPECIES DETECTED BY HNU

CLASS SPECIES	PHOTOIONIZATION RESPONSE 9.5 eV lamp	10.2 eV lamp	11.7 eV lamp
PARAFFINS AND UNSATURATED HYDROCARBONS			
methane	NR	NR	NR
ethylene	NR	L	H
acetylene	NR	NR	H
1-butene	H	H	H
hexane	NR	L	H
CHLORINATED HYDROCARBONS			
methyl chloride	NR	NR	H
carbon tetrachloride	NR	NR	H
chloroform	NR	NR	H
dichloroethane	NR	NR	H
vinylidene chloride	L	H	H
vinyl chloride	L	H	H
trichloroethylene	H	H	H
HETEROCYCLICS & AROMATICS			
phenol	H	H	H
pyridine	H	H	H
benzene	H	H	H
toluene	H	H	H
xylene	H	H	H
styrene	H	H	H
aniline	H	H	H
chlorobenzene	H	H	H
nitrobenzene	NR	L	H
NITROGEN COMPOUNDS			
formamide	NR	H	H
ammonia	NR	L	H
hydrazine	H	H	H
methyl amine	H	H	H
acetonitrile	NR	NR	NR
acrylonitrile	NR	NR	H

NR: no response
H: high response
L: low response

TABLE A-2 (Page 2 of 2)

SELECTED LIST OF SPECIES DETECTED BY HNU

CLASS SPECIES	PHOTOIONIZATION RESPONSE 9.5 eV lamp	10.2 eV lamp	11.7 eV lamp
SULFUR COMPOUNDS			
sulfur dioxide	NR	NR	NR
hydrogen sulfide	NR	H	H
carbonyl sulfide	NR	NR	H
carbon disulfide	H	H	H
methyl mercaptan	H	H	H
dimethyl sulfide	H	H	H
dimethyl disulfide	H	H	H
ALDEHYDES, KETONES, ALCOHOLS, ACIDS, ESTERS			
formaldehyde	NR	NR	H
acetaldehyde	NR	H	H
propionaldehyde	L	H	H
acrolein	L	H	H
crotonaldehyde	L	H	H
acetone	L	H	H
methanol	NR	NR	H
ethanol	NR	L	H
formic acid	NR	NR	H
acetic acid	NR	L	H
methyl methacrylate	L	H	H
OTHERS			
ethylene dibromide	NR	H	H
ethylene oxide	NR	L	H
tetraethyl lead	H	H	H
phosphine	NR	H	H
arsine	NR	H	H
iodine	H	H	H

NR: no response
H: high response
L: low response

TABLE A-3 (Page 1 of 2)

RELATIVE PHOTOIONIZATION SENSITIVITIES OF VARIOUS GASES TO A 10.2 HNU LAMP

GAS	PHOTOIONIZATION SENSITIVITY (see Note I)	SPAN CONTROL SETTING FOR DIRECT READING (approximate)
p-xylene	11.4	3.0
m-xylene	11.2	
benzene	10.0 (reference standard - see note 2)	9.8
toluene	10.0	
diethyl sulfide	10.0	
diethyl amine	9.9	9.0
styrene	9.7	9.8
trichloroethylene	8.9	8.2
tetrachlorethylene		6.1
carbon disulfide	7.1	8.0
isobutylene	7.0	8.0
acetone	6.3	
tetrahydrofuran	6.0	5.5
methyl ethyl ketone	5.7	3.8
methyl isobutyl ketone	5.7	4.7
cyclohexanone	5.1	1-3
naptha (85% aromatics)	5.0	3.3
vinyl chloride	5.0	4.3
methyl isocyanate	4.5	
iodine	4.5	
methyl mercaptan	4.3	1.0
EDB	2.7	
dimethy sulfide	4.3	4.0
allyl alcohol	4.2	
propylene	4.0	3.5
mineral spirits	4.0	
2,3-dichloropropene	4.0	
cycloexene	3.4	
crotonaldehyde	3.1	
acrolein	3.1	1.0
methyl methacrylate	3.0	2.4
pyridine	3.0	3.0
hydrogen sulfide	2.8	3.0
ethylene dibromide	2.7	1.9
n-octane	2.5	
acetaldehyde oxims	2.3	
hexane	2.2	1-2

Note 1: ppm reading when measuring 10.0 ppm of particular gas with monitor calibrated for benzene.

Note 2: Meter is calibrated to benzene but iosbutylene is utilized as calibration gas.

TABLE A-3 (Page 2 of 2)

RELATIVE PHOTOIONIZATION SENSITIVITIES OF VARIOUS GASES TO A 10.2 HNU LAMP

GAS	PHOTOIONIZATION SENSITIVITY (see Note 1)	SPAN CONTROL SETTING FOR DIRECT READING (approximate)
phosphine	2.0	1-2
heptane	1.7	
allyl chloride (3-chloropropane)	1.5	
ethylene oxide	1.0	2.0
acetic anhydride	1.0	
pinene	0.7	
dibromochloropropane	0.7	
epichlorohydrin	0.7	
nitric oxide	0.6	
pinne	0.5	
citral	0.5	
ammonia	0.3	2.5-3
acetic acid	0.1	
nitrogen dioxide	0.02	
methane	0.0	
acetylene		3.0
hydrazine		7.0
decane		5.0
n,n-dimethanol amine		6.6
n,n-dimethyl formamide		3.5
1,2-dibromomethane		

Note 1: ppm reading when measuring 10.0 ppm of particular gas with monitor calibrated for benzene.

Note 2: Meter is calibrated to benzene but iosbutylene is utilized as calibration gas.

TABLE A-4

RELATIVE PHOTOIONIZATION SENSITIVITIES OF VARIOUS GASES TO A 11.7 HNU LAMP

DIRECT GAS (approx.)	PHOTOIONIZATION SENSITIVITY (see Note 1)	SPAN CONTROL SETTING FOR DIRECT READING (approx.)
Carbon Disulfide	33.8	
Heptane	22.1	
Hexane	18.9	
Pentane	14.1	
1,2 Dichloroethane	12.9	
Benzene	12.2	5.0
MIBK	10.6	
Isobutylene	10.0 (reference Std.)	
Toluene	10.0	
Methyl Chloride	9.8	
Methylene Chloride	9.4	
1,1,1,-Triehloroethane	9.0	
Carbon Tetrachloride	9.0	
Ethylene Dichloride	9.0	
Butane	8.7	
THF	7.9	
Acrylonitrile	7.1	2.0
MEK	6.3	
Chloroform	6.0	
1,1,2,2-Tetrachloroethane	6.0	
Acetone	5.7	
Propane	5.5	
Isoproponol	4.5	
Acrolein	3.4	1.0
Ethane	3.0	
Ethanol	3.0	
Methanol	1.0	
1,1,2-Trifluoroethane	0.3	
Acetonitrile	0.1	

Note 1: ppm reading when measuring 10.0 ppm of particular gas with monitor calibrated for benzene.

TABLE A-5

RELATIVE PHOTOIONIZATION SENSITIVITIES OF VARIOUS GASES TO A HNU 9.5 LAMP

DIRECT GAS (approx.)	PHOTOIONIZATION SENSITIVITY (see Note 1)	SPAN CONTROL SETTING FOR DIRECT READING (approx.)
Xylene	10.0 (reference Std.)	1.0
Benzene	10.0	
Styrene	10.0	
Toluene	7.7	
Phenol	3.9	
Aniline	2.9	
MEK	2.2	
Pyridine	0.65	
Acetone	<0.6[a]	
Methyl Methacrylate	<0.2[a]	
Heptane	0	
Hexane	0	
Ammonia	0	
Pentane		

[a]Commercial products containing impurities; response for pure materials is probably less.

Note 1: ppm reading when measuring 10.0 ppm of particular gas with monitor calibrated for benzene.

TABLE A-6 (Page 1 of 8)

IONIZATION POTENTIAL OF VARIOUS COMPOUNDS

SOME ATOMS AND SIMPLE MOLECULES				PARAFFINS AND CYCLOPARAFFINS	
	IP(eV)		IP(eV)	Molecule	IP(eV)
H	13.595	I_2	9.28	methane	12.98
C	11.264	HF	15.77	ethane	11.65
N	14.54	HCl	12.74	propane	11.07
O	13.614	HBr	11.62	n-butane	10.63
Si	8.149	HI	10.38	i-butane	10.57
S	10.357	SO_2	12.34	n-pentane	10.35
F	17.42	CO_2	13.79	i-pentane	10.32
Cl	13.01	COS	11.18	2,2-dimethylpropane	10.35
B	11.84	CS_2	10.08	n-hexane	10.18
I	10.48	N_2O	12.90	2-methylpentane	10.12
H_2	15.426	NO_2	9.78	3-methylpentane	10.08
N_2	15.580	O_3	12.80	2,2-dimethylbutane	10.06
O_2	12.075	H^2O	12.59	2,3-dimethylbutane	10.02
CO	14.01	H_2S	10.46	n-heptane	10.08
CN	15.13	H_2Se	9.88	2,2,4-trimethylpentane	9.86
NO	9.25	H_2Te	9.14	cyclopropane	10.06
CH	11.1	HCN	13.91	cyclopentane	10.53
OH	13.18	C_2N_2	13.8	cyclohexane	9.88
F_2	15.7	NH_3	10.15	methylcyclohexane	9.85
Cl_2	11.48	CH_3	9.840		
Br_2	10.55	CH_4	12.98		

IONIZATION POTENTIAL OF VARIOUS COMPOUNDS

ALKYL HALIDES			
Molecule	IP(eV)	Molecule	IP(eV)
HCl	12.74	1-bromo-2-methylpropane	10.09
Cl^2	11.48	2-bromo-2-methylpropane	9.98
CH_4	12.98	1-bromopentane	10.10
methylchloride	11.28	HI	10.38
dechloromethane	11.35	I_2	9.28
trichloromethane	11.42	methyliodide	9.54
tetrachloromethane	11.47	diiodomethane	9.34
ethylchloride	10.98	ethyliodide	9.33
1,2-dichloroethane	11.12	1-iodopropane	9.26
1-chloropropane	10.82	2-iodopropane	9.17
2-chloropropane	10.78	1-iodobutane	9.21
1,2-dichlorobutane	10.87	2-iodobutane	9.09
1,3-dichlorobutane	10.85	1-iodo-2-methylpropane	9.18
1-chloropropane	10.67	2-iodo-2-methylpropane	9.02
2-chloropropane	10.65	1-iodopropane	9.19
1-chloro-2-methylpropane	10.66	F_2	15.7
2-chloro-2-methylpropane	10.61	HF	15.77
HBr	11.62	$CFCl_3$ (Freon 11)	11.77
Br_2	10.55	CF_2Cl_2 (Freon 12)	12.31
methylbromide	10.53	CF_3Cl (Freon 13)	12.91
dibromomethane	10.49	$CHClF_2$ (Freon 22)	12.45
tribromomethane	10.51	$CFBr_3$	10.67
CH_2BrCl	10.77	CF_2Br_2	11.07
$CHBr_2Cl$	10.59	CH_3CF_2Cl (Genetron 101)	11.98
ethylbromide	10.29	$CFCl_2CF_2Cl$	11.99
1,1-dibromoethane	10.19	CF_3CCl_3 (Freon 113)	11.78
1-bromo-2-chloroethane	10.63	$CFHBrCH_2Br$	10.75
1-bromopropane	10.18	CF_2BrCH_2Br	10.83
2-bromopropane	10.075	CF_3CH_2I	10.00
1,3-dibromopropane	10.07	n-C_3F_7I	10.36
1-bromobutane	10.13	n-$C_3F_7CH_2Cl$	11.84
2-bromobutane	9.98	n-$C_3F_7CH_2I$	9.96

TABLE A-6 (Page 3 of 8)

IONIZATION POTENTIAL OF VARIOUS COMPOUNDS

ALIPHATIC ALCOHOL, ETHER, THIOL, AND SULFIDES		ALIPHATIC ALDEHYDES AND KETONES	
Molecule	IP(eV)	Molecule	IP(eV)
H_2O	12.59	CO_2	13.79
methyl alcohol	10.85	formaldehyde	10.87
ethyl alcohol	10.48	acetaldehyde	10.21
n-propyl alcohol	10.20	propionaldehyde	9.98
i-propyl alcohol	10.16	n-butyraldehyde	9.86
n-butyl alcohol	10.04	isobutyraldehyde	9.74
dimethyl ether	10.00	n-valeraldehyde	9.82
diethyl ether	9.53	isovaleraldehyde	9.71
n-propyl ether	9.27	acrolein	10.10
i-propyl ether	9.20	crotonaldehyde	9.73
H_2S	10.46	benzaldehyde	9.53
methanethiol	9.440	acetone	9.69
ethanethiol	9.285	methyl ethyl ketone	9.53
1-propanethiol	9.195	methyl n-propyl ketone	9.39
1-butanethiol	9.14	methyl i-propyl ketone	9.32
dimethyl sulfide	8.685	diethyl ketone	9.32
ethyl methyl sulfide	8.55	methyl n-butyl ketone	9.34
diethyl sulfide	8.430	methyl i-butyl ketone	9.30
di-ni-propyl sulfide	8.30	3,3-dimethyl butanone	9.17
		2-heptanone	9.33
		cyclopentanone	9.26
		cyclohexanone	9.14
		2,3-butanedione	9.23
		2,4-pentanedione	8.87

TABLE A-6 (Page 4 of 8)

IONIZATION POTENTIAL OF VARIOUS COMPOUNDS

ALIPHATIC ACIDS AND ESTERS		ALIPHATIC AMINES AND AMIDES	
Molecule	IP(eV)	Molecule	IP(eV)
CO_2	13.79	NH_3	10.15
formic acid	11.05	methyl amine	8.97
acetic acid	10.37	ethyl amine	8.86
propionic acid	10.24	n-propyl amine	8.78
n-butyric acid	10.16	i-propyl amine	8.72
isobutyric acid	10.02	n-butyl amine	8.71
n-valeric acid	10.12	i-butyl amine	8.70
methyl formate	10.815	s-butyl amine	8.70
ethyl formate	10.61	t-butyl amine	8.64
n-propyl formate	10.54	dimethyl amine	8.24
n-butyl formate	10.50	diethyl amine	8.01
isobutyl formate	10.46	di-n-propyl amine	7.84
methyl acetate	10.27	di-i-propyl amine	7.73
ethyl acetate	10.11	di-n-butyl amine	7.69
n-propyl acetate	10.04	trimethyl amine	7.82
isopropyl acetate	9.99	triethyl amine	7.50
n-butyl acetate	10.01	tri-n-propyl amine	7.23
isobutyl acetate	9.97	formamide	10.25
sec-butyl acetate	9.91	acetamide	9.77
methyl propionate	10.15	N-methyl acetamide	8.90
ethyl propionate	10.00	N,N-dimethyl formamide	9.12
methyl n-butyrate	10.07	N,N-dimethyl acetamide	8.81
methyl isobutyrate	9.98	N,N-diethyl formamide	8.89
		N,N-diethyl acetamide	8.60

TABLE A-6 (Page 5 of 8)

IONIZATION POTENTIAL OF VARIOUS COMPOUNDS

OTHER ALIPHATIC MOLECULES WITH N ATOM		OLEFINS, CYCLO-OLEFINS, ACETYLENES	
Molecule	IP(eV)	Molecule	IP(eV)
nitromethane	11.08	ethylene	10.515
nitroethane	10.88	propylene	9.73
1-nitropropane	10.81	1-butene	9.58
2-nitropropane	10.71	2-methylpropene	9.23
HCN	13.91	trans-2-butene	9.13
acetonitrile	12.22	cis-2-butene	9.13
propionitrile	11.84	1-pentene	9.50
n-butyronitrile	11.67	2-methyl-1-butene	9.12
acrylonitrile	10.91	3-methyl-1-butene	9.51
3-butene-nitrile	10.39	3-methyl-2-butene	8.67
ethyl nitrate	11.22	1-hexene	9.46
n-propyl nitrate		1,3-butadiene	9.07
methyl thiocyanate	10.065	isoprene	8.845
ethyl thiocyanate	9.89	cyclopentene	9.01
methyl isothiocyanate	9.25	cyclohexene	8.945
ethyl isothiocyanate	9.14	4-methylcyclohexene	8.91
		4-cinylcylohexene	8.93
		cyclo-octatetraene	7.99
		acetylene	11.41
		propyne	10.36
		1-butyne	10.18

IONIZATION POTENTIAL OF VARIOUS COMPOUNDS

SOME DERIVATIONS OF OLEFINS		HETEROCYCLIC MOLECULES	
Molecule	IP(eV)	Molecule	IP(eV)
vinyl chloride	9.995	furan	8.89
cis-dichloroethylene	9.65	2-methyl furan	8.39
trans-dichloroethylene	9.66	2-furaldehyde	9.21
trichloroethylene	9.45	tetrahydrofuran	9.54
tetrachloroethylene	9.32	dihydropyran	8.34
vinyl bromide	9.80	tetrachydropyran	9.26
1,2-dibromoethylene	9.45	thiophene	8.860
tribromoethylene	9.27	2-chlorothiophene	8.68
3-chloropropene	10.04	2-bromothiophene	8.63
2,3-dichloropropene	9.82	pyrrole	8.20
1-bromopropene	9.30	pyridine	9.32
3-bromopropene	9.7	2-picoline	9.02
$CF_3CCl=CClCF_3$	10.36	3-picoline	9.04
$n\text{-}C_5F_{11}CF=CF_3$	10.48	4-picoline	9.04
acrolein	10.10	2,3-lutidine	8.85
crotonaldehyde	9.73	2,4-lutidine	8.85
mesityl oxide	9.08	2,6-lutidine	8.85
vinyl methyl ether	8.93		
allyl alcohol	9.67		
vinyl acetate	9.19		

TABLE A-6 (Page 7 of 8)

IONIZATION POTENTIAL OF VARIOUS COMPOUNDS

AROMATIC COMPOUNDS			
Molecule	**IP(eV)**	**Molecule**	**IP(eV)**
benzene	9.245	nitrobenzene	9.92
toluene	8.82	aniline	7.70
ethyl benzene	8.76	fluoro-benzene	9.195
n-propyl benzene	8.72	chloro-benzene	8.98
i-propyl benzene	8.69	bromo-benzene	8.73
n-butyl benzene	8.69	iodo-benzene	9.07
s-butyl benzene	8.68	o-dichlorobenzene	9.12
t-butyl benzene	8.68	m-dichlorobenzene	8.94
o-xylene	8.56	p-dichlorobenzene	9.155
m-xylene	8.56	1-chloro-2-fluoro-	9.21
p-xylene	8.445	benzene	
mesitylene	8.40	1-chloro-3-fluoro-	8.99
durene	8.025	benzene	
styrene	8.47	1-chloro-4-fluoro-	8.915
-methyl styrene	8.35	benzene	
ethylbenzene	8.815	o-fluorotoluene	8.915
naphthalene	8.12	m-fluorotoluene	8.915
1-methylnaphthalene	7.69	p-fluorotoluene	8.785
2-methylnaphthalene	7.955	o-chlorotoluene	8.83
biphenyl	8.27	m-chlorotoluene	8.83
phenol	8.50	p-chlorotoluene	8.70
anisole	8.22	o-bromotoluene	8.79
phenetole	8.13	m-bromotoluene	8.81
benzaldehyde	9.53	p-bromotoluene	8.67
acetophenone	9.27	o-iodotoluene	8.62
benzenethiol	8.33	m-iodotoluene	8.61
phenyl isocyanate	8.77	p-iodotoluene	8.50
phenyl isothiocyanate	8.520	benzotrifluoride	9.68
benzonitrile	9.705	o-fluorophenol	8.66

TABLE A-6 (Page 8 of 8)

IONIZATION POTENTIAL OF VARIOUS COMPOUNDS

MISCELLANEOUS MOLECULES	
Molecule	**IP(eV)**
ethylene oxide	10.565
propylene oxide	10.22
p-dioxane	9.13
dimethoxymethane	10.00
diethoxymethane	9.70
1,1-dimethoxyethane	9.65
propiolactone	9.70
methyl disulfide	8.46
ethyl disulfide	8.27
diethyl sulfide	9.68
thiolacetic acid	10.00
acetyl chloride	11.02
acetyl bromide	10.55
cyclo-$C_6H_{11}CF_3$	10.46
$(n\text{-}C_3F_7)(CH_3)C{=}O$	10.58
trichlorovinylsilane	10.79
$(C_2f_5)_3N$	11.7
isoprene	9.08
phosgene	11.77

APPENDIX B

MSHA/NIOSH

APPROVALS FOR RESPIRATORS AND CARTRIDGES

Ultra-Twin® respirator

combination cartridge, GMA-F type

NIOSH and MSHA Approved for respiratory protection against organic vapors, and dusts and mists

(See approval plate, opposite page, for specific limitations)

MEETS OSHA REQUIREMENTS FOR AN APPROVED RESPIRATOR

The Complete Ultra-Twin GMA-F Respirator Assembly consists of the following:

Item	Description	MSA Pt. No.	Required
1	Ultra-Twin Facepiece	(See Page 8)	1
2	GMA-F Cartridge	464023 (10/PKG.)	2

GMA-F
NIOSH APPROVAL PLATE

PERMISSIBLE
CHEMICAL CARTRIDGE RESPIRATOR
FOR ORGANIC VAPORS AND
DUSTS AND MISTS

MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

MSHA APPROVAL NO. TC-23C-151 NIOSH

ISSUED TO
MINE SAFETY APPLIANCES COMPANY, Pittsburgh, Pennsylvania, U.S.A.

LIMITATIONS

Approved for respiratory protection against not more than 1,000 parts per million organic vapors by volume, and dusts and mists having a time weighted average not less than 0.05 milligram per cubic meter or 2 million particles per cubic foot.
Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge. Maximum use concentrations will be lower than 1,000 parts per million organic vapors where that concentration produces atmospheres immediately dangerous to life or health.
Not for use in atmospheres containing less than 19.5 percent oxygen.
Not for use in atmopsheres immediately dangerous to life or health.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.
Follow the manufacturer's instructions for changing cartridges.
This respirator shall be selected, fitted, used and maintained in accordance with the Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

MSHA — NIOSH APPROVAL TC-23C-151

Issued to Mine Safety Appliances Company · August 31, 1984

The approved full facepiece respirator assembly for organic vapors, dust and mists consists of the following MSA parts: 7-204 1, 7-204 2 or 7-204 3 facepiece and 460964 (TC-23C-151) cartridges.

Ultra-Twin™ respirator

combination cartridge, GMA-H type

NIOSH and MSHA Approved for respiratory protection against organic vapors; pesticides; paint, lacquer and enamel mists and dust, fumes, mists, asbestos-containing dusts and mists and radionuclides

(See approval plate opposite page, for specific limitations)

WARNING Do not use for urethane paints or other paints containing diisocyanates because of their poor warning properties. Use against such contaminants could result in severe or permanent damage to the respiratory system. Use Air Supplied Respirators.

MEETS OSHA REQUIREMENTS FOR AN APPROVED RESPIRATOR

The Complete Ultra-Twin GMA-H Respirator Assembly consists of the following:

Item	Description	MSA Pt. No.	Required
1	Ultra-Twin Facepiece	(See Page 8)	1
2	GMA-H Cartridge	464029 (6/PKG.)	2

GMA-H
NIOSH APPROVAL PLATE

PERMISSIBLE
CHEMICAL CARTRIDGE RESPIRATOR FOR ORGANIC VAPORS; PESTICIDES; PAINT, LACQUER AND ENAMEL MISTS AND DUSTS, FUMES, MISTS AND RADIONUCLIDES

MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

MSHA APPROVAL NO. TC-23C-155 NIOSH

ISSUED TO
MINE SAFETY APPLIANCES COMPANY, Pittsburgh, Pennsylvania, U.S.A.

LIMITATIONS

Approved for respiratory protection against (1) not more than 1,000 parts per million organic vapors by volume; (2) pesticides; (3) mists of paints, lacquers and enamels and (4) dusts, fumes, and mists having a time weighted average less than 0.05 milligram per cubic meter, asbestos-containing dusts and mists and radionuclides.
Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.
Maximum use concentrations will be lower than 1,000 parts per million organic vapors where that concentration produces atmospheres immediately dangerous to life or health.
Not approved for fumigants.
Not for use in atmospheres containing less than 19.5 percent oxygen.
Not for use in atmospheres immediately dangerous to life or health.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.
Follow the manufacturer's instructions for changing cartridges.
This respirator shall be selected, fitted, used, and maintained in accordance with the Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

MSHA — NIOSH APPROVAL TC-23C-155
Issued to Mine Safety Appliances Company – May 10, 1985

The approved full facepiece respirator assembly for organic vapors; pesticides; paint, lacquer and enamel mists and dusts, fumes, mists and radionuclides consists of the following MSA parts: 7 204-1, 7-204 2 or 7 204 3 facepiece and 460842 (TC-23C 155) cartridges.

Ultra-Twin® respirator

combination cartridge, GMC-H type

NIOSH and MSHA Approved for respiratory protection against acid gases and/or organic and formaldehyde vapors and dusts, fumes, mists, asbestos-containing dusts and mists and radionuclides

See approval plate, opposite page, for specific limitations)

MEETS OSHA REQUIREMENTS FOR AN APPROVED RESPIRATOR

The Complete Ultra-Twin GMC-H Respirator Assembly consists of the following:

Item	Description	MSA Pt. No.	Required
1	Ultra-Twin Facepiece	(See Page 8)	1
2	GMC-H Cartridge	464027 (6/PKG.)	2

GMC-H

NIOSH APPROVAL PLATE

PERMISSIBLE
CHEMICAL CARTRIDGE RESPIRATOR FOR ORGANIC AND FORMALDEHYDE VAPORS, CHLORINE, HYDROGEN CHLORIDE, SULFUR DIOXIDE, AND DUSTS, FUMES, MISTS, AND RADIONUCLIDES

MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

MSHA APPROVAL NO. TC-23C-153 NIOSH

ISSUED TO
MINE SAFETY APPLIANCES COMPANY, Pittsburgh, Pennsylvania, U S A.

LIMITATIONS

Approved for respiratory protection against not more than 1,000 parts per million organic vapors, 30 parts per million formaldehyde vapor; 10 parts per million chlorine, 50 parts per million hydrogen chloride; 50 parts per million sulfur dioxide, dusts, fumes, and mists having a time weighted average less than 0 05 milligram per cubic meter, asbestos containing dusts and mists and radionuclides

Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge. Maximum use concentrations will be lower than 1,000 parts per million organic vapors where that concentration produces atmospheres immediately dangerous to life or health.

Not for use in atmospheres containing less than 19 5 percent oxygen.

Not for use in atmospheres immediately dangerous to life or health.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.

Follow the manufacturer's instructions for changing cartridges

This respirator shall be selected, fitted, used, and maintained in accordance with the Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

MSHA — NIOSH APPROVAL TC-23C-153

Issued to Mine Safety Appliances Company March 10, 1983

The approved full facepiece respirator assembly for organic and formaldehyde vapors, chlorine, hydrogen chloride, sulfur dioxide, dust, fumes, mists, and radionuclides consists of the following MSA parts: 7-204 1, 7-204 2 or 7 204 3 facepiece and 460844 (TC-23C-153) cartridges.

NIOSH Approval Label
For Full Facepiece Respirator Using R53HE Combination Filter Cartridges (R7753HE, S7753HE)

Permissible

FULL FACEPIECE CHEMICAL CARTRIDGE RESPIRATOR FOR ORGANIC VAPORS, CHLORINE, HYDROGEN CHLORIDE, SULFUR DIOXIDE, CHLORINE DIOXIDE, DUST, FUMES, MISTS, ASBESTOS-CONTAINING DUSTS AND MISTS, RADON DAUGHTERS, RADIONUCLIDES AND PESTICIDES

MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH

United States Department of Labor MSHA Mine Safety and Health Administration

APPROVAL NO. TC-23C-418

U S Department of Health, Education, and Welfare Center for Disease Control NIOSH National Institute for Occupational Safety and Health

ISSUED TO
AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.

LIMITATIONS

Approved for respiratory protection against (1) not more than 1,000 ppm organic vapors by volume, (2) not more than 10 ppm chlorine, 50 ppm hydrogen chloride, 50 ppm sulfur dioxide, (3) dusts and mists having a time weighted average less than 0.05 milligrams per cubic meter or 2 million particles per cubic foot, (4) asbestos-containing dusts and mists, (5) radon daughters attached to these dusts, fumes and mists, (6) radionuclides, (7) not more than 1 ppm chlorine dioxide and (8) pesticides.

Not for use in atmospheres immediately dangerous to life or health.

Not for use in atmospheres containing less than 19.5 percent oxygen.

Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.

Maximum use concentrations will be less than 1,000 ppm organic vapors where that concentration produces atmospheres immediately dangerous to life or health. Not approved for fumigantes.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.

Follow the manufacturer's instructions for changing cartridges.

Refer to pesticides label for limitations on respirator use.

This respirator shall be selected, fitted, used and maintained in accordance with the Mine Safety and Health Administration, Occupational Safety and Health Administration and other applicable regulations.

MSHA–NIOSH APPROVAL NO. TC-23C-418
ISSUED TO
AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.
APPROVAL DATE: 5/19/87

The approved full facepiece mask assembly consists of the following American Optical parts: 50349 or 50358 basic respirator assembly, R53HE (TC-23C-417) Cartridges and 51533 Lens Cover (Optional) and 51508 Spectacle Kit (Optional).

NIOSH Approval Label
For Full Facepiece Respirator Using R53HE Combination Filter Cartridges (R7753HE, S7753HE)

Permissible

**FULL FACEPIECE CHEMICAL CARTRIDGE RESPIRATOR
FOR ORGANIC VAPORS, CHLORINE, HYDROGEN CHLORIDE, SULFUR DIOXIDE, CHLORINE DIOXIDE, DUST, FUMES, MISTS, ASBESTOS-CONTAINING DUSTS AND MISTS, RADON DAUGHTERS, RADIONUCLIDES AND PESTICIDES**

**MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH**

United States Department of Labor
MSHA
Mine Safety and Health Administration

APPROVAL NO. TC-23C-418

U.S Department of Health, Education, and Welfare
Center for Disease Control
NIOSH
National Institute for Occupational Safety and Health

**ISSUED TO
AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.**

LIMITATIONS

Approved for respiratory protection against (1) not more than 1,000 ppm organic vapors by volume, (2) not more than 10 ppm chlorine, 50 ppm hydrogen chloride, 50 ppm sulfur dioxide, (3) dusts and mists having a time weighted average less than 0.05 milligrams per cubic meter or 2 million particles per cubic foot, (4) asbestos-containing dusts and mists, (5) radon daughters attached to these dusts, fumes and mists, (6) radionuclides, (7) not more than 1 ppm chlorine dioxide and (8) pesticides.

Not for use in atmospheres immediately dangerous to life or health.

Not for use in atmospheres containing less than 19.5 percent oxygen.

Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.

Maximum use concentrations will be less than 1,000 ppm organic vapors where that concentration produces atmospheres immediately dangerous to life or health. Not approved for fumigantes.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.

Follow the manufacturer's instructions for changing cartridges.

Refer to pesticides label for limitations on respirator use.

This respirator shall be selected, fitted, used and maintained in accordance with the Mine Safety and Health Administration, Occupational Safety and Health Administration and other applicable regulations.

**MSHA–NIOSH APPROVAL NO. TC-23C-418
ISSUED TO
AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.
APPROVAL DATE: 5/19/87**

The approved full facepiece mask assembly consists of the following American Optical parts: 50349 or 50358 basic respirator assembly, R53HE (TC-23C-417) Cartridges and 51533 Lens Cover (Optional) and 51508 Spectacle Kit (Optional).

NIOSH Approval Label
For Full Facepiece Respirator Using R53HE Combination Filter Cartridges (R7753HE, S7753HE)

Permissible

**FULL FACEPIECE CHEMICAL CARTRIDGE RESPIRATOR
FOR ORGANIC VAPORS, CHLORINE, HYDROGEN CHLORIDE, SULFUR DIOXIDE, CHLORINE DIOXIDE, DUST, FUMES, MISTS, ASBESTOS-CONTAINING DUSTS AND MISTS, RADON DAUGHTERS, RADIONUCLIDES AND PESTICIDES**

**MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE OF OCCUPATIONAL
SAFETY AND HEALTH**

APPROVAL NO. TC-23C-418

**ISSUED TO
AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.**

LIMITATIONS

Approved for respiratory protection against (1) not more than 1,000 ppm organic vapors by volume, (2) not more than 10 ppm chlorine, 50 ppm hydrogen chloride, 50 ppm sulfur dioxide, (3) dusts and mists having a time weighted average less than 0.05 milligrams per cubic meter or 2 million particles per cubic foot, (4) asbestos-containing dusts and mists, (5) radon daughters attached to these dusts, fumes and mists, (6) radionuclides, (7) not more than 1 ppm chlorine dioxide and (8) pesticides.

Not for use in atmospheres immediately dangerous to life or health.

Not for use in atmospheres containing less than 19.5 percent oxygen.

Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.

Maximum use concentrations will be less than 1,000 ppm organic vapors where that concentration produces atmospheres immediately dangerous to life or health. Not approved for fumigantes.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.

Follow the manufacturer's instructions for changing cartridges.

Refer to pesticides label for limitations on respirator use.

This respirator shall be selected, fitted, used and maintained in accordance with the Mine Safety and Health Administration, Occupational Safety and Health Administration and other applicable regulations.

**MSHA—NIOSH APPROVAL NO. TC-23C-418
ISSUED TO
AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.
APPROVAL DATE: 5/19/87**

The approved full facepiece mask assembly consists of the following American Optical parts: 50349 or 50358 basic respirator assembly, R53HE (TC-23C-417) Cartridges and 51533 Lens Cover (Optional) and 51508 Spectacle Kit (Optional).

MODEL 7683

PERMISSIBLE

CHEMICAL-CARTRIDGE RESPIRATOR
FOR
ORGANIC VAPORS, CHLORINE, HYDROGEN CHLORIDE, SULFUR DIOXIDE, FORMALDEHYDE, DUSTS, FUMES, MISTS, RADIONUCLIDES AND RADON DAUGHTERS

United States Department of Labor
MSHA
Mine Safety and Health Administration

U. S. Department of Health and Human Services
Centers for Disease Control
NIOSH
National Institute
for Occupational Safety and Health

MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL
SAFETY AND HEALTH

APPROVAL NO. TC-23C-212

ISSUED TO

NORTH SAFETY EQUIPMENT

Cranston, Rhode Island, U.S.A.

LIMITATIONS

Approved for respiratory protection against not more than 1,000 parts per million organic vapors by volume, 10 parts per million chlorine, 50 parts per million hydrogen chloride, 50 parts per million sulfur dioxide or 10 parts per million formaldehyde, dusts, fumes and mists having a time-weighted average less than 0.05 milligram per cubic meter, and asbestos containing dusts and mists, radionuclides and radon daughters attached to these dusts, fumes and mists.
Not for use in atmospheres containing less than 19.5 percent oxygen.
Not for use in atmospheres immediately dangerous to life or health.
Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.
Maximum use concentrations will be lower than 1,000 parts per million organic vapors where that concentration produces atmospheres immediately dangerous to life or health.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.
Follow manufacturer's instructions for changing cartridges.
This respirator shall be selected, fitted, used, and maintained in accordance with Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

MSHA-NIOSH APPROVAL TC-23C-212
Issued to North Safety Equipment
March 29, 1988

THE APPROVED ASSEMBLY CONSISTS OF THE FOLLOWING NORTH PARTS:
7600-8A facepiece assembly and N7500-83 or (TC-23C-210) cartridges.

NIOSH Approval Label
For Full Facepiece Respirator Using R53HE Combination Filter Cartridges (R7753HE, S7753HE)

Permissible

FULL FACEPIECE CHEMICAL CARTRIDGE RESPIRATOR FOR ORGANIC VAPORS, CHLORINE, HYDROGEN CHLORIDE, SULFUR DIOXIDE, CHLORINE DIOXIDE, DUST, FUMES, MISTS, ASBESTOS-CONTAINING DUSTS AND MISTS, RADON DAUGHTERS, RADIONUCLIDES AND PESTICIDES

MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH

APPROVAL NO. TC-23C-418

ISSUED TO
AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.

LIMITATIONS

Approved for respiratory protection against (1) not more than 1,000 ppm organic vapors by volume, (2) not more than 10 ppm chlorine, 50 ppm hydrogen chloride, 50 ppm sulfur dioxide, (3) dusts and mists having a time weighted average less than 0.05 milligrams per cubic meter or 2 million particles per cubic foot, (4) asbestos-containing dusts and mists, (5) radon daughters attached to these dusts, fumes and mists, (6) radionuclides, (7) not more than 1 ppm chlorine dioxide and (8) pesticides.

Not for use in atmospheres immediately dangerous to life or health.

Not for use in atmospheres containing less than 19.5 percent oxygen.

Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.

Maximum use concentrations will be less than 1,000 ppm organic vapors where that concentration produces atmospheres immediately dangerous to life or health. Not approved for fumigantes.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.

Follow the manufacturer's instructions for changing cartridges.

Refer to pesticides label for limitations on respirator use.

This respirator shall be selected, fitted, used and maintained in accordance with the Mine Safety and Health Administration, Occupational Safety and Health Administration and other applicable regulations.

MSHA—NIOSH APPROVAL NO. TC-23C-418
ISSUED TO
AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.
APPROVAL DATE: 5/19/87

The approved full facepiece mask assembly consists of the following American Optical parts: 50349 or 50358 basic respirator assembly, R53HE (TC-23C-417) Cartridges and 51533 Lens Cover (Optional) and 51508 Spectacle Kit (Optional).

MODEL 7683

PERMISSIBLE

CHEMICAL-CARTRIDGE RESPIRATOR
FOR
ORGANIC VAPORS, CHLORINE, HYDROGEN CHLORIDE, SULFUR DIOXIDE, FORMALDEHYDE, DUSTS, FUMES, MISTS, RADIONUCLIDES AND RADON DAUGHTERS

United States Department of Labor
MSHA
Mine Safety and Health Administration

U. S. Department of Health and Human Services
Centers for Disease Control
NIOSH
National Institute
for Occupational Safety and Health

MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

APPROVAL NO. TC-23C-212

ISSUED TO

NORTH SAFETY EQUIPMENT

Cranston, Rhode Island, U.S.A.

LIMITATIONS

Approved for respiratory protection against not more than 1,000 parts per million organic vapors by volume, 10 parts per million chlorine, 50 parts per million hydrogen chloride, 50 parts per million sulfur dioxide or 10 parts per million formaldehyde, dusts, fumes and mists having a time-weighted average less than 0.05 milligram per cubic meter, and asbestos-containing dusts and mists, radionuclides and radon daughters attached to these dusts, fumes and mists.
Not for use in atmospheres containing less than 19.5 percent oxygen.
Not for use in atmospheres immediately dangerous to life or health.
Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.
Maximum use concentrations will be lower than 1,000 parts per million organic vapors where that concentration produces atmospheres immediately dangerous to life or health.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.
Follow manufacturer's instructions for changing cartridges.
This respirator shall be selected, fitted, used, and maintained in accordance with Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

MSHA-NIOSH APPROVAL TC-23C-212
Issued to North Safety Equipment
March 29, 1988

THE APPROVED ASSEMBLY CONSISTS OF THE FOLLOWING NORTH PARTS:
7600-8A facepiece assembly and N7500-83 or (TC-23C-210) cartridges.

MODEL 7683

PERMISSIBLE

CHEMICAL-CARTRIDGE RESPIRATOR

FOR

ORGANIC VAPORS, CHLORINE, HYDROGEN CHLORIDE, SULFUR DIOXIDE, FORMALDEHYDE, DUSTS, FUMES, MISTS, RADIONUCLIDES AND RADON DAUGHTERS

United States Department of Labor
MSHA
Mine Safety and Health Administration

U. S. Department of Health and Human Services
Centers for Disease Control
NIOSH
National Institute
for Occupational Safety and Health

MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL
SAFETY AND HEALTH

APPROVAL NO. TC-23C-212

ISSUED TO

NORTH SAFETY EQUIPMENT

Cranston, Rhode Island, U.S.A.

LIMITATIONS

Approved for respiratory protection against not more than 1,000 parts per million organic vapors by volume, 10 parts per million chlorine, 50 parts per million hydrogen chloride, 50 parts per million sulfur dioxide or 10 parts per million formaldehyde, dusts, fumes and mists having a time-weighted average less than 0.05 milligram per cubic meter, and asbestos-containing dusts and mists, radionuclides and radon daughters attached to these dusts, fumes and mists.
Not for use in atmospheres containing less than 19.5 percent oxygen.
Not for use in atmospheres immediately dangerous to life or health.
Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.
Maximum use concentrations will be lower than 1,000 parts per million organic vapors where that concentration produces atmospheres immediately dangerous to life or health.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.
Follow manufacturer's instructions for changing cartridges.
This respirator shall be selected, fitted, used, and maintained in accordance with Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

MSHA-NIOSH APPROVAL TC-23C-212
Issued to North Safety Equipment
March 29, 1988

THE APPROVED ASSEMBLY CONSISTS OF THE FOLLOWING NORTH PARTS:
7600-8A facepiece assembly and N7500-83 or (TC-23C-210) cartridges.

MODEL 7683

PERMISSIBLE

CHEMICAL-CARTRIDGE RESPIRATOR FOR ORGANIC VAPORS, CHLORINE, HYDROGEN CHLORIDE, SULFUR DIOXIDE, FORMALDEHYDE, DUSTS, FUMES, MISTS, RADIONUCLIDES AND RADON DAUGHTERS

United States Department of Labor
MSHA
Mine Safety and Health Administration

U. S. Department of Health and Human Services
Centers for Disease Control
NIOSH
National Institute
for Occupational Safety and Health

MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL
SAFETY AND HEALTH

APPROVAL NO. TC-23C-212

ISSUED TO

NORTH SAFETY EQUIPMENT

Cranston, Rhode Island, U.S.A.

LIMITATIONS

Approved for respiratory protection against not more than 1,000 parts per million organic vapors by volume, 10 parts per million chlorine, 50 parts per million hydrogen chloride, 50 parts per million sulfur dioxide or 10 parts per million formaldehyde, dusts, fumes and mists having a time-weighted average less than 0.05 milligram per cubic meter, and asbestos-containing dusts and mists, radionuclides and radon daughters attached to these dusts, fumes and mists.
Not for use in atmospheres containing less than 19.5 percent oxygen.
Not for use in atmospheres immediately dangerous to life or health.
Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.
Maximum use concentrations will be lower than 1,000 parts per million organic vapors where that concentration produces atmospheres immediately dangerous to life or health.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.
Follow manufacturer's instructions for changing cartridges.
This respirator shall be selected, fitted, used, and maintained in accordance with Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

MSHA-NIOSH APPROVAL TC-23C-212
Issued to North Safety Equipment
March 29, 1988

THE APPROVED ASSEMBLY CONSISTS OF THE FOLLOWING NORTH PARTS:
7600-8A faceplece assembly and N7500-83 or (TC-23C-210) cartridges.

MODEL 7683

PERMISSIBLE

CHEMICAL-CARTRIDGE RESPIRATOR
FOR
ORGANIC VAPORS, CHLORINE, HYDROGEN CHLORIDE, SULFUR DIOXIDE, FORMALDEHYDE, DUSTS, FUMES, MISTS, RADIONUCLIDES AND RADON DAUGHTERS

United States Department of Labor
MSHA
Mine Safety and Health Administration

U. S. Department of Health and Human Services
Centers for Disease Control
NIOSH
National Institute
for Occupational Safety and Health

MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL
SAFETY AND HEALTH

APPROVAL NO. TC-23C-212

ISSUED TO

NORTH SAFETY EQUIPMENT

Cranston, Rhode Island, U.S.A.

LIMITATIONS

Approved for respiratory protection against not more than 1,000 parts per million organic vapors by volume, 10 parts per million chlorine, 50 parts per million hydrogen chloride, 50 parts per million sulfur dioxide or 10 parts per million formaldehyde, dusts, fumes and mists having a time-weighted average less than 0.05 milligram per cubic meter, and asbestos-containing dusts and mists, radionuclides and radon daughters attached to these dusts, fumes and mists.

Not for use in atmospheres containing less than 19.5 percent oxygen.

Not for use in atmospheres immediately dangerous to life or health.

Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.

Maximum use concentrations will be lower than 1,000 parts per million organic vapors where that concentration produces atmospheres immediately dangerous to life or health.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.

Follow manufacturer's instructions for changing cartridges.

This respirator shall be selected, fitted, used, and maintained in accordance with Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

MSHA-NIOSH APPROVAL TC-23C-212
Issued to North Safety Equipment
March 29, 1988

THE APPROVED ASSEMBLY CONSISTS OF THE FOLLOWING NORTH PARTS:
7600-8A facepiece assembly and N7500-83 or (TC-23C-210) cartridges.

NIOSH Approval Label
For Full Facepiece Respirator Using R53HE Combination Filter Cartridges (R7753HE, S7753HE)

Permissible

FULL FACEPIECE CHEMICAL CARTRIDGE RESPIRATOR FOR ORGANIC VAPORS, CHLORINE, HYDROGEN CHLORIDE, SULFUR DIOXIDE, CHLORINE DIOXIDE, DUST, FUMES, MISTS, ASBESTOS-CONTAINING DUSTS AND MISTS, RADON DAUGHTERS, RADIONUCLIDES AND PESTICIDES

MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH

United States Department of Labor MSHA Mine Safety and Health Administration

APPROVAL NO. TC-23C-418

U S Department of Health, Education, and Welfare Center for Disease Control NIOSH National Institute for Occupational Safety and Health

ISSUED TO
AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.

LIMITATIONS

Approved for respiratory protection against (1) not more than 1,000 ppm organic vapors by volume, (2) not more than 10 ppm chlorine, 50 ppm hydrogen chloride, 50 ppm sulfur dioxide, (3) dusts and mists having a time weighted average less than 0.05 milligrams per cubic meter or 2 million particles per cubic foot, (4) asbestos-containing dusts and mists, (5) radon daughters attached to these dusts, fumes and mists, (6) radionuclides, (7) not more than 1 ppm chlorine dioxide and (8) pesticides.

Not for use in atmospheres immediately dangerous to life or health.

Not for use in atmospheres containing less than 19.5 percent oxygen.

Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.

Maximum use concentrations will be less than 1,000 ppm organic vapors where that concentration produces atmospheres immediately dangerous to life or health. Not approved for fumigantes.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.

Follow the manufacturer's instructions for changing cartridges.

Refer to pesticides label for limitations on respirator use.

This respirator shall be selected, fitted, used and maintained in accordance with the Mine Safety and Health Administration, Occupational Safety and Health Administration and other applicable regulations.

MSHA—NIOSH APPROVAL NO. TC-23C-418
ISSUED TO
AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS, U.S.A.
APPROVAL DATE: 5/19/87

The approved full facepiece mask assembly consists of the following American Optical parts: 50349 or 50358 basic respirator assembly, R53HE (TC-23C-417) Cartridges and 51533 Lens Cover (Optional) and 51508 Spectacle Kit (Optional).

MODEL 7683

PERMISSIBLE

CHEMICAL-CARTRIDGE RESPIRATOR FOR ORGANIC VAPORS, CHLORINE, HYDROGEN CHLORIDE, SULFUR DIOXIDE, FORMALDEHYDE, DUSTS, FUMES, MISTS, RADIONUCLIDES AND RADON DAUGHTERS

United States Department of Labor
MSHA
Mine Safety and Health Administration

U. S. Department of Health and Human Services
Centers for Disease Control
NIOSH
National Institute for Occupational Safety and Health

MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

APPROVAL NO. TC-23C-212

ISSUED TO

NORTH SAFETY EQUIPMENT

Cranston, Rhode Island, U.S.A.

LIMITATIONS

Approved for respiratory protection against not more than 1,000 parts per million organic vapors by volume, 10 parts per million chlorine, 50 parts per million hydrogen chloride, 50 parts per million sulfur dioxide or 10 parts per million formaldehyde, dusts, fumes and mists having a time-weighted average less than 0.05 milligram per cubic meter, and asbestos containing dusts and mists, radionuclides and radon daughters attached to these dusts, fumes and mists.
Not for use in atmospheres containing less than 19.5 percent oxygen.
Not for use in atmospheres immediately dangerous to life or health.
Do not wear for protection against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.
Maximum use concentrations will be lower than 1,000 parts per million organic vapors where that concentration produces atmospheres immediately dangerous to life or health.

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained.
Follow manufacturer's instructions for changing cartridges.
This respirator shall be selected, fitted, used, and maintained in accordance with Mine Safety and Health Administration, Occupational Safety and Health Administration, and other applicable regulations.

MSHA-NIOSH APPROVAL TC-23C-212
Issued to North Safety Equipment
March 29, 1988

THE APPROVED ASSEMBLY CONSISTS OF THE FOLLOWING NORTH PARTS:
7600-8A facepiece assembly and N7500-83 or (TC-23C-210) cartridges.

APPENDIX C

OSHA PELs AND NIOSH RELs

TABLE C-1 (Page 1 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m^3 [b]	SKIN DESIGNATION
Acetaldehyde	75-07-0	200	360	-
Acetic acid	64-19-7	10	25	-
Acetic anhydride	108-24-7	5	20	-
Acetone	67-64-1	1000	2400	-
Acetonitrile	75-05-8	40	70	-
2-Acetylaminofluorine; see 1910.1014	53-96-3			
Acetylene dichloride; see 1,2-Dichloroethylene				
Acetylene tetrabromide	79-27-6	1	14	-
Acrolein	107-02-8	0.1	0.25	-
Acrylamide	79-06-1	-	0.3	X
Acrylic acid	79-10-7	10	30	X
Acrylonitrile; see 1910.1045	107-13-1			
Aldrin	309-00-2	-	0.25	X
Allyl alcohol	107-18-6	2	5	X
Allyl chloride	107-05-1	1	3	-
Allylglycidyl ether (AGE)	106-92-3	C 10	C 45	-
Allyl propyl disulfide	2179-59-1	2	12	-
alpha-Alumina:	1344-28-1			
Total dust		-	15	-
Respirable fraction		-	5	-
Aluminum (as Al):	7429-90-5			
Metal:				
Total dust		-	15	-
Respirable fraction		-	5	-
2-Aminodiphenyl; see 1910.1011	92-67-1			
2-Aminoethanol; see Ethanolamine				
2-Aminopyridine	504-29-0	0.5	2	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 2 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m³ [b]	SKIN DESIGNATION
Ammonia	7664-41-7	50	35	-
Ammonium chloride fume	12125-02-9	-	10	-
Ammonia sulfamate:	7773-06-0			
Total dust		-	15	-
Respirable fraction		-	5	-
n-Amyl acetate	628-63-7	100	525	-
sec-Amyl acetate	626-38-0	125	650	-
Aniline and homologs	62-53-3	2	19	X
Anisidine (o,p-isomers) - skin	29191-52-4	-	0.5	X
Antimony and compounds (as Sb)	7440-36-0	-	0.5	-
Alpha naphthyl thiourea (ANTU)	86-88-4	-	0.3	-
Arsenic organic compounds (as As)	7440-38-2	-	0.5	-
Arsenic, inorganic compounds (as As); see 1910.1018	7440-38-2	-	-	-
Arsine	7784-42-1	0.05	0.2	-
Asbestos; see 1910.1001	Varies			
Azinphos-methyl	86-50-0	-	0.2	X
Barium (soluble compounds) (as Ba)	7440-39-3	-	0.5	-
Barium sulfate:	7727-43-7			
Total dust		-	15	-
Respirable fraction		-	5	-
Benomyl:	17804-35-2			
Total dust		-	15	-
Respirable fraction		-	5	-
Benzene; see 1910.1028	71-43-2	See Table B-2 for the limits applicable in the operations or sectors excluded in 1910.1028[c]		
Benzidine; see 1910.1010	92-87-5			
p-Benzoquinone; see Quinone				
Benzo(a)pyrene; see coal tar pitch volatiles				

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 3 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m³ [b]	SKIN DESIGNATION
Benzoyl peroxide	94-36-0	-	5	-
Benzyl chloride	100-44-7	1	5	-
Beryllium and beryllium compounds (as Be)	7440-41-7		d	-
Biphenyl; see Diphenyl				
Bismuth telluride, undoped:	1304-82-1			
Total dust		-	15	-
Respirable fraction		-	5	-
Boron oxide:	1303-86-2			
Total dust		-	15	-
Boron trifluoride	7637-07-2	C 1	C 3	-
Bromine	7726-95-6	0.1	0.7	-
Bromoform	75-25-2	0.5	5	X
Butadiene (1,3-butadiene)	106-99-0	1000	2200	
Butanethiol; see Butyl mercaptan				
2-Butanone (methyl ethyl ketone)	79-93-3	200	590	-
2-Butoxyethanol	111-76-2	50	240	-
n-Butyl acetate	123-86-4	150	710	-
sec-Butyl acetate	105-46-4	200	950	-
tert-Butyl acetate	540-88-5	200	950	-
n-Butyl alcohol	71-36-3	100	300	X
sec-Butyl alcohol	78-92-2	150	450	-
tert-Butyl alcohol	75-65-0	100	300	-
Butylamine	109-73-9	C 5	C 15	X
tert-Butyl chromate (as CrO3)	1189-85-1	-	C 0.1	X
n-Butyl glycidyl ether (BGE)	2426-08-6	50	270	-
Butyl mercaptan	109-79-5	10	35	-
p-tert-Butyltoluene	98-51-1	10	60	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 4 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m³ [b]	SKIN DESIGNATION
Cadmium (as Cd); see 1910.1027	7440-43-9			
Calcium carbonate:	1317-65-3			
Total dust		-	15	-
Respirable fraction		-	5	-
Calcium hydroxide:	1305-62-0			-
Total dust		-	15	
Respirable fracrion		-	5	
Calcium oxide	1305-78-8	-	5	-
Calcium silicate:	1344-95-2			
Total dust		-	15	-
Respirable fraction		-	5	-
Calcium sulfate:	7778-18-9			
Total dust		-	15	-
Respirable fraction		-	5	-
Camphor, synthetic	76-22-2	-	2	-
Carbaryl (Sevin[R])	63-25-2	-	5	-
Carbon black	1333-86-4	-	3.5	-
Carbon dioxide	124-38-9	5000	9000	-
Carbon disulfide	75-15-0	-	d	X
Carbon monoxide	630-08-0	50	55	-
Carbon tetrachloride	56-23-5	-	d	-
Cellulose:	9004-34-6			
Total dust		-	15	-
Respirable fraction		-	5	-
Chlordane	57-74-9	-	0.5	X
Chlorinated camphene	8001-35-2	-	0.5	X
Chlorinated diphenyl oxide	55720-99-5	-	0.5	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 5 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm[a]	mg/m[3 b]	
Chlorine	7782-50-5	C 1	C 3	-
Chlorine dioxide	10049-04-4	0.1	0.3	-
Chlorine trifluoride	7790-91-2	C 0.1	C 0.4	-
Chloroacetaldehyde	107-20-0	C 1	C 3	-
a-Chloroacetophenone (phenacyl chloride)	532-27-4	0.05	0.3	-
Chlorobenzene	108-90-7	75	350	-
o-Chlorobenzylidene malononitrile	2698-41-1	0.05	0.4	X
Chlorobromomethane	74-97-5	200	1050	-
2-Chloro-1,3-butadiene; see b-Chloroprene				
Chlorodifluoromethane	75-45-6	1000	3500	-
Chlorodiphenyl (42% Chlorine) (PCB)	53469-21-9	-	1	X
Chlorodiphenyl (54% Chlorine) (PCB)	11097-69-1	-	0.5	X
1-Chloro, 2,3-epoxypropane; see Epichlorohydrin				
2-Chloroethanol; see Ethylene chlorohydrin				
Chloroethylene; see Vinyl chloride				
Chloroform (Trichloromethane)	67-66-3	C 50	C 240	-
bis(Chloromethyl)ether; see 1910.1008	542-88-1			
Chloromethyl methyl ether; see 1910.1006	107-30-2			
1-Chloro-1-nitropropane	600-25-9	20	100	-
Chloropicrin	76-06-2	0.1	0.7	-
beta-Chloroprene	126-99-8	25	90	X
o-Chlorostyrene	2039-87-4	50	285	-
o-Chlorotoluene	95-49-8	50	250	-
2-Chloro-6-trichloromethyl pyridine:	1929-82-4			
Total dust		-	15	-
Respirable fraction		-	5	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 6 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m³ [b]	SKIN DESIGNATION
Chromic acid and chromates (as $CroO_3$)	Varies with compound	-	d	
Chromium (II) compounds (as Cr)	7440-47-3	-	0.5	-
Chromium (III) compounds (as Cr)	7440-47-3	-	0.5	-
Chromium metal and insoluble salts (as Cr)	7440-47-3	-	1	-
Chrysene; see Coal tar pitch volatiles	218-01-9			
Clopidol:	2971-90-6			
Total dust		-	15	-
Respirable fraction		-	5	-
Coal dust (less than 5% SiO_2), respirable quartz fraction		-	e	-
Coal dust (greater than or equal to 5% SiO_2), respirable quartz fraction		-	e	-
Coal tar pitch volatiles (benzene soluble fraction), anthracene, BaP, phenanthrene, acridine, chrysene, pyrene	65966-93-2	-	0.2	-
Cobalt metal, dust, and fume (as Co)	7440-48-4	-	0.1	-
Coke oven emissions; see 1910.1043	--			
Copper:	7440-50-8			
Fume (as Cu)		-	0.1	-
Dusts and mists (as Cu)		-	1	-
Cotton dust; see 1910.1043	--			-
Crag herbicide (Sesone):	136-78-7			
Total dust		-	15	-
Respirable fraction		-	5	-
Cresol, all isomers	1319-77-3	5	22	X
Crotonaldehyde	123-73-9; 4170-30-3	2	6	-
Cumene	98-82-8	50	245	X
Cyanides (as CN)	Varies with compound	-	5	-
Cyclohexane	110-82-7	300	1050	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 7 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m³ [b]	SKIN DESIGNATION
Cyclohexanol	108-93-0	50	200	X
Cyclohexanone	108-94-1	50	200	X
Cyclohexene	110-83-8	300	1015	-
Cyclopentadiene	542-92-7	75	200	-
2,4-D(Dichlorylphenoxy-acetic acid)	94-75-7	-	10	-
Decaborane	17702-41-9	0.05	0.3	X
Demeton (Systox[R])	8065-48-3	-	0.1	X
Diacetone alcohol (4-Hydroxy-4-methyl-2-pentanone)	123-42-2	50	240	-
1,2-Diaminoethane; see Ethylenediamine				
Diazinon	333-41-5	-	0.1	X
Diazomethane	334-88-3	0.2	0.4	-
Diborane	19287-45-7	0.1	0.1	-
1,2-Dibromo-3-chloropropane; see 1910.1044	96-12-8			
1,2-dibromoethane; see Ethylene dibromide				
Dibutyl phosphate	107-66-4	1	5	-
Dibutyl phthalate	84-74-2	-	5	-
o-Dichlorobenzene	95-50-1	C 50	C 200	-
p-Dichlorobenzene	106-46-7	75	450	-
3,3'-Dichlorobenzidine; see 1910.1007	91-94-1			
Dichlorodifluoromethane	75-71-8	1000	4950	-
1,3-Dichloro-5,5-dimethyl hydantoin	118-52-5	-	0.2	-
1,1-Dichloroethane	75-34-3	100	400	-
1,2-Dichloroethane; see Ethylene dichloride				
1,2-Dichloroethylene	540-59-0	200	790	-
Dichloroethyl ether	111-44-4	C 15	C 90	X
Dichloromethane; see Methylene chloride				
Dichloromonofluoromethane	75-43-4	1000	4200	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 8 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m^3 [b]	SKIN DESIGNATION
1,1-Dichloro-1-nitroethane	594-72-9	C 10	C 60	-
1,2-Dichloropropane; see Propylene dichloride				
Dichlorotetrafluoroethane	76-14-2	1000	7000	-
Dicrotophos (DDUP)	141-66-2	-	1	X
Dicyclopentadienyl iron:	102-54-5			
Total dust		-	15	-
Respirable fraction		-	5	-
Dieldrin	60-57-1	-	0.25	X
Diethylamine	109-89-7	25	75	-
2-Diethylaninoethanol	100-37-8	10	50	X
Diethyl ether; see Ethyl ether				
Difluorodibromomethane	75-61-6	100	860	-
Diglycidyl ether (DGE)	2238-07-5	C 0.5	C 2.8	-
Dihydroxybenzene; see Hydroquinone				
Diisobutyl ketone	108-83-8	50	290	-
Diisopropylamine	108-18-9	5	20	X
4-Dimethylaminoazobenzene; see 1910.1015	60-11-7			
Dimethoxymethane; see Methylal				
Dimethyl acetamide	127-19-5	10	35	X
Dimethylamine	124-40-3	10	18	-
Dimethylaminobenzene; see Xylidene				
Dimethylaniline (N,N-Dimethyl aniline)	121-69-7	5	25	X
Dimethylbenzene; see Xylene				
Dimethyl-1,2-dibromo-2,2-dichloroethyl phosphate	300-76-5	-	3	X
Dimethylformamide	68-12-2	10	30	X
2,6-Dimethyl-4-beptanone; see Diisobutyl ketone				
1,1-Dimethylhydrazine	57-14-7	0.5	1	X

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 9 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m³ [b]	SKIN DESIGNATION
Dimethylphthalate	131-11-3	-	5	-
Dimethyl sulfate	77-78-1	1	5	X
Dinitrobenzene (all isomers)	528-29-0 99-65-0 100-25-4	-	1	X
Dinitro-o-cresol	534-52-1	-	0.2	X
Dinitrotoluene	121-14-2	-	1.5	X
Dioxane (Diethylene dioxide)	123-91-1	100	360	X
Diphenyl (Biphenyl)	92-52-4	0.2	1	-
Diphenylmethane diisocyanate; see Methylene bisphenyl isocyanate				
Dipropylene glycol methyl ether	34590-94-8	100	600	X
Di-sec octyl phthalate (Di-2-[ethylhexyl]phthalate)	117-81-7	-	5	-
Emery:	112-62-9			
Total dust		-	15	-
Respirable fraction		-	5	-
Endosulfan	115-29-7	-	0.1	X
Endrin	72-20-8	-	0.1	X
Epichlorohydrin	106-89-8	5	19	X
EPN	2104-64-5	-	0.5	X
1,2-Epoxypropane; see Propyleneoxide				
2,3-Epoxy-1-propanol; see Glycidol				
Ethanethiol; see Ethylmercaptan				
Ethanolamine	141-43-5	3	8	-
Ethion	563-12-2	-	0.4	X
2-Ethoxyethanol	110-80-5	200	740	X
2-Ethoxyethyl acetate (Cellosolve acetate)	111-15-9	100	540	X
Ethyl acetate	141-78-6	400	1400	-
Ethyl acrylate	140-88-5	25	100	X
Ethyl alcohol (Ethanol)	64-17-5	1000	1900	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 10 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m³ [b]	SKIN DESIGNATION
Ethylamine	75-04-7	10	18	-
Ethyl amyl ketone (5-methyl-3-heptanone)	106-68-3	25	130	-
Ethyl benzene	100-41-4	100	435	-
Ethyl bromide	74-96-4	200	890	-
Ethyl butyl ketone (3-Heptanone)	106-35-4	50	230	-
Ethyl chloride	75-00-3	1000	2600	-
Ethyl ether	60-29-7	400	1200	-
Ethyl formate	109-94-4	100	300	-
Ethyl mercaptan	75-08-1	C 10	C 25	-
Ethyl silicate	78-10-4	100	850	-
Ethylene chlorohydrin	107-07-3	5	16	X
Ethylenediamine	107-15-3	10	25	-
Ethylene dibromide	106-93-4		d	
Ethylene dichloride	107-06-2		d	-
Ethylene glycol dinitrate	628-96-6	C 0.2	C 1	X
Ethylene glycol methyl acetate; see Methyl cellosolve acetate				
Ethyleneimine; see 1910.1012	151-56-4			
Ethylene oxide; see 1910.1047	75-21-8			
Ethylidine chloride; see 1,1-Dichloroethane				
N-ethylmorpholine	100-74-3	20	94	X
Ferbam:	14484-64-1			
Total dust		-	15	-
Ferrovanadium dust	12604-58-9	-	1	-
Fluorides (as F)	Varies with compound	-	2.5	-
Fluorine	7782-41-4	0.1	0.2	-
Fluorotrichloromethane (Trichlorofluoromethane)	75-69-4	1000	5800	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 11 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m^3 [b]	SKIN DESIGNATION
Formaldehyde; see 1910.1048	50-00-0			
Formic acid	64-18-6	5	9	-
Furfural	98-01-1	5	20	X
Furfuryl alcohol	98-00-0	50	200	X
Glycerin (mist):	56-81-5			
Total dust		-	15	-
Respirable fraction		-	5	-
Glycidol	556-52-5	50	150	-
Glycol monoethyl ether; see 2-Ethoxyethanol				
Grain dust (oat, wheat, barley)	-	-	10	-
Graphite, natural respirable dust	7782-42-5	-	e	-
Graphite, synthetic:	-			
Total dust		-	15	-
Respirable fraction		-	5	-
Guthion[R]; see Azinphos methyl				
Gypsum:	7778-18-9			
Total dust		-	15	-
Respirable fraction		-	5	-
Hafnium	7440-58-6	-	0.5	-
Heptachlor	76-44-8	-	0.5	X
Heptane (n-heptane)	142-82-5	500	2000	-
Hexachloroethane	67-72-1	1	10	X
Hexachloronaphthalene	13335-87-1	-	0.2	X
n-Hexane	110-54-3	500	1800	-
2-Hexanone (methyl n-butyl ketone)	591-78-6	100	410	-
Hexone (methyl isobutyl ketone)	108-10-1	100	410	-
sec-Hexyl acetate	108-84-9	50	300	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 12 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m[3] [b]	SKIN DESIGNATION
Hydrazine	302-01-2	1	1.3	X
Hydrogen bromide	10035-10-6	3	10	-
Hydrogen chloride	7647-01-0	C 5	C 7	-
Hydrogen cyanide	74-90-8	10	11	X
Hydrogen fluoride (as F)	7664-39-3	-	d	-
Hydrogen peroxide	7722-84-1	1	1.4	-
Hydrogen selenide (as Se)	7783-07-5	0.05	0.2	-
Hydrogen sulfide	7783-06-4	-	d	-
Hydroquinone	123-31-9	-	2	-
Iodine	7553-56-2	C 0.1	C 1	-
Iron oxide fume	1309-37-1	-	10	
Isoamyl acetate	123-92-2	100	525	-
Isoamyl alcohol (primary and secondary)	123-51-3	100	360	-
Isobutyl acetate	110-19-0	150	700	-
Isobutyl alcohol	78-83-1	100	300	-
Isophorone	78-59-1	25	140	-
Isopropyl acetate	108-21-4	250	950	-
Isopropyl alcohol	67-63-0	400	980	-
Isopropylamine	75-31-0	5	12	-
Isopropyl ether	108-20-3	500	2100	-
Isopropyl glycidyl ether (IGE)	4016-14-2	50	240	-
Kaolin:	-			
Total dust		-	15	-
Respirable fraction		-	5	-
Ketene	463-51-4	0.5	0.9	-
Lead inorganic (as Pb); see 1910.1025	7439-92-1			

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 13 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m³ [b]	SKIN DESIGNATION
Limestone:	1317-67-3			
Total dust		-	15	-
Respirable fraction		-	5	-
Lindane	58-89-9	-	0.5	X
Lithium hydride	7580-67-8	-	0.025	-
Liquified petroleum gas (LPG)	68476-85-7	1000	1800	-
Magnesite:	546-93-0			
Total dust		-	15	-
Respirable fraction		-	5	-
Magnesium oxide fume:	1309-48-4			
Total particulate		-	15	-
Malathion:	121-75-5	-	-	
Total dust		-	15	X
Maleic anhydride	108-31-6	0.25	1	-
Manganese compounds (as Mn)	7439-96-5	-	C 5	-
Manganese fume (as Mn)	7439-96-5		C 5	-
Marble:	1317-65-3			
Total dust		-	15	-
Respirable fraction		-	5	-
Mercury (aryl and inorganic) (as Hg)	7439-97-6	-	d	X
Mercury (organo) alkyl compounds (as Hg)	7439-97-6	-	d	X
Mercury (vapor) (as Hg)	7439-97-6	-	d	X
Mesityl oxide	141-79-7	25	100	-
Methanethiol; see Methyl mercaptan				
Methomyl (Lannate)	16752-77-5	-	2.5	-
Methoxychlor:	72-43-5			
Total dust		-	15	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 14 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m³ [b]	SKIN DESIGNATION
2-Methoxyethanol; Methyl cellosolve	109-86-4	25	80	
2-Methoxyethyl acetate (methyl cellosolve acetate)	110-49-6	25	120	
4-Methoxyphenol	150-76-5	-	5	-
Methyl acetate	79-20-9	200	610	-
Methyl acetylene (propyne)	74-99-7	1000	1650	-
Methyl acetylene-propadiene mixture (MAPP)		1000	1800	-
Methyl acrylate	96-33-3	10	35	X
Methylal (dimethoxymethane)	109-87-5	1000	3100	-
Methyl alcohol	67-56-1	200	260	X
Methylamine	74-89-5	10	12	-
Methyl amyl alcohol; see Methyl isobutyl carbinol				
Methyl (n-amyl) ketone	110-43-0	100	465	-
Methyl bromide	74-83-9	C 20	C 60	X
Methyl butyl ketone; see 2-Hexanone				
Methyl chloride	74-87-3	-	d	-
Methyl chloroform (1,1,1-trichloroethane)	71-55-6	350	1900	-
Methylcyclohexane	108-87-2	500	2000	-
Methylcyclohexanol	25639-42-3	100	470	-
o-Methylcyclohexanone	583-60-8	100	460	X
Methylene chloride	75-09-2	-	d	
Methyl ethyl ketone (MEK); see 2-Butanone				
Methyl formate	107-31-3	100	250	-
Methyl hydrazine (monomethyl hydrazine)	60-34-4	C 0.2	C 0.35	X
Methyl iodide	74-88-4	5	26	X
Methyl isoamyl ketone	110-12-3	100	475	-
Methyl isobutyl carbinol	108-11-2	25	100	X

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 15 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m³ [b]	SKIN DESIGNATION
Methyl isobutyl ketone; see Hexone				
Methyl isocyanate	624-83-9	0.02	0.05	X
Methyl mercaptan	74-93-1	C 10	C 20	-
Methyl methacrylate	80-62-6	100	410	-
Methyl propyl ketone; see 2-Pentanone				
alpha-Methyl styrene	98-83-9	C 100	C 480	-
Methylene bisphenyl isocyanate (MBI)	101-68-8	C 0.02	C 0.2	-
Mica; see Silicates				
Molybdenum (as Mo):	7439-98-7			
Soluble compounds		-	5	-
Insoluble compounds:				
Total dust		-	15	-
Monomethyl aniline	100-61-8	2	9	X
Morpholine	110-91-8	20	70	X
Naphtha (coal tar)	8030-30-6	100	400	-
Naphthalene	91-20-3	10	50	-
alpha-Naphthylamine; see 1910.1004	134-32-7			
beta-Naphthylamine; see 1910.1009	91-59-8			
Nickel carbonyl (as Ni)	13463-39-3	0.001	0.007	-
Nickel, metal, and insoluble compounds (as Ni)	7440-02-0	-	1	-
Nickel, soluble compounds (as Ni)	7440-02-0	-	1	-
Nicotine	54-11-5	-	0.5	X
Nitric acid	7697-37-2	2	5	-
Nitric oxide	10102-43-9	25	30	-
p-Nitroaniline	100-01-6	1	6	X
Nitrobenzene	98-95-3	1	5	X
p-Nitrochlorobenzene	100-00-5	-	1	X

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 16 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m³ [b]	SKIN DESIGNATION
4-Nitrodiphenyl; see 1910.1003	92-93-3			
Nitroethane	79-24-3	100	310	-
Nitrogen dioxide	10102-44-0	C 5	C 9	-
Nitrogen trifluoride	7783-54-2	10	29	-
Nitroglycerin	55-63-0	C 0.2	C 2	X
Nitromethane	75-52-5	100	250	-
1-Nitropropane	108-03-2	25	90	-
2-Nitropropane	79-46-9	25	90	-
N-Nitrosodimethylamine; see 1910.1016	63-5-6			
Nitrotoluene (all isomers):		5	30	
o-Isomer	88-72-2;			
m-Isomer	99-08-1;			X
p-Isomer	99-99-0			
Nitrotrichloromethane; see Chloropicrin				
Octachloronaphthalene	2234-13-1	-	0.1	X
Octane	111-65-9	300	1450	-
Oil mist, mineral	8012-95-1	-	5	-
Osmium tetroxide (as Os)	20816-12-0	-	0.002	-
Oxalic acid	144-62-7	-	1	-
Oxygen difluoride	7783-41-7	0.05	0.1	-
Ozone	10028-15-6	0.1	0.2	-
Paraffin wax fume	8002-74-2	-	2	-
Paraquat, respirable dust	4685-14-7	-	0.5	X
	1910-42-5			
	2074-50-2			
Parathion	56-38-2	-	0.1	X
Particulates not otherwise regulated (PNOR):	-			
Total dust	-	-	15	-
Respirable fraction	-	-	5	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 17 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m[3] [b]	SKIN DESIGNATION
PCB; see chlorodiphenyl (42% and 54% chlorine)				
Pentaborane	19624-22-7	0.005	0.01	-
Pentachloronaphthalene	1321-64-8	-	0.5	X
Pentachlorophenol	87-86-5	-	0.5	X
Pentaerythritol:	115-77-5			
Total dust		-	15	-
Respirable fraction		-	5	-
Pentane	109-66-0	1000	2950	-
2-Pentanone (methyl propyl ketone)	107-87-9	200	700	-
Perchloroethylene (tetrachloroethylene)	127-18-4	-	d	-
Perchloromethyl mercaptan	594-42-3	0.1	0.8	-
Perchloryl fluoride	7616-94-6	3	13.5	-
Perlite:	-			-
Total dust		-	15	-
Respirable fraction		-	5	-
Petroleum distillates (naphtha) (rubber solvent)	8002-05-9	500	2000	X
Phenol	108-95-2	5	19	X
p-Phenylene diamine	106-50-3	-	0.1	-
Phenyl ether, vapor	101-84-8	1	7	-
Phenyl ether-biphenyl mixture, vapor	-	1	7	-
Phenylethylene; see Styrene				
Phenyl glycidyl ether (PGE)	122-60-1	10	60	-
Phenylhydrazine	100-63-0	5	22	X
Phosdrin (Mevinphos[R])	7786-34-7	-	0.1	X
Phosgene (carbonyl chloride)	74-44-5	0.1	0.4	-
Phosphine	7803-51-2	0.3	0.4	-
Phosphoric acid	7664-38-2	-	1	-
Phosphorus (yellow)	7723-14-0	-	0.1	-
Phosphorus pentachloride	10026-13-8	-	1	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 18 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m^3 [b]	SKIN DESIGNATION
Phosphorus pentasulfide	1314-80-3	-	1	-
Phosphorus trichloride	7719-12-2	0.5	3	-
Phthalic anhydride	85-44-9	2	12	-
Picloram:	1918-02-1			
Total dust		-	15	-
Respirable fraction		-	5	-
Picric acid	88-89-1	-	0.1	X
Pindone (2-pivalyl-1,3-indandione)	83-26-1	-	0.1	-
Plaster of paris:	7778-18-9			
Total dust		-	15	-
Respirable fraction		-	5	-
Platinum (as Pt):	7440-06-4			
Metal		-	-	-
Soluble salts		-	0.002	-
Portland cement:	65997-15-1			
Total dust		-	15	-
Respirable fraction		-	5	-
Propane	74-98-6	1000	1800	-
beta-Propriolactone; see 1910.1013	57-57-8			
n-Propyl acetate	109-60-4	200	840	-
n-Propyl alcohol	71-23-8	200	500	-
n-Propyl nitrate	627-13-4	25	110	-
Propylene dichloride	78-87-5	75	350	-
Propylene imine	75-55-8	2	5	X
Propylene oxide	75-56-9	100	240	-
Propyne; see Methylacetylene				
Pyrethrum	8003-34-7	-	5	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 19 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m³ [b]	SKIN DESIGNATION
Pyridine	110-86-1	5	15	-
Quinone	106-51-4	0.1	0.4	-
Rhodium (as Rh), metal fume and insoluble compounds	7440-16-6	-	0.1	-
Rhodium (as Rh), soluble compounds	7440-16-6	-	0.001	-
Ronnel	299-84-3	-	15	-
Rotenone	83-79-4	-	5	-
Rouge:	-			
Total dust		-	15	-
Respirable fraction		-	5	-
Selenium compounds (as Se)	7782-49-2	-	0.2	-
Selenium hexafluoride (as Se)	7783-79-1	0.05	0.4	-
Silica, amorphous, precipitated and gel	-	-	e	-
Silica, amorphous, diatomaceous earth, containing less than 1% crystalline silica	68855-54-9	-	e	-
Silica, crystalline cristobalite, respirable dust	14464-46-1	-	e	-
Silica, crystalline quartz, respirable dust	14808-60-7	-	e	-
Silica, crystalline tripoli, respirable dust	1317-95-9	-	e	-
Silica, crystalline tridymite, respirable dust	15468-32-3	-	e	-
Silica, fused, respirable dust	60676-86-0	-	e	-
Silicates (less than 1% crystalline silica):				
Mica (respirable dust)	12001-26-2	-	e	-
Soapstone, total dust	-	-	e	-
Soapstone, respirable dust	-	-	e	-
Talc (containing asbestos); use asbestos limit; see 29 CFR 1910.1001		-	-	
Talc (containing no asbestos); respirable dust	14807-96-6	-	e	-
Tremolite, asbestiform; see 1910.1001		-	-	
Silicon:	7440-21-3			
Total dust		-	15	-
Respirable fraction		-	5	-

Note: Footnotes appear on page 2.

TABLE C-1 (Page 20 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m^3 [b]	SKIN DESIGNATION
Silicon carbide:	409-21-2			
Total dust		-	15	-
Respirable fraction			5	-
Silver, metal and soluble compounds (as Ag)	7440-22-4	-	0.01	-
Soapstone; see Silicates				
Sodium fluoroacetate	62-74-8	-	0.05	X
Sodium hydroxide	1310-73-2	-	2	-
Starch:	9005-25-8			
Total dust		-	15	-
Respirable fraction		-	5	-
Stibine	7803-52-3	0.1	0.5	-
Stoddard solvent	8052-41-3	500	2900	-
Strychnine	57-24-9	-	0.15	-
Styrene	100-42-5	-	d	-
Sucrose:	57-50-1			
Total dust		-	15	-
Respirable fraction		-	5	-
Sulfur dioxide	7446-09-5	5	13	-
Sulfur hexafluoride	2551-62-4	1000	6000	-
Sulfuric acid	7664-93-9	-	1	-
Sulfur monochloride	10025-67-9	1	6	-
Sulfur pentafluoride	5714-22-7	0.025	0.25	-
Sulfuryl fluoride	2699-79-8	5	20	-
Systox[R]; see Demeton				
2,4,5-T (2,4,5-trichlorophenoxyacetic acid)	93-76-5	-	10	-
Talc; see Silicates				
Tantalum, metal and oxide dust	7440-25-7	-	5	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 21 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm[a]	mg/m^3 [b]	
TEDP (Sulfotep)	3689-24-5	-	0.2	X
Tellurium and compounds (as Te)	13494-80-9	-	0.1	-
Tellurium hexafluoride (as Te)	7783-80-4	0.02	0.2	-
Temephos:	3383-96-8			
Total dust		-	15	-
Respirable fraction		-	5	-
TEPP	107-49-3	-	0.05	X
Terphenyls	26140-60-3	C 1	C 9	-
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	500	4170	-
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	500	4170	-
1,1,2,2-Tetrachloroethane	79-34-5	5	35	X
Tetrachloroethylene; see Perchloroethylene				
Tetrachloromethane; see Carbon tetrachloride				
Tetrachloronaphthalene	1335-88-2	-	2	X
Tetraethyl lead (as Pb)	78-00-2	-	0.075	X
Tetrahydrofuran	109-99-9	200	590	-
Tetramethyl lead (as Pb)	75-74-1	-	0.075	X
Tetramethyl succinonitrile	3333-52-6	0.5	3	X
Tetranitromethane	509-14-8	1	8	-
Tetryl (2,4,6-trinitrophenyl-methyl-nitramine)	479-45-8	-	1.5	X
Thallium, soluble compounds (as Ti)	7440-28-0	-	0.1	X
4,4-Thiobis(6-tert, Butyl-M-cresol):	96-69-5			
Total dust		-	15	-
Respirable fraction		-	5	-
Thiram	137-26-8	-	5	-
Tin, inorganic compounds (except oxides) (as Sn)	7440-31-5	-	2	-
Tin, organic compounds (as Sn)	7440-31-5	-	0.1	X

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 22 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA		SKIN DESIGNATION
		ppm[a]	mg/m^3 [b]	
Titanium dioxide:	13463-67-6			
Total dust		-	15	-
Toluene	108-88-3	-	d	-
Toluene-2,4-diisocyanate (TDI)	584-84-9	C 0.02	C 0.14	-
o-Toluidine	95-53-4	5	22	X
Toxaphene; see Chlorinated camphene				
Tremolite; see Silicates				
Tributyl phosphate	126-73-8	-	5	-
1,1,1-Trichloroethane; see Methyl chloroform				
1,1,2-Trichloroethane	79-00-5	10	45	X
Trichloroethylene	79-01-6	-	d	-
Trichloromethane; see Chloroform				
Trichloronaphthalene	1321-65-9	-	5	X
1,2,3-Trichloropropane	96-18-4	50	300	-
1,1,2-Trichloro 1,2,2-trifluoroethane	76-13-1	1000	7600	-
Triethylamine	121-44-8	25	100	-
Trifluorobromomethane	75-63-8	1000	6100	-
2,4,6-Trinitrophenyl; see Picric acid				
2,4,6-Trinitrophenyl methyl nitramine; see Tetryl				
2,4,6-Trinitrotoluene (TNT)	118-96-7	-	1.5	X
Triorthocresyl phosphate	78-30-8	-	0.1	X
Turpentine	8006-64-2	100	560	-
Uranium (as U):	7440-61-1			
Insoluble compounds		-	0.05	-
Soluble compounds		-	0.05	-
Vanadium:	1314-62-1			
Respirable dust (as V_2O_5)		-	C 0.5	-
Fume (as V_2O_5)		-	C 0.1	-

Note: Footnotes appear on page 23 of this table.

TABLE C-1 (Page 23 of 23)

OSHA PELs

SUBSTANCE	CAS No.	TWA ppm[a]	TWA mg/m³ [b]	SKIN DESIGNATION
Vegetable oil mist:	-			
Total dust		-	15	-
Respirable fraction		-	5	-
Vinyl benzene; see Styrene				
Vinyl bromide	593-60-2	5	20	-
Vinyl chloride; see 1910.1017	75-01-4			
Vinylcyanide; see Acrylonitrile				
Vinyl toluene	25013-15-4	100	480	-
Warfarin	81-81-2	-	0.1	-
Xylenes (o-, m-, p-isomers)	1330-20-7	100	435	-
Xylidine	1300-73-8	5	25	X
Yttrium	7440-65-5	-	1	-
Zinc chloride fume	7646-85-7	-	1	-
Zinc oxide fume	1314-13-2	-	5	-
Zinc oxide:	1314-13-2			
Total dust		-	15	-
Respirable fraction		-	5	-
Zinc stearate:	557-05-1			
Total dust		-	15	-
Respirable fraction		-	5	-
Zirconium compounds (as Zr)	7440-6	-	5	-

Note: The PELs are 8-hr TWAs unless otherwise noted. There are as determined from breathing-zone air samples.

[a] Parts of vapor or gas per million parts of contaminated air by volume at 25°C and 760 torr.
[b] Approximate milligrams of substance per cubic meter of air.
[c] The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except in some circumstances, i.e., the distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures; for the excepted subsegments, the benzene limits in Table 2-2 apply.
[d] See Table B-2.
[e] See Table B-3.

C = Ceiling limit.
X = Exposure possible through cat:

TABLE C-2

OSHA PELs

MATERIAL	8-hr TIME-WEIGHTED AVERAGE	ACCEPTABLE CEILING CONCENTRATION	ACCEPTABLE MAXIMUM PEAK ABOVE THE ACCEPTABLE CEILING CONCENTRATION FOR AN 8-hr SHIFT	
			CONCENTRATION	MAXIMUM DURATION
Benzene (Z37.40-1969)[a]	10 ppm	25 ppm	50 ppm	10 min
Beryllium and beryllium compounds (Z37.29-1970)	2 ug/m^3	5 ug/m^3	25 ug/m^3	30 min
Cadmium fume (Z37.5-1970)[b]	0.1 mg/m^3	0.3 mg/m^3		
Cadmium dust (Z37.5-1970)[b]	0.2 mg/m^3	0.6 mg/m^3		
Carbon disulfide (Z37.3-1968)	20 ppm	30 ppm	100 ppm	30 min
Carbon tetrachloride (Z37.17-1967)	10 ppm	25 ppm	200 ppm	5 min in any 4 hrs
Chromic acid and chromates (Z37.7-1971)		1 mg/10 m^3		
Ethylene dibromide (Z37.31-1970)	20 ppm	30 ppm	50 ppm	5 min
Ethylene dichloride (Z37.21-1969)	50 ppm	100 ppm	200 ppm	5 min in any 3 hrs
Fluoride as dust (Z37.38-1969)	2.5 mg/m^3			
Formaldehyde (Z37.16-1967)	3 ppm	5 ppm	10 ppm	30 min
Hydrogen fluoride (Z37.28-1969)	3 ppm			
Hydrogen sulfide (Z37.2-1966)		20 ppm	50 ppm	10 min onee only if no other measurable exposure occurs
Mercury (Z37.8-1971)		1 mg/10 m^3		
Methyl chloride (Z37.18-1969)	100 ppm	200 ppm	300 ppm	5 min in any 3 hrs
Methylene chloride (Z37.23-1969)	500 ppm	1,000 ppm	2,000 ppm	5 min in any 2 hrs
Organo (alkyl) mercury (Z37.30-1969)	0.01 mg/m^3	0.04 mg/m^3		
Styrene (Z37.15-1969)	100 ppm	200 ppm	600 ppm	5 min in any 3 hrs
Tetrachloroethylene (Z37.22-1967)	100 ppm	200 ppm	300 ppm	5 min in any 3 hrs
Toluene (Z37.12-1967)	200 ppm	300 ppm	500 ppm	10 min
Trichloroethylene (Z37.19-1967)	100 ppm	200 ppm	300 ppm	5 min in any 2 hrs

[a]This standard applies to the industry segments exempt from the 1 ppm 8-hour TWA and 5 ppm STEL of the benzene standard at 1910.1028.
[b]This standard applies to any operations or sectors for which the cadmium standard, 1910.1027, is stayed or otherwise not in effect.

TABLE C-3

OSHA PELs - MINERAL DUSTS

SUBSTANCE	mppcf[a]	mg/m³
Silica:		
Cystalline		
Quartz (respirable)	$\frac{250^b}{\% SiO_2 + 5}$	$\frac{10\ mg/m^{3e}}{\% SiO_2 + 2}$
Quartz (total dust)		$\frac{30\ mg/m^3}{\% SiO_2 + 2}$
Cristobalite: Use 1/2 the value calculated from the count or mass formulae for quartz		
Tridymite: Use 1/2 the value calculated from the formulae for quartz		
Amorphous (including natural diatomaeeous earth)	20	$\frac{80\ mg/m^3}{\% SiO_2}$
Silicates (less than 1% cyrstalline silica):		
Mica	20	
Soapstone	20	
Talc (not containing asbestos)	20[c]	
Talc (containing asbestos) - use asbestos limit		
Tremolite, asbestoform (see 29 CFR 1910.1001)		
Portland cement	50	
Graphite (natural)	15	
Coal Dust:		
Respirable fraction less than 5% SiO_2		$\frac{2.4\ mg/m^{3e}}{\% SiO_2 + 2}$
Respirable fraction greater than 5% SiO_3		$\frac{10\ mg/m^{3e}}{\% SiO_2 + 2}$
Inert or Nuisance Dust:[d]		
Respirable fraction	15	5 mg/m³
Total dust	50	15 mg/m³

Note - Conversion factors - mppcf x 35.3 = million particles per cubic meter = particles per c.c.

[a]Millions of particles per cubic foot of air, based on impinger samples counted by light-field techniques.
[b]The percentage of cyrstalline silica in the formula is the amount determined from airborne samples, except in those instances in which other methods have been shown to be applicable.
[c]Containing less than 1% quartz; if 1% quartz, use quartz limit.
[d]All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by this limit, which is the same as the particulates not otherwise regulated (PNOR) limit in Table B-1.
[e]Both concentration and percent quartz for the application of this limit are to be determined from the fraction passing a size-selector with the following characteristics:

Aerodynamic Diameter (unit density sphere)	Percent Passing Selector	Aerodynamic Diameter (unit density sphere)	Percent Passing Selector
2	90	3.5	50
2.5	75	5.0	25
		10	0

TABLE C-4 (Page 26 of 4)

NIOSH RECOMMENDED EXPOSURE LIMITS (RELs)[a]

COMPOUND	RELs ppm	RELs mg/m^3	NOTES
Acetone	250	590	10-hr TWA
Acetonitrile	20	34	10-hr TWA
Acrylamide	-	0.03	10-hr TWA
Acrylonitrile	1	-	10-hr TWA
	10	-	15-min ceiling
Aldrin	-	0.25	
Allyl chloride	1	3	10-hr TWA
	2	6	15-min ST
Allyl glycidyl ether	5	22	10-hr TWA
	10	44	15-min ST
Ammonia	25	18	10-hr TWA
	35	27	15-min ST
Antimony	-	0.5	10-hr TWA
Arsenic	-	0.002	15-min ceiling
Arsine	-	0.002	15-min ceiling
Benzene	0.1	-	10-hr TWA
	1	-	15-min ST
Benzoyl peroxide	-	5	10-hr TWA
Benzyl chloride	1	5	15-min ceiling
Beryllium	-	0.0005	Not to exceed
Boron trifluoride	1	3	ceiling limit
Butadiene	Reduce to lowest feasible limit		
2-Butanone	200	590	10-hr TWA
	300	885	15-min ST
tert-Butyl chromate	-	0.001 as Cr+6	10-hr TWA
N-Butyl glycidyl ether	5.6	30	15-min ceiling
Butyl mercaptan	0.5	1.8	15-min ceiling
Cadmium dust	Reduce to lowest feasible limit		
Cadmium fume	Reduce to lowest feasible limit		
Calcium arsenate	-	0.002	15-min ceiling
Carbaryl (sevin)	-	5	10-hr TWA
Carbon black	-	3.5	10-hr TWA
Carbon dioxide	5000	9000	10-hr TWA
	30000	54000	15-min ST
Carbon disulfide	1	3	10-hr TWA
	10	30	15-min ST
Carbon monoxide	35	40	10-hr TWA
	200	229	ceiling limit
Carbon tetrachloride	2	12.6	60-min ST
Chlorine	0.5	1.5	10-min TWA

TABLE C-4 (Page 27 of 4)

NIOSH RECOMMENDED EXPOSURE LIMITS (RELs)[a]

COMPOUND	RELs ppm	RELs mg/m^3	NOTES
Chlorine	1	3	15-min ST
Chlorodiphenyl (42%)	-	0.001	10-hr TWA
Chlorodiphenyl (54%)	-	0.001	10-hr TWA
Chloroform	2	9.78	60-min ST
Chloroprene	1	3.6	15-min ceiling
Cresol	2.3	10	10-hr TWA
Cyanides as CN	4.7	5	10-min ceiling
Cyclohexanone	25	100	10-hr TWA
DDT	-	0.5	10-hr TWA
Diacetone alcohol	50	240	10-hr TWA
Dieldrin	-	0.25	10-hr TWA
Diglycidyl ether	0.1	0.5	10-hr TWA
Diisobutyl ketone	25	150	10-hr TWA
1,1-Dimethylhydrazine	0.06	0.15	120-min ceiling
Dinitro-o-cresol	-	0.2	10-hr TWA
Dinitrotoluene	-	1.5	10-hr TWA
di-sec-Octylphthlate	-	5	10-hr TWA
	-	10	15-min ST
Dioxane	1	3.6	30-min ceiling
2-Ethoxy ethylacetate	Reduce exposure to lowest feasible limit		
Ethylene dibromide	0.045		10-hr TWA
	0.13		15-min ceiling
Ethylene dichloride	1	4	10-hr TWA
	2	8	15-min ST
Ethylene glycol dinitrate	-	0.1	15-min ST
Ethylene oxide	<0.1	0.18	10-hr TWA
	5	9	10-min/day
Ethyl mercaptan	0.5	1.3	15-min ceiling
Ferro vanadium dust	-	1	10-hr TWA
	-	3	15-min ST
Fluorides	-	2.5	10-hr TWA
Formaldehyde	0.016	-	10-hr TWA
	0.1	-	15-min ceiling
Furfuryl alcohol	10	40	10-hr TWA
	15	60	15-min ST
Heptane	85	350	10-hr TWA
	440	1800	15-min ceiling
Hexachloroethane	1	10	10-hr TWA
Hexane	50	180	10-hr TWA
2-Hexanone	1	4	10-hr TWA
Hexone	50	205	10-hr TWA

TABLE C-4 (Page 28 of 4)

NIOSH RECOMMENDED EXPOSURE LIMITS (RELs)[a]

COMPOUND	RELs ppm	RELs mg/m³	NOTES
Hexone	75	300	15-min ST
Hydrazine	0.03	0.04	120-min ceiling
Hydrogen cyanide	4.7	5	15-min ST
Hydrogen fluoride	3	2.5	10-hr TWA
	6	5	15-min ceiling
Hydrogen sulfide	10	15	10-min ceiling
Hydroquinone	-	2	15-min ceiling
Isophorone	4	25	10-hr TWA
Isopropyl alcohol	400	980	10-hr TWA
	500	1225	15-min ST
Isopropyl glyceride ether	50	240	15-min ceiling
Lead	-	<0.1	10-hr TWA
Malathion	-	10	10-hr TWA
Mercury vapor	-	0.05	10-hr TWA
Mesityl oxide	10	40	10-hr TWA
Methyl alcohol	200	260	10-hr TWA
	250	325	15-min ST
Methyl (n-amyl) ketone	100	465	10-hr TWA
Methyl bromide	Reduce exposure to lowest feasible limit		
Methyl cellosolve	Reduce exposure to lowest feasible limit		
Methyl chloride	Reduce exposure to lowest feasible limit		
Methyl chloroform	350	1900	15-min ceiling
Methylene bisphenyl isocyanate	0.005	0.05	10-hr TWA
	0.02	0.2	10-min ceiling
Methylene chloride	Reduce exposure to lowest feasible limit		
Methyl iodide	2	10	10-hr TWA
Methyl mercaptan	0.5	1	15-min ceiling
Nickel	-	0.015	10-hr TWA
Nitric acid	2	5	10-hr TWA
	4	10	15-min ST
Nitric oxide	25	30	10-hr TWA
Nitrogen dioxide	1	1.8	15-min ST
2-Nitro propane	Reduce exposure to lowest feasible limit		
Octane	75	350	10-hr TWA
	385	1800	15-min ceiling
Parathion	-	0.05	10-hr TWA
Pentane	120	350	10-hr TWA
	610	1800	15-min ST
2-Pentanone	150	530	10-hr TWA
Petroleum distillates	-	350	10-hr TWA
	-	1800	15-min ceiling

NIOSH RECOMMENDED EXPOSURE LIMITS (RELs)[a]

COMPOUND	RELs ppm	RELs mg/m^3	NOTES
Phenol	5	19	10-hr TWA
	15.6	60	15-min ceiling
Phenyl glycidyl ether	1	6	15-min ceiling
Phenyl hydrazine	0.14	0.6	120-min ceiling
Phosgene	0.1	0.4	10-hr TWA
	0.2	0.8	15-min ceiling
Silica, crystalline	-	0.05	10-hr TWA
Sodium hydroxide	-	2	15-min ceiling
Stoddard solvent	-	350	10-hr TWA
	-	1800	15-min ceiling
Styrene	50	215	10-hr TWA
	100	425	15-min ST
Sulfur dioxide	2	5	10-hr TWA
	5	10	15-min ST
Sulfuric acid	-	1	10-hr TWA
1,1,2,2-Tetrachloroethane	1	7	10-hr TWA
Tetrachloroethylene	Minimize workplace exposure concentration		
Tetra methyl succinonitrile	0.5	3	10-hr TWA
Tin, organic	-	0.1	10-hr TWA
Toluene	100	375	10-hr TWA
	150	560	15-min ST
Toluene-2.4-diisocyanate	0.005	0.04	10-hr TWA
	0.02	0.15	15-min ST
Trichloroethylene	25	-	10-hr TWA
Vanadium pentoxide	-	0.05	15-min ceiling
Vinyl chloride	Lowest reliably detectable concentration		
Xylene	100	435	10-hr TWA
	150	655	15-min ST
Zinc oxide fume	-	5	10-hr TWA
	-	10	15-min ST

TWA - time weighted average.
ST - Short-term exposure limit.

[a] 1990 values.

APPENDIX D

QUALITATIVE RESPIRATOR FIT-TESTING PROTOCOL

I. QUALITATIVE RESPIRATOR FIT TESTING: PROTOCOL FOR ISOAMYL ACETATE AS OUTLINED IN OSHA STANDARD 29 CFR 1910.1025 APPENDIX D

Isoamyl Acetate Protocol

A. Odor threshold screening.

1. Three 1-liter glass jars with metal lids (e.g. Mason or Bell jars) are required.

2. Odor-free water (e.g. distilled or spring water) at approximately 25° C shall be used for the solutions.

3. The isoamyl acetate (IAA) (also known as isopentyl acetate) stock solution is prepared by adding 1 cc of pure IAA to 800 cc of odor free water in a 1-liter jar and shaking for 30 seconds. This solution shall be prepared new at least weekly.

4. The screening test shall be conducted in a room separate from the room used for actual fit testing. The two rooms shall be well ventilated but may not be connected to the same recirculating ventilation system.

5. The odor test solution is prepared in a second jar by placing .4 cc of the stock solution into 500 cc of odor free water using a clean dropper or pipette. Shake for 30 seconds and allow to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution may be used for only one day.

6. A test blank is prepared in a third jar by adding 500 cc of odor free water.

7. The odor test and test blank jars shall be labelled 1 and 2 for jar identification. If the labels are put on the lids, they can be periodically dried off and switched to avoid people thinking the same jar always has the IAA.

8. The following instructions shall be typed on a card and placed on the table in front of the two test jars (i.e. 1 and 2):

"The purpose of this test is to determine if you can smell banana oil at a low concentration. The two bottles in front of you contain water. One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight, then shake each bottle for two seconds. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of the bottle. Indicate to the test conductor which bottle contains banana oil."

9. The mixtures used in the IAA odor detection test shall be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.

10. If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA QLFT may not be used.

11. If the test subject correctly identifies the jar containing the odor test solution, he may proceed to respirator selection and fit testing.

B. Respirator selection.

1. The test subject shall be allowed to select the most comfortable respirator from a large array of various sizes and manufacturers that includes at least three sizes of elastomeric half-facepieces and units of at least two manufacturers.

2. The selection process shall be conducted in a room separate from the fit-test chamber to prevent odor fatigue. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to assess a "comfortable" respirator. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This may not constitute his formal training on respirator use, only a review.

3. The test subject should understand that he is being asked to select the respirator which provides the most comfortable fit for him. Each respirator represents a different size and shape and, if fit properly, will provide adequate protection.

4. The test subject holds each facepiece up to his face and eliminates those which are obviously not giving a comfortable fit. Normally, selection will begin with a half-mask and if a fit cannot be found here, the subject will be asked to go to the full facepiece respirators. (A small percentage of users will not be able to wear any half-mask.)

5. The more comfortable facepieces are recorded; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in #6 below. If the test subject is not familiar with using a particular respirator, he shall be directed to don the mask several times and to adjust the straps each time, so that he becomes adept at setting proper tension on the straps.

6. Assessment of comfort shall include reviewing the following points with the test subject:

-- Chin properly placed.
-- Positioning of mask on nose.
-- Strap tension.
-- Fit across nose bridge.
-- Room for safety glasses.
-- Distance from nose to chin.
-- Room to talk.
-- Tendency to slip.
-- Cheeks filled out.
-- Self-observation in mirror.
-- Adequate time for assessment.

7. The test subject shall conduct the conventional negative- and positive-pressure fit checks (e.g. see ANSI Z88.2-1980). Before conducting the negative- or positive-pressure checks, the subject shall be told to "seat" his mask by rapidly moving the head side-to-side and up and down, taking a few deep breaths.

8. The test subject is now ready for fit testing.

9. After passing the fit test, the test subject shall be questioned again regarding the comfort of the respirator. If it has become uncomfortable, another model of respirator shall be tried.

10. The employee shall be given the opportunity to select a different facepiece and be retested if during the first two weeks of on-the-job wear the chosen facepiece becomes unacceptably uncomfortable.

C. Fit test.

1. The fit test chamber shall be substantially similar to a clear 55-gallon drum liner suspended inverted over a 2 foot diameter frame, so that the top of the chamber is about 6 inches above the test subject's head. The inside top center of the chamber shall have a small hook attached.

2. Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridges or offer protection against organic vapors. The cartridges or masks shall be changed at least weekly.

3. After selecting, donning, and properly adjusting a respirator himself, the test subject shall wear it to the fit testing room. This room shall be separate from the room used for odor threshold screening and respirator selection, and shall be well ventilated, as by an exhaust fan or lab hood, to prevent general room contamination.

4. A copy of the following exercises and rainbow (or equally effective) passage shall be taped to the inside of the test chamber.

Test Exercises

i. Normal breathing.

ii. Deep breathing. Be certain breaths are deep and regular.

iii. Turning head from side-to-side. Be certain movement is complete. Alert the test subject not to bump the respirator on the shoulders. Have the test subject inhale when his head is at either side.

iv. Nodding head up-and-down. Be certain motions are complete and made about every second. Alert the test subject not bump the respirator on the chest. Have the test subject inhale when his head is in the fully up position.

v. Talking. Talk aloud and slowly for several minutes. The following paragraph is called the Rainbow Passage. Reading it will result in a wide range of facial movements, and thus be useful to satisfy this requirement. Alternative passages which serve the same purpose may also be used.

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

vi. Normal breathing.

5. Each test subject shall wear his respirator for at least 10 minutes before starting the fit test.

6. Upon entering the test chamber, the test subject shall be given a 6 inch by 5 inch piece of paper towel or other porous absorbent single ply material, folded in half and wetted with three-quarters of one cc of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber.

7. Allow two minutes for the IAA test concentration to be reached before starting the fit-test exercises. This would be an appropriate time to talk with the test subject, to explain the fit test, the importance of his cooperation, the purpose for the head exercises, or to demonstrate some of the exercises.

8. Each exercise described in No. 4 above shall be performed for at least one minute.

9. If at any time during the test, the subject detects the banana-like odor of IAA, he shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

10. Upon returning to the selection room, the subject shall remove the respirator, repeat the odor sensitivity test, select and put on another respirator, return to the test chamber, etc. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject shall wait about 5 minutes before retesting. Odor sensitivity will usually have returned by this time.

11. If a person cannot be fitted with the selection of half-mask respirators, include full facepiece models in the selection process. When a respirator is found that passes the test, its efficiency shall be demonstrated for the subject by having him break the face seal and take a breath before exiting the chamber.

12. When the test subject leaves the chamber, he shall remove the saturated towel, returning it to the test conductor. To keep the area from becoming contaminated, the used towels shall be kept in a self-sealing bag. There is no significant IAA concentration buildup in the test chamber from subsequent tests.

13. Persons who have successfully passed this fit test may be assigned the use of the tested respirator in atmospheres with up to 10 times the PEL of airborne lead. In other words, this IAA protocol may be used to assign a protection factor no higher than 10.

II. QUALITATIVE RESPIRATOR FIT TESTING: PROTOCOL FOR IRRITANT SMOKE AS OUTLINED IN OSHA STANDARD 29 CFR 1910.1025 APPENDIX D

Irritant Fume Protocol

A. Respirator selection.

Respirators shall be selected as described in section IB above, except that each respirator shall be equipped with high efficiency cartridges.

B. Fit test.

1. The test subject shall be allowed to smell a weak concentration of the irritant smoke to familiarize him with its characteristic odor.

2. The test subject shall properly don the respirator selected as above, and wear it for at least 10 minutes before starting the fit test.

3. The test conductor shall review this protocol with the test subject before testing.

4. The test subject shall perform the conventional positive pressure and negative pressure fit checks. Failure of either check shall be cause to select an alternate respirator.

5. Break both ends of a ventilation smoke tube containing stannic oxychloride, such as the MSA part No. 5645, or equivalent. Attach a short length of tubing to one end of the smoke tube. Attach the other end of the smoke tube to a low pressure air pump set to deliver 200 milliliters per minute.

6. Advise the test subject that the smoke can be irritating to the eyes and instruct him to keep his eyes closed while the test is performed.

7. The test conductor shall direct the stream of irritant smoke from the tube towards the faceseal area of the test subject. He shall begin at least 12 inches from the facepiece and gradually move to within one inch, moving around the whole perimeter of the mask.

8. The following exercises shall be performed while the respirator seal is being challenged by the smoke. Each shall be performed for one minute.

i. Normal breathing.

ii. Deep breathing. Be certain breaths are deep and regular.

iii. Turning head from side-to-side. Be certain movement is complete. Alert the test subject not to bump the respirator on the shoulders. Have test subject inhale when his head is at either side.

iv. Nodding head up-and-down. Be certain motions are complete. Alert the test subject not to bump the respirator on the chest. Have the test subject inhale when his head is in the fully up position.

v. Talking--slowly and distinctly, count backwards from 100.

vi. Normal breathing.

9. If the irritant smoke produces an involuntary reaction (cough) by the test subject, the test conductor shall stop the test. In this case the tested respirator is rejected and another respirator shall be selected.

10. Each test subject passing the smoke test without evidence of a response shall be given a sensitivity check of the smoke from the same tube to determine whether he reacts to the smoke. Failure to evoke a response shall void the fit test.

11. Steps B4, B7, B8 of this protocol shall be performed in a location with exhaust ventilation sufficient to prevent general contamination of the testing area by the test irritant smoke.

12. Respirators successfully tested by the protocol may be used in contaminated atmospheres up to ten times the PEL. In other words this protocol may be used to assign protection factors not exceeding ten.

LAWLER, MATUSKY & SKELLY ENGINEERS
QUALITATIVE FIT TEST FOR RESPIRATORS

1. DATE
Yr. Mo. Day

EMPLOYEE NAME
Last First M.I.

EMPLOYEE No.

AGE ______ SEX (M/F) ______

1) Experience (years) ______
2) Frequency ______
3) Mask Now Using ______
4) Unusual Conditions ______

5) Mask(s) Selected
______
______
______
______

6) Qualitative Tests

PP NP IAA IS
______

1 = Passed
2 = Failed
3 = Did Not Run

7) IAA Sensitivity Test - Pass or Fail

8) Smoke Sensitivity Test - Pass or Fail

9) Respirator Selection

1st Choice - Pass Fail
2nd Choice - Pass Fail
3rd Choice - Pass Fail
Final Selection ______
manufacturer siz

COMMENTS:

Facial Conditions (X)

Wrinkles
Broken Nose
Deep Nostrils
Wide-bridge
Shallow-bridge

10) Test Instructor Name:

______

11) Odor Sensitivity

Jar No.	Odor	
1	Y	N
2	Y	N
3	Y	N
4	Y	N

Odor Description

2. FREQUENCY - How many times respirator used during week

1) Less than 1/week
2) 2-5 times/week
3) 5-10 times/week
4) 1-4 times/day

QUALITATIVE TESTS

PP = Positive Pressure
NP = Negative Pressure
IA = Isoamyl Acetate
IS = Irritant Smoke

3. MASKS (Block 37) - (Manufacturer)

1 = Mike Safety Appliances
2 = American Optical
3 = Scott Aviation
4 = North
5 = Wilson
6 = Survivor

Size (Block 38)
1 = Small
2 = Medium (if only 1 size, record 2)
3 = Large
4 = Full Face

4. UNUSUAL CONDITIONS

1 = Beard/Heavy
2 = Beard/Light
3 = Scarce
4 = Wrinkles
5 = Glasses
6 = Other
7 = Several Days Beard Growth

APPENDIX E

Lawler, Matusky & Skelly Engineers

SITE-SPECIFIC HEALTH AND SAFETY PLAN FORM

LAWLER, MATUSKY & SKELLY ENGINEERS

SITE-SPECIFIC

HEALTH AND SAFETY PLAN FORM

Site Name: ____________________ HASP Preparer: ____________________

Address: ____________________ City/State: ____________________

Job No.: ____________________

APPROVALS

Project Manager: ____________________

Safety Officer: ____________________

PROJECT PERSONNEL:

On-Site Coordinator: ____________________

On-Site Health and
Safety Officer: ____________________

Phone: (914) 735-8300

DATE OF PLAN PREPARATION:

HAZARDOUS/SUBSTANCES (known or suspected, contaminated media or in storage container, etc.):

____

____

____

____

____

HAZARD ASSESSMENT (toxic effects, including TLVs, IDLHs, reactivity, stability, flammability, and operational hazards with sampling, decontaminating, etc):

____

SITE WORK ZONES: (designate exclusion zone, contamination reduction zone and support zone)

____

SITE ACCESS: (describe procedures to control site access)

____

MONITORING PROCEDURES (If required by the Safety Officer)
Monitoring the site for identity and concentration of contamination in all media:

Medical monitoring procedures for evidence of personnel exposure, i.e., analyses specific to site not covered in general LMS physical:

Personnel monitoring procedures:

DECONTAMINATION AND DISPOSAL

Decontamination Procedures (contaminated personnel, surfaces, materials, instruments, equipment, etc.):

Disposal Procedures (contaminated equipment, supplies, disposables, washwater):

EMERGENCY PROCEDURES

In event of personnel exposure (skin contact, inhalation, ingestion, specific procedures for specific chemicals):

In event of personnel injury:

In event of potential or actual fire or explosion:

In event of potential or actual ionizing radiation exposure:

____

____

____

In event of environmental accident (spread of contamination outside sites):

____

____

____

EMERGENCY SERVICES (complete here or have separate list available on-site)

	Location	Telephone
Emergency Medical Facility		

____

____

____

Ambulance Service

____

____

Fire Department

____

____

Police Department

Poison Control Center

PERSONNEL POTENTIALLY EXPOSED TO HAZARDOUS SUBSTANCES (As Applicable)

Personnel Authorized to Enter Site (specific conditions of site would preclude most LMS trained persons from entering site and would allow only certain personnel, list here)

1. ____________________

2. ____________________

3. ____________________

4. ____________________

ALTERNATIVE WORK PRACTICES

(Describe alternative work practices or instruments not specified in this form. Indicate work practices specified in the chapter for which proposed alternative work practices will serve as substitute).

TASK-SPECIFIC LEVEL OF PROTECTION GRAND ACTION LEVELS

(Attach table including specific description of protective gear and action levels or downgrade LOP.)

SITE MAP

(Attach a site map. Map should be properly scaled and keyed to local landmarks.)

TRAINING

(Provide description of minimum training, reference OSHA Sections.)

AFFIDAVIT

All personnel who enter site must sign attached affidavit. LMS personnel must also read and comply with LMS' generic HASP.

The Payne Firm, Inc.

HEALTH AND SAFETY PLAN
Former Chromalloy Facility
West Nyack, New York

ACTIVITY: Mobilization of Field Vehicles and Equipment

Air Monitoring	**PPE**	**Decontamination Procedures**
Elevated airborne concentrations affecting field crews or downwind areas are not expected. See Section 6.1 for more information.	Level D protection. Upgrade to Level C if airborne concentrations are above PEL. See Table 4.2 for further information.	As potential Project contaminants are not anticipated as part of this task, personal decontamination is not required. See Section 4.3.2 for equipment decontamination procedures.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Hand tools	Pre-post maintenance	Tailgate Safety Meeting
Heavy Equipment	Visual prior to use	Site-specific orientation
		Hazard Communications
Principal Steps	**Potential Safety Hazards**	**Recommended Controls**
Staging Equipment	Slip, trip and fall hazards	Determine best access route before transporting equipment
		Good housekeeping, keep work area free of debris and obstacles. Continually inspect areas for slip, trip and fall hazards.
		Look before you step, insure safe and secure footing.
	Heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs. require assistance or mechanical equipment; size up the lift.
	Falling Objects	Stay alert and clear of materials suspended overhead. Wear hard hat and steel-toed boots.
	Flying debris, dirt, dust etc.	Use safety glasses/goggles. Ensure that eye-wash station is in good working order.
	Pinch points	Keep hands, fingers and feet clear of moving/suspended materials and equipment.
		Beware of contact points.
		Stay alert at all times.
	Fire	Fire extinguishers shall be suitably placed, distinctly marked, readily available and maintained in a fully charged and operable condition.
		All flammable liquids will be transported in UL/FM approved containers and sources of ignition will be prohibited.
	Vehicle traffic	Pay attention at all times.
		Wear high-visibility clothing.
		Ensure that operators of vehicles know that you are near their equipment.
		A spotter will aid in the backing of vehicles with poor visibility.
		Work areas will be demarcated/barricaded.
	Contact with utilities	Above and underground utilities shall be located.
	Cut hazards	Wear adequate hand protection.
	Biological hazards	Inspect work areas carefully and avoid placing hands and feet into concealed areas.
		Be alert for bees, spiders, ticks and snakes.
	Hazardous plants (Poison oak, sumac, ivy), insects, snakes etc.	Remove vegetation, identify hazardous plants, insects, etc.
	Flood potential	Check meteorology/climatology of the area. Look for any history of flooding.
	Thermal stress	Refer to appropriate sections of HASP
	Hazard communications	Label all containers as to contents (Fuel, etc.)
		Obtain Material Safety Data Sheets for solvents etc. that are being used.

The Payne Firm, Inc.

HEALTH AND SAFETY PLAN
Former Chromalloy Facility
West Nyack, New York

ACTIVITY: Demobilization

Air Monitoring	**PPE**	**Decontamination Procedures**
Elevated airborne concentrations affecting field crews or downwind areas are not expected. See Section 6.1 for more information.	Level D protection. Upgrade to Level C if airborne concentrations are above PEL. See Table 4.2 for further information.	As potential Project contaminants are not anticipated as part of this task, personal decontamination is not required. See Section 4.3.2 for equipment decontamination procedures.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Hand tools	Pre-post maintenance	Tailgate Safety Meeting
Heavy equipment	Visual prior to use	Site-specific orientation
		Hazard Communications
Principal Steps	**Potential Safety Hazards**	**Recommended Controls**
Removal of equipment and support structures	Slip, trip and fall hazards	Determine best access route before transporting equipment
		Good housekeeping, keep work area free of debris and obstacles. Continually inspect areas for slip, trip and fall hazards.
		Look before you step, insure safe and secure footing.
	Heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs. require assistance or mechanical equipment; size up the lift.
	Falling Objects	Stay alert and clear of materials suspended overhead. Wear hard hat and steel-toed boots.
	Flying debris, dirt, dust etc.	Use safety glasses/goggles. Ensure that eye-wash station is in good working order.
	Pinch points	Keep hands, fingers and feet clear of moving/suspended materials and equipment.
		Beware of contact points.
		Stay alert at all times.
	Fire	Fire extinguishers shall be suitably placed, distinctly marked, readily available and maintained in a fiully charged and operable condition.
		All flammable liquids will be transported in UL/FM approved containers and sources of ignition will be prohibited.
	Noise	Sound levels above 85 dBA mandates hearing protection.
	Vehicle traffic	Pay attention at all times.
		Wear high-visibility clothing.
		Ensure that operators of vehicles know that you are near their equipment.
		A spotter will aid in the backing of vehicles with poor visibility.
		Work areas will be demarcated/barricaded.
	Contact with utilities	Above and underground utilities shall be located.
	Cut hazards	Wear adequate hand protection.
	Thermal stress	Refer to appropriate sections of SSHASP
	Fuel	Fuel will be transported and stored in approved containers.
	Strains, sprains	Use the proper tool for the job being performed.
		Get assistance if needed.
		Avoid twisting or turning while pulling tools etc.
	Unattended worker	"Buddy System" - Visual contact will be maintained with the sampling technician during sampling activities.
	Driving over soft ground	Make an initial visual check.
		Apply gravel if needed to pervent mud or standing water.
		Level ground with loader and spread gravel as needed.

The Payne Firm, Inc.

HEALTH AND SAFETY PLAN
Former Chromalloy Facility
West Nyack, New York

ACTIVITY: Drilling

Air Monitoring	**PPE**	**Decontamination Procedures**
Elevated airborne concentrations affecting field crews or downwind areas are not expected. See Section 6.1 for more information.	Modified Level D protection. Upgrade to Level C if airborne concentrations are above PEL. See Table 4.2 for further information.	As potential Project contaminants are not anticipated as part of this task, personal decontamination is not required. See Section 4.3.2 for equipment decontamination procedures.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Hand tools	Pre-post maintenance	Tailgate Safety Meeting
Pipe	Visual prior to use	Site-specific orientation
Heavy Equipment		Hazard Communications
Principal Steps	**Potential Safety Hazards**	**Recommended Controls**
Drilling/Boring	Slip, trip and fall hazards	Slip, trip and fall hazards
	Strains, sprains, heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs. require assistance or mechanical equipment; size up the lift.
	Falling Objects	Stay alert and clear of materials suspended overhead. Wear hard hat and steel-toed boots.
	Flying debris, dirt, dust etc.	Use safety glasses/goggles. Ensure that eye-wash station is in good working order.
	Noise	Sound levels above 85 dBA mandates hearing protection.
	Pinch points	Keep hands, fingers and feet clear of moving/suspended materials and equipment.
		Beware of contact points.
		Stay alert at all times.
	Contact with overhead power lines.	Minimum overhead clearance shall be in accordance with industry standards.
	Fire	The drill rig or boring rig will be equiped with at least one dry chemical fire extinguisher having a minimum UL rating of 1A5BC
	Underground utilities	All underground utilities will be located prior to subsurface activities.
	Cut hazards	Wear adequate hand protection.
	Traffic	Work area will be barricaded off.
		Personnel will wear high-visibility vests.
	Driving over soft ground	Make an initial visual check.
		Apply gravel if needed to pervent mud or standing water.
		Level ground with loader and spread gravel as needed.
	Contact with contaminated materials.	Personnel will wear appropriate PPE for the operation. This may include chemical resistant gloves, boot covers, splash suit.
	Contact with drilling equipment	Before any machinery or mechanized equipment is placed into service it shall be inspected and tested by a competent mechanic and certified to be in safe operating condition.
		Preventive maintenance procedures recommended by the manufacturer will be followed.
		Only qualified personnel shall operate machinery and mechanized equipment.
		Machinery or equipment shall not be operated in a manner that will endanger persons or property nor will the safe operating speeds or loads be exceeded.
		All repairs on machinery will be made at a location that provides protection from traf for repairpersons.
		Maintain eye contact with drill operator when entering zone of operation.
		Establish work zone around the drill rig.
		All mobile equipment shall be equipped with a backup alarm.

The Payne Firm, Inc.

HEALTH AND SAFETY PLAN
Former Chromalloy Facility
West Nyack, New York

ACTIVITY: Decontamination of Equipment

Air Monitoring	**PPE**	**Decontamination Procedures**
Elevated airborne concentrations affecting field crews or downwind areas are not expected. See Section 6.1 for more information.	Modified Level D protection. Upgrade to Level C if airborne concentrations are above PEL. See Table 4.2 for further information.	As potential Project contaminants are not anticipated as part of this task, personal decontamination is not required. See Section 4.3.2 for equipment decontamination procedures.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Hand tools	Pre-post maintenance	Tailgate Safety Meeting
Heavy equipment, dump trucks	Visual prior to use	Site-specific orientation
		Hazard Communications
		Hazardous waste operations
Principal Steps	**Potential Safety Hazards**	**Recommended Controls**
Movement to DECON area	Noise	Sound levels above 85 dBA mandates hearing protection.
	Contact with heavy equipment	A lockout-tagout procedure shall be used for equipment found to be faulty or undergoing maintenance.
		Equipment will not be allowed to run unattended.
		Only qualified personnel shall operate machinery and mechanized equipment.
		All equipment will be shut down and positive means taken to prevent operation while decontamination is being done.
		All decontamination of equipment will be done at a location that provides protection from traffic.
		Getting on or off equipment while it is in motion is prohibited.
		All mobile equipment shall be equipped with a backup alarm.
	Contact with potentially contaminated materials	Real-time air monitoring will take place. Proper PPE and equipment will be used.
		Good housekeeping will be stressed to safeguard against contamination and mitigate safety hazards.
		All personnel will practice good hygiene practices.
		The work area will be demarcated. All unnecessary personnel will be kept out of the work areas.
		Refer to SSHASP for chemical hazards discussion.
	Strains, sprains, heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs. require assistance or mechanical equipment; size up the lift.
		Good housekeeping, keep work areas free of obstacles.
	Cut hazards	Wear adequate hand protection.
		Keep hands, fingers and feet clear of moving/suspended materials and equipment.
		Beware of contact points.
		Stay alert at all times.
Pressure washing	Eye injuries	Safety glass/goggles or face shield shall be worn.
	Burns	Rain suits or equivalent shall be worn to prevent direct contact with hot water.

The Payne Firm, Inc.

HEALTH AND SAFETY PLAN
Former Chromalloy Facility
West Nyack, New York

ACTIVITY: Excavation and Trenching

Air Monitoring	**PPE**	**Decontamination Procedures**
Elevated airborne concentrations affecting field crews or downwind areas are not expected. See Section 6.1 for more information.	Modified Level D protection. Upgrade to Level C if airborne concentrations are above PEL. See Table 4.2 for further information.	As potential Project contaminants are not anticipated as part of this task, personal decontamination is not required. See Section 4.3.2 for equipment decontamination procedures.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Hand tools	Pre-post maintenance	Tailgate Safety Meeting
Heavy equipment	Visual prior to use	Site-specific orientation
		Hazard Communications
Principal Steps	**Potential Safety Hazards**	**Recommended Controls**
Excavation	Underground utilities	All underground utilities will be located prior to subsurface activities.
	Open excavations	Health and Safety Program Procedure X.X Barricading for work site protection" will be adhered to at all times.
	Noise	Sound levels above 85 dBA mandates hearing protection.
	Contact with heavy equipment	A lockout-tagout procedure shall be used for equipment found to be faulty or undergoing maintenance.
		Equipment will not be allowed to run unattended.
		Only qualified personnel shall operate machinery and mechanized equipment.
		All equipment will be shut down and positive means taken to prevent operation while decontamination is being done.
		Getting on or off equipment while it is in motion is prohibited.
		All mobile equipment shall be equipped with a backup alarm.
		Before any machinery or mechanized equipment is placed into service it shall be inspected and tested by a competent mechanic and certified to be in safe operating condition.
		Preventive maintenance procedures recommended by the manufacturer will be followed.
		Bulldozer and scraper blades; end-loader buckets and similar equipment will be either fully lowered or blocked when repaired or when not in use and whenever operator leaves the machine.
		Machinery or equipment shall not be operated in a manner that will endanger persons or property nor will the safe operating speeds or loads be exceeded.
		All repairs on machinery will be made at a location that provides protection from traffic for repairpersons.
		Maintain eye contact with drill operator when entering zone of operation.
		Establish work zone around the drill rig.
		Equipment shall be inspected before being placed into service and at the beginning of each shift.
	Contact with overhead power lines	Overhead clearances will be maintained in accordance with industry standards.
	Fire	Each bulldozer, backhoe or other similar equipment will be equipped with at least one fire extinguisher having a minimum UL rating of 1A5BC.
	Pinch points	Keep hands, fingers and feet clear of moving/suspended materials and equipment.
		Beware of contact points.
	Starins, sprains and heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs. require assistance or mechanical equipment; size up the lift.
	Cut hazards	Wear adequate hand protection.
	Traffic	Work areas will be barricaded off.

ACTIVITY HAZARD ANALYSES
Former Chromalloy Facility
West Nyack, New York

ACTIVITY: Ground Water Sampling

Air Monitoring	PPE	Decontamination Procedures
Elevated airborne concentrations affecting field crews or downwind areas are not expected. See Section 6.1 for more information.	Modified Level D protection. Upgrade to Level C if airborne concentrations are above PEL. See Table 4.2 for further information.	As potential Project contaminants are not anticipated as part of this task, personal decontamination is not required. See Section 4.3.2 for equipment decontamination procedures.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Hand tools	Pre-post maintenance	Tailgate Safety Meeting
Sampling Equipment	Visual prior to use	Site-specific orientation
		Hazardous Waste Operations
		Hazard Communications
Principal Steps	**Potential Safety Hazards**	**Recommended Controls**
Staging Equipment	Slip, trip and fall hazards	Determine best access route before transporting equipment
		Good housekeeping, keep work area free of debris and obstacles. Continually inspect areas for slip, trip and fall hazards.
		Look before you step, insure safe and secure footing.
	Heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs. require assistance or mechanical equipment; size up the lift.
	Falling Objects	Stay alert and clear of materials suspended overhead. Wear hard hat and steel-toed boots.
	Flying debris, dirt, dust etc.	Use safety glasses/goggles. Ensure that eye-wash station is in good working order.
	Pinch points	Keep hands, fingers and feet clear of moving/suspended materials and equipment.
		Beware of contact points.
		Stay alert at all times.
	Fire	Fire extinguishers shall be suitably placed, distinctly marked, readily available and maintained in a fully charged and operable condition.
		All flammable liquids will be transported in UL/FM approved containers and sources of ignition will be prohibited.
	Contact with moving equipment vehicles	Work areas will be demarcated/barricaded.
		Equipment will be laid out in an area free of traffic flow.
	Bees, spiders and snakes	Inspect work areas carefully and avoid placing hands and feet into concealed areas.
	Cut hazards	Wear adequate hand protection. Use care when handling glassware.
	Chemical exposure	Initial real-time air monitoring will take place.
		Proper use of PPE.
		Label all containers as to contents and dispose of properly.
		Obtain Material Safety Data Sheets for solvents etc. that are being used.
	Noise	Sound levels above 85 dBA mandates hearing protection.

The Payne Firm, Inc.

ACTIVITY HAZARD ANALYSES
Former Chromalloy Facility
West Nyack, New York

ACTIVITY: Ground Water Sampling

Sample Collection	Bees, spiders and snakes	Inspect work areas carefully and avoid placing hands and feet into concealed areas.
	Cross-contamination and contact with potentially contaminated materials	Sample technicians will wear proper protective clothing and equipment to safeguard against potential contamination.
		Only essential personnel will be in the work area.
		Initial real-time air monitoring will take place before and during sampling activities.
		All personnel will practice good hygiene practices.
		Proper decontamination procedures will be followed.
		All liquids and materials used for decontamination will be contained and disposed of in accordance with Federal, State and local regulations.
	Cut hazards	Wear adequate hand protection. Use care when handling glassware.
	Chemical exposure	Proper use of PPE.
		Label all containers as to contents and dispose of properly.
	Strains, sprains	Use the proper tool for the job being performed.
		Get assistance if needed.
		Avoid twisting or turning while pulling tools etc.
	Spills, residual materials	Absorbent materials and containers will be kept available where leaks or spills may occur.
	Lighting	Adequate lighting will be provided to ensure a safe working environment.
	Unattended worker	"Buddy System" - Visual contact will be maintained with the sampling technician during sampling activities.
Equipment Decontamination	Chemical exposure	Maintain MSDS for all chemicals and follow protection procedures.
Moving and Shipping Collected Samples	Heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs. require assistance or mechanical equipment; size up the lift.
	Pinch points	Keep hands, fingers and feet clear of moving/suspended materials and equipment.
		Beware of contact points.
		Stay alert at all times.
	Cut hazards	Wear adequate hand protection. Use care when handling glassware.
	Chemical exposure	Label all containers as to contents and dispose of properly.

The Payne Firm, Inc.

HEALTH AND SAFETY PLAN
Former Chromalloy Facility
West Nyack, New York

ACTIVITY: Installation of Ground Water Extraction System

Air Monitoring	**PPE**	**Decontamination Procedures**
Elevated airborne concentrations affecting field crews or downwind areas are not expected. See Section 6.1 for more information.	Modified Level D protection. Upgrade to Level C if airborne concentrations are above PEL. See Table 4.2 for further information.	As potential Project contaminants are not anticipated as part of this task, personal decontamination is not required. See Section 4.3.2 for equipment decontamination procedures.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Hand tools	When equipment is brought on site and before being placed into service.	Tailgate Safety Meeting each morning and as needed.
Heavy equipment		Equipment operators must have proper authorization for the equipment they are using.
		Electricians must be certified to perform the work they are assigned.
Principal Steps	**Potential Safety Hazards**	**Recommended Controls**
Installation of piping system	Heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs. require assistance or mechanical equipment; size up the lift.
	Falling Objects	Stay alert and clear of materials suspended overhead. Wear hard hat and steel-toed boots.
	Flying debris, dirt, dust etc.	Use safety glasses/goggles. Ensure that eye-wash station is in good working order.
	Slip, trip and fall hazards	Determine best access route before transporting equipment
		Good housekeeping, keep work area free of debris and obstacles. Continually inspect areas for slip, trip and fall hazards.
		Look before you step, insure safe and secure footing.
	Cut hazards	Wear adequate hand protection.
	Thermal stress	Refer to appropriate sections of SSHASP
	Contact with heavy equipment	Before any machinery or mechanized equipment is placed into service it shall be inspected and tested by a competent mechanic and certified to be in safe operating condition.
		Only qualified personnel shall operate machinery and mechanized equipment.
		Getting on or off equipment while it is in motion is prohibited.
		Equipment will not be allowed to run unattended.
		All mobile equipment shall be equipped with a backup alarm.
	Driving over soft ground	Make an initial visual check.
		Apply gravel if needed to prevent mud or standing water.
		Level ground with loader and spread gravel as needed.
	Failure of ropes, chains, slings, cables	Daily inspection of all lift equipment shall be performed.
		Rigging equipment shall not be loaded in excess of its recommended safe working load.
		Work or travel under elevated loads is prohibited.
	Use of welding torches	Obtain a Hot Work permit
		Store and use compressed gases properly.
		Install radiation shields when welding in close proximity to other individuals.
		Ensure that a fire extinguisher is immediately available.

The Payne Firm, Inc.

HEALTH AND SAFETY PLAN
Former Chromalloy Facility
West Nyack, New York

ACTIVITY: Installation of Ground Water Extraction System

Installation of electrical units and pumps	Contact with electrical current	Follow lockout-tagout procedures when testing or starting equipment
	Failure of ropes, chains, slings, cables	Daily inspection of all lift equipment shall be performed.
		Rigging equipment shall not be loaded in excess of its recommended safe working load.
		Work or travel under elevated loads is prohibited.
	Heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs. require assistance or mechanical equipment; size up the lift.

The Payne Firm, Inc.

HEALTH AND SAFETY PLAN
Former Chromalloy Facility
West Nyack, New York

ACTIVITY: Disposition of Investigation Derived Waste

Air Monitoring	**PPE**	**Decontamination Procedures**
Elevated airborne concentrations affecting field crews or downwind areas are not expected. See Section 6.1 for more information.	Modified Level D protection. Upgrade to Level C if airborne concentrations are above PEL. See Table 4.2 for further information.	As potential Project contaminants are not anticipated as part of this task, personal decontamination is not required. See Section 4.3.2 for equipment decontamination procedures.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Hand tools	Pre-post maintenance	Tailgate Safety Meeting
Sampling equipment	Visual prior to use	Site-specific orientation
		Hazard Communications
		Hazardous waste operations
Principal Steps	**Potential Safety Hazards**	**Recommended Controls**
Staging equipment	Slip, trip and fall hazards	Determine best access route before transporting equipment
		Good housekeeping, keep work area free of debris and obstacles. Continually inspect areas for slip, trip and fall hazards.
		Look before you step, insure safe and secure footing.
	Heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs. require assistance or mechanical equipment; size up the lift.
	Falling Objects	Stay alert and clear of materials suspended overhead. Wear hard hat and steel-toed boots.
	Flying debris, dirt, dust etc.	Use safety glasses/goggles. Ensure that eye-wash station is in good working order.
	Pinch points	Keep hands, fingers and feet clear of moving/suspended materials and equipment.
		Beware of contact points.
		Stay alert at all times.
	Fire	Fire extinguishers shall be suitably placed, distinctly marked, readily available and maintained in a fully charged and operable condition.
		All flammable liquids will be transported in UL/FM approved containers and sources of ignition will be prohibited.
	Contact with moving vehicles/equipment.	Work area will be barricaded off.
		Personnel will wear high-visibility vests.
		Equipment will be laid out in an area free from traffic flow.
	Bees, spiders and snakes	Inspect work areas carefully and avoid placing hands and feet into concealed areas.
	Cut hazards	Wear adequate hand protection.
	Chemical exposure	Initial real-time air monitoring will take place.
		Proper use of PPE.
		Label all containers as to contents and dispose of properly.
		Obtain Material Safety Data Sheets for solvents etc. that are being used.
	Hazard communications	Label all containers as to contents and dispose of properly.
		Wear appropriate PPE.
	Noise	Sound levels above 85 dBA mandates hearing protection.

The Payne Firm, Inc.

HEALTH AND SAFETY PLAN
Former Chromalloy Facility
West Nyack, New York

ACTIVITY: Disposition of Investigation Derived Waste

Sample collection	Electrical shock	All non-essential circuits will be de-energized and locked out.
	Bees, spiders and snakes	Inspect work areas carefully and avoid placing hands and feet into concealed areas.
	Cross-contamination and contact with potentially contaminated materials	Sample technicians will wear proper protective clothing and equipment to safeguard against potential contamination.
		Only essential personnel will be in the work area.
		Initial real-time air monitoring will take place before and during sampling activities.
		All personnel will practice good hygiene practices.
		Proper decontamination procedures will be followed.
		All liquids and materials used for decontamination will be contained and disposed of in accordance with Federal, State and local regulations.
	Cut hazards	Wear adequate hand protection.
	Chemical exposure	Label all containers as to contents.
		Wear appropriate PPE.
	Strains, sprains	Use the proper tool for the job being performed.
		Get assistance if needed.
		Avoid twisting or turning while pulling tools etc.
	Spills, residual materials	Absorbent materials and containers will be kept available where leaks or spills may occur.
	Lighting	Adequate lighting will be provided to ensure a safe working environment.
	Unattended worker	"Buddy System" - Visual contact will be maintained with the sampling technician during sampling activities.
Equipment decontamination	Chemical exposure	Maintain MSDS for all chemicals used and follow protection procedures.
Moving and Shipping Collected Samples	Heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs. require assistance or mechanical equipment; size up the lift.
	Pinch points	Keep hands, fingers and feet clear of moving/suspended materials and equipment.
		Beware of contact points.
		Stay alert at all times.
	Cut hazards	Wear adequate hand protection. Use care when handling glassware.
	Hazard communications	Label all containers as to contents and associated hazards.

The Payne Firm, Inc.

HEALTH AND SAFETY PLAN
Former Chromalloy Facility
West Nyack, New York

ACTIVITY: Ground Water Extraction Treatment System O&M

Air Monitoring	**PPE**	**Decontamination Procedures**
Elevated airborne concentrations affecting field crews or downwind areas are not expected. See Section 6.1 for more information.	Level D protection. Upgrade to Level C if airborne concentrations are above PEL. See Table 4.2 for further information.	As potential Project contaminants are not anticipated as part of this task, personal decontamination is not required. See Section 4.3.2 for equipment decontamination procedures.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Hand tools	When equipment is brought on site and before being placed into service.	Tailgate Safety Meeting each morning and as needed.
Heavy equipment		OSHA 40-hour Hazardous Waste Training and 8 hour Refresher as needed.
		Equipment operators must have proper authorization for the equipment they are using.
Principal Steps	**Potential Safety Hazards**	**Recommended Controls**
Routine system operation and general maintenance	Heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs. require assistance or mechanical equipment; size up the lift.
	Falling Objects	Stay alert and clear of materials suspended overhead. Wear hard hat and steel-toed boots.
	Flying debris, dirt, dust etc.	Use safety glasses/goggles. Ensure that eye-wash station is in good working order.
	Slip, trip and fall hazards	Determine best access route before transporting equipment
		Good housekeeping, keep work area free of debris and obstacles. Continually inspect areas for slip, trip and fall hazards.
		Look before you step, insure safe and secure footing.
	Cut hazards	Wear adequate hand protection.
	Thermal stress	Refer to appropriate sections of SSHASP
Maintenance requiring system shut down	Unexpected system activation	Implement lockout-tagout procedures in accordance with industry standards.
		Before any machinery or mechanized equipment is placed into service it shall be inspected and tested by a competent mechanic and certified to be in safe operating condition.
		Getting on or off equipment while it is in motion is prohibited.
		Equipment will not be allowed to run unattended.
	Exposure to hazardous materials	Initial monitoring of air in the breathing zone shall be performed before disconnecting any piping or appurtenance.
		Proper use of PPE
	Driving over soft ground	Make an initial visual check.
		Apply gravel if needed to prevent mud or standing water.
		Level ground with loader and spread gravel as needed.
	Electric shock	Lighting for work and means of egress; electrical hookups to be made by qualified electricians.

The Payne Firm, Inc.

HEALTH AND SAFETY PLAN
Former Chromalloy Facility
West Nyack, New York

ACTIVITY: Soil Sampling

Air Monitoring	**PPE**	**Decontamination Procedures**
Elevated airborne concentrations affecting field crews or downwind areas are not expected. See Section 6.1 for more information.	Modified Level D protection. Upgrade to Level C if airborne concentrations are above PEL. See Table 4.2 for further information.	As potential Project contaminants are not anticipated as part of this task, personal decontamination is not required. See Section 4.3.2 for equipment decontamination procedures.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Hand tools	Pre-post maintenance	Tailgate Safety Meeting
Sampling Equipment	Visual prior to use	Site-specific orientation
		Hazard Communications
		Hazardous waste operations
Principal Steps	**Potential Safety Hazards**	**Recommended Controls**
Staging equipment	Slip, trip and fall hazards	Determine best access route before transporting equipment
		Good housekeeping, keep work area free of debris and obstacles. Continually inspect areas for slip, trip and fall hazards.
		Look before you step, insure safe and secure footing.
	Heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs. require assistance or mechanical equipment; size up the lift.
	Falling Objects	Stay alert and clear of materials suspended overhead. Wear hard hat and steel-toed boots.
	Flying debris, dirt, dust etc.	Use safety glasses/goggles. Ensure that eye-wash station is in good working order.
	Pinch points	Keep hands, fingers and feet clear of moving/suspended materials and equipment.
		Beware of contact points.
		Stay alert at all times.
	Fire	Fire extinguishers shall be suitably placed, distinctly marked, readily available and maintained in a fully charged and operable condition.
		All flammable liquids will be transported in UL/FM approved containers and sources of ignition will be prohibited.
	Contact with moving vehicles/equipment.	Work area will be barricaded off.
		Personnel will wear high-visibility vests.
		Equipment will be laid out in an area free from traffic flow.
	Bees, spiders and snakes	Inspect work areas carefully and avoid placing hands and feet into concealed areas.
	Cut hazards	Wear adequate hand protection.
	Chemical exposure	Initial real-time air monitoring will take place.
		Proper use of PPE.
		Label all containers as to contents and dispose of properly.
		Obtain Material Safety Data Sheets for solvents etc. that are being used.
	Noise	Sound levels above 85 dBA mandates hearing protection.

The Payne Firm, Inc.

HEALTH AND SAFETY PLAN
Former Chromalloy Facility
West Nyack, New York

ACTIVITY: Soil Sampling

Sample collection	Electrical shock	All non-essential circuits will be de-energized and locked out.
	Bees, spiders and snakes	Inspect work areas carefully and avoid placing hands and feet into concealed areas.
	Cross-contamination and contact with potentially contaminated materials	Sample technicians will wear proper protective clothing and equipment to safeguard against potential contamination.
		Only essential personnel will be in the work area.
		Initial real-time air monitoring will take place before and during sampling activities.
		All personnel will practice good hygiene practices.
		Proper decontamination procedures will be followed.
		All liquids and materials used for decontamination will be contained and disposed of in accordance with Federal, State and local regulations.
	Cut hazards	Wear adequate hand protection.
	Chemical exposure	Label all containers as to contents.
	Strains, sprains	Use the proper tool for the job being performed.
		Get assistance if needed.
		Avoid twisting or turning while pulling tools etc.
	Spills, residual materials	Absorbent materials and containers will be kept available where leaks or spills may occur.
	Lighting	Adequate lighting will be provided to ensure a safe working environment.
	Unattended worker	"Buddy System" - Visual contact will be maintained with the sampling technician during sampling activities.
Equipment decontamination	Chemical exposure	Maintain MSDS for all chemicals used and follow protection procedures.
Moving and Shipping Collected Samples	Heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs. require assistance or mechanical equipment; size up the lift.
	Pinch points	Keep hands, fingers and feet clear of moving/suspended materials and equipment.
		Beware of contact points.
		Stay alert at all times.
	Cut hazards	Wear adequate hand protection. Use care when handling glassware.
	Chemical exposure	Label all containers as to contents and dispose of properly.

The Payne Firm, Inc.

HEALTH AND SAFETY PLAN
Former Chromalloy Facility
West Nyack, New York

ACTIVITY: Well Installations

Air Monitoring	**PPE**	**Decontamination Procedures**
Elevated airborne concentrations affecting field crews or downwind areas are not expected. See Section 6.1 for more information.	Modified Level D protection. Upgrade to Level C if airborne concentrations are above PEL. See Table 4.2 for further information.	As potential Project contaminants are not anticipated as part of this task, personal decontamination is not required. See Section 4.3.2 for equipment decontamination procedures.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Hand tools	Pre-post maintenance	Tailgate Safety Meeting
Pipe	Visual prior to use	Site-specific orientation
Heavy equipment		Hazard Communications
		Hazardous waste operations
Principal Steps	**Potential Safety Hazards**	**Recommended Controls**
Staging equipment	Slip, trip and fall hazards	Determine best access route before transporting equipment
		Good housekeeping, keep work area free of debris and obstacles. Continually inspect areas for slip, trip and fall hazards.
		Look before you step, insure safe and secure footing.
	Heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs. require assistance or mechanical equipment; size up the lift.
	Falling Objects	Stay alert and clear of materials suspended overhead. Wear hard hat and steel-toed boots.
	Flying debris, dirt, dust etc.	Use safety glasses/goggles. Ensure that eye-wash station is in good working order.
	Pinch points	Keep hands, fingers and feet clear of moving/suspended materials and equipment.
		Beware of contact points.
		Stay alert at all times.
	Fire	Fire extinguishers shall be suitably placed, distinctly marked, readily available and maintained in a fiully charged and operable condition.
		All flammable liquids will be transported in UL/FM approved containers and sources of ignition will be prohibited.
	Contact with moving vehicles/equipment.	Work area will be barricaded off.
		Personnel will wear high-visibility vests.
		Equipment will be laid out in an area free from traffic flow.
	Bees, spiders and snakes	Inspect work areas carefully and avoid placing hands and feet into concealed areas.
	Cut hazards	Wear adequate hand protection.
	Chemical exposure	Initial real-time air monitoring will take place.
		Proper use of PPE.
		Label all containers as to contents and dispose of properly.
		Obtain Material Safety Data Sheets for solvents etc. that are being used.
Well installation	Open excavations	Health and Safety Program Procedure X.X Barricading for work site protection" will be adhered to at all times.
	Noise	Sound levels above 85 dBA mandates hearing protection.
	Drilling equipment operations	Refer to Activity Hazard Analysis for Drilling

The Payne Firm, Inc.

APPENDIX D-1

DAILY HEALTH AND SAFETY REPORT

Former Chromalloy Facility Site
West Nyack, New York

Date:____

On-Site Health and Safety Officer (SSO):____________________________________

On-Site Field Operations Leader (FOL):_____________________________________

Background PID Reading (measured at Assembly Area):_________________________

Today's Tasks and Work Areas:____

____

____

____

Level of Protection Required:____

Today's Tasks and Work Areas:____

____

____

____

Level of Protection Required:____

Additional Comments**:**____

The Payne Firm, Inc.

APPENDIX D-2

AIR MONITORING DATA SHEET

Former Chromalloy Facility
West Nyack, New York

DATA SHEET

Date:	**Meter ID:**
Job Location:	**MeterID:**
Crew:	

TIME	SAMPLE LOCATION	PID READING	OVA READING	COMMENTS

The Payne Firm, Inc.

APPENDIX D-3

INCIDENT REPORTING FORM (OSHA Form 301)

Former Chromalloy Facility Site
West Nyack, New York

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

<u>Information About The Employee</u>

Full Name:____

Street:____

City, State, ZIP:____

Date of birth:____

Date Hired:____

__________Male__________Female

<u>Information About The Physician or Other Health Care Professional</u>

Name of physician or other health care professional:____

If treatment was given away from the worksite, where was it given?

Facility:____

Street:____

City, State, ZIP:____

<u>Was the employee treated in an emergency room?</u>

__________Yes__________No

The Payne Firm, Inc.

Was the employee hospitalized overnight as an in-patient?

_________Yes_________No

Information About The Case

Case number from the Log _____________________ (Transfer the case number from the Log after you record the case.)

Date of the injury or illness:____

Time employee began work:____

Time of Incident:____

_________Check here if time can not be determined

What was the employee doing just before the incident occurred?

Examples: Describe the activity, as well as the tools, equipment, or material the employee was using. Be specific. "climbing a ladder while carrying roofing materials;" "spraying chlorine from hand sprayer;" "daily computer key-entry."

____
____
____
____
____

What happened?

Examples: Tell us how the injury occurred. "When ladder slipped on wet floor, worker fell 20 feet;" "Worker was sprayed with chlorine when gasket broke during replacement;" "Worker developed soreness in wrist over time."

____
____
____
____
____

The Payne Firm, Inc.

What was the injury or illness?

Examples: Tell us the part of the body that was affected and how it was affected; be more specific than "hurt," "pain," or sore." "strained back;" "chemical burn, hand;" "carpal tunnel syndrome."

____
____
____
____
____

What object or substance directly harmed the employee?

Examples: "concrete floor;" "chlorine;" "radial arm saw."

____
____
____
____
____

If the employee died, when did death occur?____

(If this question does not apply to the incident, leave it blank.)

Incident Reporting Form Completed by:____

Title:____

Phone:____

Date:____

The Payne Firm, Inc.

APPENDIX D-4

EMERGENCY RESPONSE CHECKLIST

Former Chromalloy Facility Site
West Nyack, New York

ACTION	**YES**	**NO**
In an Emergency:		
Confirm the reported incident		
Evacuate and secure the area		
Render first aid/emergency medical care		
Notify Promptly:		
Fire Department		
Police Department		
Nearest Hospital		
Payne Project Manager or Project Health and Safety Officer		
Start Documentation		
If a Spill or Leak Occurs:		
Don proper PPE		
Stop the source		
Contain the spill		
Clean up the spill		
Upon evacuation, take attendance at assembly area		
Authority Given:		
Leave the Project		
Re-start the operations		
Debrief and document the incident		
Copy of document submitted to PHSO		

Appendix F

Site-Wide Inspection Form

SITE-WIDE INSPECTION FORM

General Information

Client/Project:	**Chromalloy/W.Nyack**	**Project Number:**	
Location:	**West Nyack, NY**	**Time of Inspection:**	
Weather:		**:**	
Date:			

Pre-Inspection:

- Notification of property owner and building occupants onsite
- Inspector shall review prior inspection form to help aid in order to determine any changes on site.
- Inspector shall bring a digital camera with a date stamp for photo documentation of site conditions and a copy of the Site Plans to note areas of change since the last inspection.

Access:

Any changes in the fence line for the Site? Note any change on the Site Plan.

Any breaks in the fence line surrounding the Site?

Are the gates secure?

Existing Conditions:

Any changes to the building layout since the past inspection?

Any new occupants on-site since the last inspection?

Does the current occupant have a materials storage area, is it secured, contained? (Note on the Site Plan)

Provide a summary of the materials observed.

SITE-WIDE INSPECTION FORM

Asphalt /Building Cover Inspection:

Is there any evidence or excavation or trenching activity since the last inspection? (Note any areas on the Site Plan)

Any evidence of new monitoring wells or abandonment of monitoring wells?

Is there any areas of erosion since the last inspection?

Are there any areas of removed asphalt or building slab with exposed soil?

Are there any areas of proposed improvement according to the property owner/building occupants?

Items of Concern:

List additional items/conditions

Post Inspection

This form shall be accompanied by the photo documentation and revised Site Plans and submitted hard copy and electronic (PDF) to:

Mr. Randy Whitcher
NYSDEC – DER Remedial Bureau C
625 Broadway
Albany, NY 12233
Email: rjwhitch@gw.dec.state.ny.us

Appendix G

Quality Assurance Project Plan / Field Sampling Plan

GENERIC QUALITY ASSURANCE
PROJECT PLAN AND FIELD SAMPLIGN PLAN

Prepared for:

Former Chromalloy Facility

West Nyack, NY

Site No. 334039

Prepared by:

TRC Engineers, Inc.

APRIL 2014

GENERIC QUALITY ASSURANCE PROJECT PLAN

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

List of Tables

List of Appendices

1.0 INTRODUCTION

The purpose of this Generic Quality Assurance Project Plan (QAPP) is to describe the detailed sample collection and analytical procedures that, when implemented, will result in the acquisition of documented, high-quality valid data. The QAPP provides general information and references standard operating procedures applicable to the analytical sampling program detailed in each site-specific Work Plan. This information includes definitions and generic goals for data quality and required types and quantities of Quality Assurance/Quality Control (QA/QC) samples. The procedures address field documentation; sample handling, custody, and shipping; instrument calibration and maintenance; auditing; data reduction, validation, and reporting; corrective action requirements; and QA/QC reporting specific to the analyses performed by the contracted laboratory.

The field sampling program may include some or all of the following specific activities and environmental matrices:

- Background soil sampling;
- Surface soil sampling;
- Exploratory test pits and subsurface soil sampling;
- Soil borings and subsurface soil sampling;
- Soil vapor survey;
- Geophysical survey;
- Surface water, sediment and wetland sampling;
- On-site field screening analysis of surface and subsurface soil utilizing immunoassay colorimetric quantification;
- Monitoring well installations;
- Groundwater sampling;
- Bedrock core sampling;

- In-situ hydraulic conductivity testing and short-term aquifer testing;
- Downhole logging;
- Geotechnical logging and analyses;
- Air screening survey;
- Ambient air sampling;
- Indoor air sampling;
- Vapor Intrusion Sampling; and
- Investigative-derived waste characterization and handling.

If any of the collection procedures, sample analysis or sample matrices are modified for a specific site investigation, detailed information regarding the changes and rationale for the change will be provided in a Site-Specific QAPP.

This document has been prepared in conformance with the NYSDEC guidelines for preparation of QA/QC Plans, including the 2005 Analytical Services Protocol (ASP).

2.0 DATA USE OBJECTIVES

The data generated from the field investigations will be used to determine the nature, extent and source(s) of contamination at the site, prepare a qualitative human health risk and environmental assessment/site hazard assessment, and develop a cost-effective, environmentally sound, long-term remediation plan consistent with the planned use of the site. The data will also be utilized to monitor for the health and safety of workers at the site and potential off-site receptors.

2.1 Data Quality Requirements and Assessment

Data quality requirements and assessments are provided in the 2005 NYSDEC ASP, which includes the detection limit for each parameter and sample matrix. Note that quantification limits, estimated accuracy, accuracy protocol, estimated precision and precision protocol are determined by the laboratory and will be in conformance with the requirements of the 2005 NYSDEC ASP, where applicable. Table 2-1 presents a summary of the data quality requirements.

Table 2-1

DATA QUALITY REQUIREMENTS

Parameter	Sample Matrix	CRDL*	Estimated Accuracy	Accuracy Protocol**	Estimated Precision	Precision Protocol**
Volatile Organics	Liquid Solid	10 10	0.87 - 1.18 ug/l	Vol. IV, Part XIX, Method 8260, Table 7	0.11 - 0.84 ug/l	Vol. IV, Part XIX, Method 8260, Table 7
Base Neutrals	Liquid Solid	10-50 330-1600	0.29 - 1.23 ug/l	Vol. IV, Part XIX, Method 8270, Table 7	0.13 - 1.05 ug/l	Vol. IV, Part XIX, Method 8270, Table 7
Acid Extractables	Liquid Solid	10-50 330-1600	0.29 - 1.23 ug/l	Vol. IV, Part XIX, Method 8270, Table 7	0.13 - 1.055 ug/l	Vol. IV, Part XIX, Method 8270, Table 7
Pesticides/PCBs	Liquid Solid	0.5-1.0 8.0-160	0.66 - 0.97 ug/l	Vol. IV, Part XIX, Method 8081/8082, Table 4	0.15 - 0.47 ug/l	Vol. IV, Part XIX, Method 8081/8082, Table 4
Metals	Liquid Solid	0.2-5000 0.2-5000	--	Vol. III, Part XIV, Method 200.7*** Table 4	--	Vol. III, Part XIV, Method 200.7*** Table 4
Cyanide	Liquid Solid	10 10	85% - 102% of recovery	Vol. III, Part XV, Method 335.2, Subpart 10	±0.005 - +0.094 mg/l	Vol. III, Part XV, Method 335.2, Subpart 10

*Contract Required Detection Limits - units are ug/l for liquid samples, ug/kg for solid samples.
** Reference: NYSDEC 7/05 ASP.
***If trace ICP is not used, then SW-846 Methods for:

Metal	Method
Selenium	7740
Lead	7421
Thallium	7841
Mercury	7470
Arsenic	7060

Table 2-1 (continued)

DATA QUALITY REQUIREMENTS
OBJECTIVES FOR PRECISION, ACCURACY, AND COMPLETENESS

Matrix/Parameter	Precision (%)	Accuracy (%)
Soil/Sediment		
VOCs[a]	See Table 2-1a	See Table 2-1a
Extractables[a]	See Table 2-1b	See Table 2-1b
Pesticides/PCBs	See Table 2-1c	See Table 2-1c
Metals[b][c]	± 25	75-125
Water		
VOCs[a]	See Table 2-1a	See Table 2-1a
Extractables[a]	See Table 2-1b	See Table 2-1b
Pesticides/PCBs	See Table 2-1c	See Table 2-1c
Metals[b][c]	± 25%	75-125

NOTES:

(a) Accuracy will be determined as percent recovery of surrogate spike compounds and matrix spike compounds. Surrogate and matrix spike compounds for VOCs, extractables, and pesticides/PCBs are listed in Table 2-2a, 2-2b and 2-2c, respectively. Precision will be estimated as the relative standard deviation of the percent recoveries per matrix.

(b) Accuracy will be determined as percent recovery of matrix spikes when appropriate or the percent recovery of a QC sample if spiking is inappropriate. Precision will be determined as relative percent difference of matrix spike duplicate samples, or duplicate samples if spiking is inappropriate.

(c) Precision will be determined as the average percent difference for replicate samples. Accuracy will be determined as the percent recovery of matrix spike samples or laboratory control samples, as appropriate.

Source: 2005 NYSDEC ASP

Table 2-1a

DATA QUALITY REQUIREMENTS
ACCURACY REQUIREMENTS FOR VOCs

	Spike Recovery Limits (%) Water	Spike Recovery Limits (%) Low/Medium Soil
Surrogate Compound		
Toluene-d8	88-110	84-138
4-Bromofluorobenzene	86-115	59-113
1,2-Dichloroethane-d4	76-114	70-121
Matrix Spike Compound		
1,1-Dichloroethene	61-145	59-172
Trichloroethane	71-120	62-137
Chlorobenzene	75-130	60-133
Toluene	76-125	59-139
Benzene	76-127	66-142

Source: NYSDEC ASP

Table 2-1b

**DATA QUALITY REQUIREMENTS
OBJECTIVES FOR PRECISION AND ACCURACY
OF EXTRACTABLE COMPOUNDS
BASED UPON RECOVERY OF SURROGATE AND
MATRIX SPIKE COMPOUNDS***

Surrogate Compounds	Matrix	Precision	Accuracy %
d5-Nitrobenzene	Water	≤ 20	35-114
	Solid	≤ 25	23-120
2-Fluorobiphenyl	Water	≤ 20	43-116
	Solid	≤ 25	30-115
d14-Terphenyl	Water	≤ 20	33-141
	Solid	≤ 25	18-137
d5-Phenol	Water	≤ 20	10-110
	Solid	≤ 25	24-113
2-Fluorophenol	Water	≤ 20	21-110
	Solid	≤ 25	25-121
2,4,6-Tribromophenol	Water	≤ 20	10-123
	Solid	≤ 25	19-122
2-Chlorophenol-d4 (Advisory)	Water	≤ 20	33-110
	Solid	≤ 25	20-130
1,2-Dichlorobenzene-d4 (Advisory)	Water	≤ 20	16-110
	Solid	≤ 25	20-130

Table 2-1b (continued)

DATA QUALITY REQUIREMENTS
OBJECTIVES FOR PRECISION AND ACCURACY
OF EXTRACTABLE COMPOUNDS
BASED UPON RECOVERY OF SURROGATE AND
MATRIX SPIKE COMPOUNDS*

	Matrix	Precision	Accuracy %
Matrix Spike Compounds			
1,2,4-Trichlorobenzene	Water	≤ 20	39-98
	Solid	≤ 25	38-107
Acenaphthene	Water	≤ 20	46-118
	Solid	≤ 25	31-137
2,4-Dinitrotoluene	Water	≤ 20	24-96
	Solid	≤ 25	28-89
Pyrene	Water	≤ 20	26-127
	Solid	≤ 25	35-142
N-Nitroso-Di-n-Propylamine	Water	≤ 20	41-116
	Solid	≤ 25	41-126
1,4-Dichlorobenzene	Water	≤ 20	36-97
	Solid	≤ 25	28-104
Pentachlorophenol	Water	≤ 20	9-103
	Solid	≤ 25	17-109
Phenol	Water	≤ 20	12-110
	Solid	≤ 25	26-90
2-Chlorophenol	Water	≤ 20	27-123
	Solid	≤ 25	25-102

Table 2-1b (continued)

DATA QUALITY REQUIREMENTS
OBJECTIVES FOR PRECISION AND ACCURACY
OF EXTRACTABLE COMPOUNDS
BASED UPON RECOVERY OF SURROGATE AND
MATRIX SPIKE COMPOUNDS*

	Matrix	Precision	Accuracy %
Matrix Spike Compounds (continued)			
4-Chloro-3-methylphenol	Water	≤ 20	23-97
	Solid	≤ 25	26-103
4-Nitrophenol	Water	≤ 20	10-80
	Solid	≤ 25	11-114

* Accuracy will be determined as percent recovery of these compounds. Precision will be estimated as the relative standard deviation of the percent recoveries per matrix.

Source: NYSDEC ASP

Table 2-1c

ADVISORY RECOVERY LIMITS
SURROGATE AND MATRIX SPIKE COMPOUNDS
FOR PESTICIDES/PCBs*

	Advisory Recovery Limits (%)	
	Water	Soil/Sediment
Surrogate Compound		
Decachlorobiphenyl	60-150	60-150
Tetrachloro-m-xylene	60-150	60-150
Matrix Spike Compound		
Lindane	56-123	46-127
Heptachlor	40-131	35-130
Aldrin	40-120	34-132
Dieldrin	52-126	31-134
Endrin	56-121	42-139
4,4'-DDT	38-127	23-134

*Samples do not have to be reanalyzed if these recovery limits are not met.

Source: NYSDEC ASP

In addition to meeting the requirements provided in the 2005 NYSDEC ASP, the data must be of sufficient quality to ensure that sampling data accurately characterizes site conditions. Data obtained during the site investigations will be compared to specific Standards, Criteria and Guidelines (SCGs). The SCGs to be utilized on a preliminary basis for screening purposes include:

Matrix	**SCG**
Groundwater and Surface Water	NYSDEC Division of Water Technical and Operational Guidance Series (TOGs) (1.1.1) - Ambient Water Quality Standards and Guidance Values, dated June 1998, addendum April 2000.
Surface and Subsurface Soil, Sediment and Sludge	NYSDEC 6 NYCRR Subpart 375-6 Remedial Program Soil Cleanup Objectives, effective December 14, 2006.
	AND
	NYSDEC Commissioner Policy CP-51 on Soil Cleanup Guidance, effective December 3, 2010.
Air	NYSDEC DAR-1, Guidelines for the Control of Toxic Ambient Air Contaminants, dated November 1997* and Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York dated October 2006.

* Including Complete and HAP Listings, AGCs, SGCs and Air Quality Standards for the DAR-1 Software Program.

Final selection of SCGs for site remediation and development will be based on the intended use of the property, potential receptors and potential contaminant migration pathways. These SCGs would consider the United States Environmental Protection Agency (USEPA) Region III Risk-Based Concentration Table.

The methods of analysis will be in accordance with the 2005 NYSDEC ASP. Specific analytical procedures and laboratory QA/QC descriptions are not included in this QAPP Plan, but will be available upon request from the laboratory selected to perform the analyses. The laboratory will be New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certified for organic and inorganic analyses.

2.1.1 Data Precision

Precision is the mutual agreement among individual measurements of the same property and is a measure of the random error component of the data collection process. The overall precision of the data is the sum of that due to sampling and analysis. The sampling precision is assessed by the collection of field duplicates. To determine the analytical precision of the method and/or laboratory analyst, a routine program of laboratory control sample analyses is performed and precision is determined using a moving range value. The results of the replicate sample analyses are used to calculate the relative percent difference (RPD), which is then used to evaluate precision associated with sampling and analysis.

For replicate results R_1 and R_2:

$$RPD = (2[R_1 - R_2]/ [R_1 + R_2]) \times 100$$

2.1.2 Data Accuracy

Accuracy is the agreement between a measurement and the true value. It is a measure of the bias or systematic error of the entire data collection process. Sampling accuracy is assessed by evaluating the results of field and trip blank samples. To determine the accuracy of an analytical method and/or the laboratory analyst, a periodic program of laboratory control sample spiking is conducted. The results of sample spiking are used to calculate the percent recovery (%R) as a measurement bias associated with the sample matrix.

$$\%R = 100(S_1 - S_2]/ T_1$$

where

S_1 = Observed spiked sample concentration;

S_2 = Sample concentration without spike addition; and,

T_1 = True concentration of the spike.

2.1.3 Data Representativeness

Representativeness is the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a quantitative parameter that is used to assess the design and implementation of the sampling program. The sampling program has been designed so that the samples collected are as representative as possible of the medium being sampled and that a sufficient number of samples will be collected. Representativeness is addressed by the description of the sampling techniques and the rationale used to select the sampling locations.

Representative samples will be collected as follows:

- Soil Vapor - Samples will be collected from decontaminated stainless steel or dedicated tubing soil probes after the soil vapor has reached equilibrium. Samples will be collected using a certified clean Summa canister with dedicated regulator and polyethylene tubing. See Section 6.3, Soil Vapor Collection Procedures.

- Surface Soil - Samples will be collected at a depth of 0-6 inches using a dedicated polystyrene scoop or sterile wooden tongue depressor.

- Concrete Chip – Samples will be collected at a depth of 0-2 inches using a decontaminated chisel.

- Subsurface Soil (Test Pit) - Samples will be collected from the center of the decontaminated bucket of the backhoe using a dedicated scoop or sterile wooden tongue depressor.

- Subsurface Soil (Monitoring Well/Soil Boring) - Samples will be collected using a decontaminated steel split spoon sampler during monitoring well or soil boring construction.

- Subsurface Soil (Probe) - Samples will be collected using a decontaminated screen point sampler and dedicated acetate tube liner.

- Sediment/Sludge (Dry Well/Drainage System) - Samples will be collected from the center of the dry well, wastewater disposal/sanitary system, or catch basin and storm drain (if possible) after the drainage/storm water sample is obtained in order not to introduce sediment into the water column. Samples will be collected utilizing a decontaminated long handle scoop (if possible) or from a soil probe or split spoon sampler.

- Wastewater/Drainage Water - Samples will be collected from the center of the wastewater disposal/sanitary system (if possible) and at a depth of 6 inches below the surface of standing water (if possible) using a dedicated disposable bailer or decontaminated long handle scoop.

- Storm Water - Samples will be collected from the center of the drainage system or storm drain (if possible) at a depth of 6 inches below the surface of standing water (if possible) using a dedicated polyethylene bailer or decontaminated polyethylene scoop.

- Groundwater (Probe) - Samples will be collected immediately upon installation of the probe using dedicated tubing equipped with a bottom check valve.

- Groundwater (Hydropunch) - Samples will be collected immediately upon installation of the hydropunch screen using a dedicated small diameter bailer or hydropunch sampler.

- Groundwater (Monitoring Well) - Samples will be collected with a dedicated/disposable bailer or decontaminated low-flow submersible pump after the monitoring well has been purged of three to five well casing volumes until field measurements for pH, conductivity, temperature and turbidity have stabilized, or until the well is purged dry (whichever comes first) and the well has been allowed to recharge.

- Water Supply - Samples will be collected from the water supply wells, from an accessible point prior to any treatment systems (if possible) and will be collected directly into the sample container.

- Air (Ambient/Indoor)- Samples will be collected using a certified clean Summa canister equipped with a dedicated flow regulator.

- Equipment Calibration - Field equipment used for air monitoring will be calibrated daily before use according to the manufacturer's procedures.

- Equipment Decontamination – Non-dedicated sampling equipment will be decontaminated prior to use at each location according to the procedures described in Section 7.0 of this QAPP Plan.

2.1.4 Data Comparability

Comparability is the extent to which comparisons among different measurements of the same quantity or quality will yield valid conclusions. For NYSDEC projects, comparability among measurements will be achieved through the use of standard procedures and uniform concentration units. All data will be presented in the units designated by the methods specified by a NYSDOH ELAP certified laboratory, and the 2005 NYSDEC ASP. In addition, sample locations, collection procedures and analytical methods from earlier studies will be evaluated for comparability with current procedures/methods.

2.1.5 Data Completeness

Completeness is the adequacy in quantity of valid measurements to prevent misinterpretation and to answer important questions. Percent completeness is calculated as the ratio of usable data to total data. The acceptability of 100% of the data is desired as a goal for this project. The acceptability of less than 100% complete data, meeting all laboratory QA/QC protocols/ standards, will be evaluated on a case-by-case basis.

3.0 SAMPLING DESIGN

The following presents a general discussion of the sampling that may be conducted during field investigations for work assignments.

- Soil Vapor - Soil vapor samples will be collected during soil vapor surveys or subslab sampling programs to locate/confirm the source and extent of contamination on-site.

- Surface Soil - Surface soil samples will be collected on-site to determine the nature and extent of on-site surface soil contamination.

- Subsurface Soil - Subsurface soil samples will be collected during construction of monitoring wells and borings, test pits or at direct-push probe locations to determine the nature and extent of on-site subsurface soil contamination.

- Sediment/Sludge - Sediment and sludge samples will be collected from dry wells, storm drainage systems and/or wastewater disposal/sanitary systems located on-site to determine if collection/disposal systems are a source of contamination.

- Wastewater/Drainage Water - Waste water and drainage water samples will be collected from dry wells and/or wastewater disposal/sanitary systems located on-site to determine if these wells/systems are a source of contamination.

- Storm Water - Storm water samples will be collected from catch basins and storm drains located on-site to determine if the storm water system has been contaminated or is a source of contamination.

- Groundwater - Groundwater samples will be obtained from monitoring wells, direct-push probes or hydropunch sampling devices, which will be installed as part of the site investigation, or from monitoring wells, which were installed previously at the site, to determine if disposal of waste material on-site has impacted groundwater.

- Water Supply - Water supply samples will be collected from private water supply systems to determine if these systems are impacted by on-site (or off-site) contamination.

- Air - Ambient air samples will be collected on-site, particularly in structures, to determine potential exposure to vapor emissions as a result of on-site waste disposal or contaminated soil and/or groundwater underlying the site.

4.0 SAMPLING AND ANALYSES

4.1 Field Duplicates

Field duplicate samples may be collected to demonstrate the accuracy of field screening and un-validated laboratory data with limited analytical deliverables. If all environmental samples are analyzed by ASP methods, duplicate samples (if collected) will be taken at a frequency of at least 5% (1 in 20). However, if duplicate samples are collected for confirmation of field screening and laboratory data with limited analytical deliverables, at least 20% of the samples will be verified with duplicate samples analyzed by ASP methods for Target Analyte List (TAL) and Target Compound List (TCL) analytes. These ASP method duplicate sample requirements apply to each distinct matrix.

4.2 Matrix Spikes/Matrix Spike Duplicates and Spiked Blanks

Matrix spike samples are quality control procedures, consistent with 2005 NYSDEC ASP specifications, used by the laboratory as part of its internal Quality Assurance/Quality Control program. The matrix spikes (MS) and matrix spike duplicates (MSD) are aliquots of a designated sample (water or soil) which are spiked with known quantities of specified compounds. MS/MSD samples are used to evaluate the matrix effect of the sample upon the analytical methodology, as well as to determine the precision of the analytical method used. Samples to be analyzed as MS/MSDs may be designated in the field (that is, additional aliquots of a particular sample from the site may be collected) or they may be selected by the laboratory.

A matrix spike blank is an aliquot of analyte-free water, prepared in the laboratory, and spiked with the same solution used to spike the MS and MSD. The matrix spike blank (MSB) will be subjected to the same analytical procedure as the MS/MSD and used to indicate the appropriateness of the spiking solution by calculating the spike compound recoveries. The procedure and frequency regarding the MS, MSD and MSB samples are defined in the NYSDEC ASP.

4.3 Analytical Parameters

All soil, sediment, or surface water samples collected supplemental remedial activities or at the request of the Department will be properly labeled and shipped under chain of custody documentation to the laboratory for analysis. Unless noted otherwise, all samples will be analyzed by a NYSDOH Environmental Laboratory Accreditation Program (ELAP) approved laboratory by an analytical method utilizing the most current NYSDEC Analytical Services Protocol (ASP) for the following Department of Environmental Remediation (DER)-10 required analytical parameters:

- Target compound list (TCL) volatile organic compounds (VOCs) plus the 10 highest concentration tentatively identified compounds (TICs)
- TCL SVOCs plus 20 TICs;
- TCL Pesticides and Herbicides;
- TCL PCBs;
- Target Analyte List (TAL) metals;
- Cyanide;
- For investigations of known petroleum releases, utilize the suite of contaminants in the fuel oil and gasoline tables (i.e., Tables 2 and 3) of the NYSDEC Commissioner Policy CP-51 on Soil Cleanup Guidance and Spill Guidance Manual; and,
- For investigations of non-petroleum releases, sample analysis will use methods appropriate for the stored or discharged material.

When sampling soil vapor, sub-slab vapor, crawl space air, indoor air or outdoor air, all samples will be analyzed by a NYSDOH ELAP approved laboratory in accordance with USEPA approved analytical methods utilizing the most current version of NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (Issued October 2006)

Table 4-1 presents a summary of the parameters/sample fraction to be analyzed together with the sample location, type of sample, sample matrix, type of sample container, method of sample preservation, holding time and analytical method. Superfund category deliverables are required for all analytical results in order to perform complete validation of the results.

4.4 Field Blank (Field Rinsate Blank)/Equipment Blank

Field blanks are samples of water used for field decontamination purposes. Specifically, field blanks will include potable, site-supplied water used in decontamination activities and laboratory-supplied, reagent-grade, deionized water used for the final rinse in decontamination activities. Based upon discussions with the NYSDEC, field blanks will not be required for field investigations in which dedicated, disposable sampling equipment (for example, bailers or sterile scoops) are being utilized for sample collection. However, an equipment blank is required when a split spoon is utilized since it will be decontaminated on-site after each use. Equipment blanks will be collected at a rate of one per day and analyzed for the same parameters as that of the samples collected with that equipment. The equipment blank will be collected by pouring laboratory supplied deionized water over/through the decontaminated equipment early in the field effort to assess the quality of the potable water supply used in decontamination activities.

4.5 Trip Blanks (Travel Blanks)

Trip blanks are containers of reagent-grade deionized water which are kept with the field sample containers from the time they leave the laboratory until the time they are returned to the laboratory. The primary purpose of a trip blank is to detect sources of contamination which may be introduced into the sample during sample collection or transit that might potentially influence contaminant values reported in actual samples, both quantitatively and qualitatively. The following have been identified as potential sources of contamination:

Table 4-1

SUMMARY OF MONITORING PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Container Type/Size/No.	Sample Preservation	Maximum Holding Time	Analytical Method
On-site/ Off-site	Grab	Ambient Air	Volatile Organics	Certified Clean Summa Canister	None	7 days	EPA/600/4-89/017 Method T015
On-site/ Off-site	Grab	Soil Vapor	Volatile Organics	Certified Clean Summa Canister	None	7 days	EPA/600/4-89/017 Method T015

*Holding time based upon VTSR (Verified Time of Sample Receipt).

Table 4-1 (continued)

SUMMARY OF MONITORING PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Container Type/Size/No.	Sample Preservation	Maximum Holding Time*	Analytical Method
Water Supply Wells, Monitoring Wells, and Probe and Hydropunch Locations	Grab	Groundwater	Volatile Organics	Glass, clear/ 40 mL/3 ICHEM 300 series or equivalent	Cool to 4°C or	5 days after VTSR for analysis	7/05 NYSDEC ASP, Method 8260B
	Grab	Groundwater	Base Neutral and Acid Extractable Organics	Glass, amber/ 1L/2 ICHEM 300 series or equivalent	Cool to 4°C	5 days after VTSR for extraction, 40 days after extraction for analysis	7/05 NYSDEC ASP, Method 8270C
	Grab	Groundwater	Pesticides/PCBs	Glass, amber/ 1L/2 ICHEM 300 series or equivalent	Cool to 4°C	5 days after VTSR for extraction, 40 days after extraction for analysis	7/05 NYSDEC ASP, Method 8081A/8082
	Grab	Groundwater	Metals	Plastic/1L/1 ICHEM 300 series or equivalent	HNO_3 to pH <2 Cool to 4°C	26 days after VTSR for Hg analysis, 6 months after VTSR for analysis of others	7/05 NYSDEC ASP, Method 6010/7470A**
	Grab	Groundwater	Cyanide	Plastic/1L/1 ICHEM 300 series or equivalent	NaOH to pH >12 Cool to 4°C	12 days after VTSR for analysis	7/05 NYSDEC ASP, Method 9010B

VTSR - Verified Time of Sample Receipt at the laboratory

*Holding times based on the NYSDEC 7/05 ASP

**If Trace ICP is not used then SW-846 Methods for:

Metal	Method
Selenium	7740
Lead	7421
Thallium	7841
Mercury	7470
Arsenic	7060

Table 4-1 (continued)

SUMMARY OF MONITORING PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Container Type/Size/No.	Sample Preservation	Maximum Holding Time*	Analytical Method
Dry Wells, Storm Drainage Systems, and Wastewater Disposal/Sanitary Systems	Grab	Sediment/Sludge	Volatile Organics	Glass, clear/ 40 mL/2 ICHEM 200 series or equivalent	Cool to 4°C	5 days after VTSR for analysis	7/05 NYSDEC ASP, Method 8260B
	Grab	Sediment/Sludge	Base Neutral and Acid Extractable Organics	Glass, amber/ 150 mL/1 ICHEM 200 series or equivalent	Cool to 4°C	5 days after VTSR for extraction, 40 days after extraction for analysis	7/05 NYSDEC ASP, Method 8270C
	Grab	Sediment/Sludge	Pesticides/PCBs	Glass, amber/ 150 mL/1 ICHEM 200 series or equivalent	Cool to 4°C	5 days after VTSR for extraction, 40 days after extraction for analysis	7/05 NYSDEC ASP, Method 8081A/8082
	Grab	Sediment/Sludge	Metals	Glass, amber/ 150 mL/1 ICHEM 200 series or equivalent	Cool to 4°C	26 days after VTSR for Hg analysis, 6 months after VTSR for analysis of others	7/05 NYSDEC ASP, Method 6010/7471A**
	Grab	Sediment/Sludge	Cyanide	Glass, amber/ ICHEM 200 series or equivalent	Cool to 4°C	12 days after VTSR for analysis	7/05 NYSDEC ASP, Method 9010B

VTSR - Verified Time of Sample Receipt at the laboratory

*Holding times based on the NYSDEC 7/05 ASP

**If Trace ICP is not used then SW-846 Methods for:

Metal	Method
Selenium	7740
Lead	7421
Thallium	7841
Mercury	7470
Arsenic	7060

Table 4-1 (continued)

SUMMARY OF MONITORING PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Container Type/Size/No.	Sample Preservation	Maximum Holding Time*	Analytical Method
On-site Off-site Soil	Grab	Surface Soil	Volatile Organics	Glass, clear/ 40 mL/2 ICHEM 200 series or equivalent	Cool to 4°C	5 days after VTSR for analysis	7/05 NYSDEC ASP, Method 8260B
	Grab	Surface Soil	Base Neutral and Acid Extractable Organics	Glass, amber/ 150 mL/1 ICHEM 200 series or equivalent	Cool to 4°C	5 days after VTSR for extraction, 40 days after extraction for analysis	7/05 NYSDEC ASP, Method 8270C
	Grab	Surface Soil	Pesticides/PCBs	Glass, amber/ 150 mL/1 ICHEM 200 series or equivalent	Cool to 4°C	5 days after VTSR for extraction, 40 days after extraction for analysis	7/05 NYSDEC ASP, Method 8081A/8082
	Grab	Surface Soil	Metals	Glass, amber/ 150 mL/1 ICHEM 200 series or equivalent	Cool to 4°C	26 days after VTSR for Hg analysis, 6 months after VTSR for analysis of others	7/05 NYSDEC ASP, Method 6010B/7471A**
	Grab	Surface Soil	Cyanide	Glass, amber/ ICHEM 200 series or equivalent	Cool to 4°C	12 days after VTSR for analysis	7/05 NYSDEC ASP, Method 9010B

VTSR - Verified Time of Sample Receipt at the laboratory

*Holding times based on the NYSDEC 7/05 ASP

**If Trace ICP is not used then SW-846 Methods for:

Metal	Method
Selenium	7740
Lead	7421
Thallium	7841
Mercury	7470
Arsenic	7060

Table 4-1 (continued)

SUMMARY OF MONITORING PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Container Type/Size/No.	Sample Preservation	Maximum Holding Time*	Analytical Method
Monitoring Wells Soil Borings, and Probe and Hydropunch Locations	Grab	Subsurface Soil	Volatile Organics	Glass, clear/ 40 mL/2 ICHEM 200 series or equivalent	Cool to 4°C	5 days after VTSR for analysis	7/05 NYSDEC ASP, Method 8260B
	Grab	Subsurface Soil	Base Neutral and Acid Extractable Organics	Glass, amber/ 150 mL/1 ICHEM 200 series or equivalent	Cool to 4°C	5 days after VTSR for extraction, 40 days after extraction for analysis	7/05 NYSDEC ASP, Method 8270C
	Grab	Subsurface Soil	Pesticides/PCBs	Glass, amber/ 150 mL/1 ICHEM 200 series or equivalent	Cool to 4°C	5 days after VTSR for extraction, 40 days after extraction for analysis	7/05 NYSDEC ASP, Method 8081A/8082
	Grab	Subsurface Soil	Metals	Glass, amber/ 150 mL/1 ICHEM 200 series or equivalent	Cool to 4°C	26 days after VTSR for Hg analysis, 6 months after VTSR for analysis of others	7/05 NYSDEC ASP, Method 6010B/7471A**
	Grab	Subsurface Soil	Cyanide	Glass, amber/ 150 mL/1 ICHEM 200 series or equivalent	Cool to 4°C	12 days after VTSR for analysis	7/05 NYSDEC ASP, Method 9010B

VTSR - Verified Time of Sample Receipt at the laboratory

*Holding times based on the NYSDEC 7/05 ASP

**If Trace ICP is not used then SW-846 Methods for:

Metal	Method
Selenium	7740
Lead	7421
Thallium	7841
Mercury	7470
Arsenic	7060

Table 4-1 (continued)

SUMMARY OF MONITORING PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Container Type/Size/No.	Sample Preservation	Maximum Holding Time*	Analytical Method
Site	Trip Blank	Water	Volatile Organics	Glass, clear/ 40 mL/2 ICHEM 300 series or equivalent	Cool to 4°C	5 days after VTSR for analysis	7/05 NYSDEC ASP, Method 8260B

VTSR - Verified Time of Sample Receipt at the laboratory

- Laboratory reagent water;
- Sample containers;
- Cross contamination in shipment;
- Ambient air or contact with analytical instrumentation during preparation and analysis at the laboratory; and
- Laboratory reagents used in analytical procedures.

A trip blank will consist of a set of 40 ml sample vials filled at the laboratory with laboratory demonstrated analyte free water. Trip blanks will be handled, transported and analyzed in the same manner as the samples acquired that day, except that the sample containers themselves are not opened in the field. Rather, these sample containers only travel with the sample cooler. The temperature of the trip blanks will be maintained at 4°C while on-site and during shipment. Trip blanks will return to the laboratory with the same set of bottles they accompanied in the field.

The purpose of a trip blank is to control sample bottle preparation and blank water quality as well as sample handling. Thus, the trip blank will travel to the site with the empty sample bottles and back from the site with the collected samples in an effort to simulate sample handling conditions. Contaminated trip blanks may indicate inadequate bottle cleaning or blank water of questionable quality. Trip blanks will be implemented only when collecting water samples, including field blanks, and analyzed for volatile organic compounds only.

4.6 Method Blanks/Holding Blanks

A method blank is an aliquot of laboratory water or soil which is spiked with the same internal and surrogate compounds as the samples. The purpose of the method blank is to define and determine the level of laboratory background contamination. Frequency, procedure and maximum laboratory containment concentration limits are specified in the 2005 NYSDEC ASP. A holding blank is an aliquot of analyte-free water that is stored with the environmental samples in order to demonstrate that the samples have not been contaminated during laboratory storage. This blank will be analyzed using the same analytical procedure as the samples.

5.0 STANDARD OPERATING PROCEDURES

Environmental samples will be collected from different locations as part of the field investigation. These may include but are not limited to: groundwater, wastewater, storm/drainage water, sediment/sludge, subsurface soil, surface soil, soil vapor and ambient air, concrete chips and/or cores, wipes. Sample locations will consist of monitoring wells, water supply wells, dry wells, wastewater disposal/sanitary systems, direct push probe locations, hydropunch locations, storm water drainage systems, soil borings, surface soils, test pits, soil vapor points and ambient air. Actual locations will be determined on a site-specific basis.

General sampling approaches and equipment are described in this section. A summary of the sampling program, including sample media, depths, equipment, rationale and analytical parameters, is provided in Table 5-1.

When taking soil samples, an attempt will be made to maintain sample integrity by preserving its physical form and chemical composition to as great an extent as possible. An appropriate sampling device (i.e., decontaminated or dedicated equipment) will be utilized to transfer the sample into the sample container. The sample will reflect and contain a good representation of the matrix from which it was collected. The sample will be transferred into the sample container as quickly as possible, with no mixing, to ensure that the volatile fraction is not lost.

The materials involved in groundwater sampling are critical to the collection of high quality monitoring information, particularly where the analyses of volatile, pH sensitive or reduced chemical constituents are of interest. The materials for bailers and pump parts will be PTFE (e.g., Teflon®), stainless steel and/or polyethylene.

Table 5-1

SUMMARY OF SAMPLING PROGRAM

Environmental Media	Sample Location	Sample Point	Sample Depth	Equipment	Rationale	Sample Analysis
Soil Vapor	On-site or Off-site	Soil vapor survey point	3 feet below soil surface	Decontaminated or disposable soil vapor rods/ tubing, dedicated regulator and certified clean Summa canister	To determine subsurface contamination	TCL volatile parameters EPA 600/4-89/017 Method T015
Surface Soil	On-site or Off-site	Throughout site	0-6 inches below soil surface	Disposable polyethylene scoop and/or sterile wooden tongue depressor	To determine surface soil contamination	TCL +30 and TAL parameters + CN 2005 NYSDEC ASP
Subsurface Soil	On-site or Off-site	Test pit	Dependent on visual charac- teristics and total organic vapor field screening	Decontaminated backhoe bucket, disposable polyethylene scoop and sterile wooden tongue depressor	To determine subsurface soil contamination	TCL +30 and TAL parameters + CN 2005 NYSDEC ASP
Sediment/Sludge	On-site or Off-site	Dry well/catch basin/wastewater/ sanitary system/storm drain	0-6 inches below sediment surface	Decontaminated polyethylene scoop or split spoon sampler	To determine sediment contamination	TCL +30 and TAL parameters + CN 2005 NYSDEC ASP
Wastewater	On-site or Off-site	Wastewater/ Sanitary System	6 inches below water surface	Decontaminated long handle polyethylene scoop or polyethylene bailer	To determine drainage wastewater contamination	TCL +30 and TAL parameters + CN 2005 NYSDEC ASP
Drainage/Storm Water	On-site or Off-site	Dry well/catch basin/ storm drain	6 inches below water surface	Decontaminated long handle polyethylene scoop or polyethylene bailer	To determine storm water contamination	TCL +30 and TAL parameters + CN 2005 NYSDEC ASP

Table 5-1 (continued)

SUMMARY OF SAMPLING PROGRAM

Environmental Media	Sample Location	Sample Point	Sample Depth	Equipment	Rationale	Sample Analysis
Subsurface Soil	On-site or Off-site	Monitoring well borehole/soil boring	Dependent on visual charac-teristics and total organic vapor field screening	Auger, decontaminated split spoon and sterile wooden tongue depressor and decontaminated stainless steel tools	To determine subsurface soil contamination	TCL +30 and TAL parameters + CN 2005 NYSDEC ASP
Subsurface Soil	On-site or Off-site	Probe location	Dependent on visual charac-teristics and total organic vapor field screening	Decontaminated probe and polyethylene tube liner	To determine subsurface soil contamination	TCL +30 and TAL parameters + CN 2005 NYSDEC ASP
Groundwater	On-site or Off-site	Probe location	At surface of water in probe	Disposable polyethylene tubing with bottom check valve	To determine groundwater contamination	TCL +30 and TAL parameters + CN 2005 NYSDEC ASP
Groundwater	On-site or Off-site	Hydropunch location	At surface of water in screen	Disposable polyethylene - small diameter bailer	To determine groundwater contamination	TCL +30 and TAL parameters + CN 2005 NYSDEC ASP
Groundwater	On-site or Off-site	Monitoring well	At surface of water in well	Disposable polyethylene bailer (after purge of three well volumes)	To determine groundwater contamination	TCL +30 and TAL parameters + CN 2005 NYSDEC ASP
Water Supply	On-site or Off-site	Prior to treatment system, if possible, or from faucet	NA	Sample container directly after running water for 5 minutes	To determine water supply contamination	TCL +30 and TAL parameters + CN 2005 NYSDEC ASP
Air	On-site or Off-site	Ambient Air	Breathing Zone	Certified clean Summa canister and dedicated regulator	To determine air contamination and worker exposure	TCL VOC EPA 600/4-89/017 T015

Table 5-1 (continued)

SUMMARY OF SAMPLING PROGRAM

Environmental Media	Sample Location	Sample Point	Sample Depth	Equipment	Rationale	Sample Analysis
Air	On-site	Drilling and sample locations	In the breathing zone and at point of sample collection	Photoionization and/or flame ionization detector	To screen for air contamination	Total organic vapors

NA - Not applicable.

There will be several steps taken after the transfer of the soil or water sample into the sample container that are necessary to properly complete collection activities. Once the sample is transferred into the appropriate container, the container will be capped and, if necessary, the outside of the container will be wiped with a clean paper towel to remove excess sampling material. The container will not be submerged in water in an effort to clean it. Rather, if necessary, a clean paper towel moistened with distilled/deionized water will be used.

The sample container will then be properly labeled. Information such as sample number, location, collection time and sample description will be recorded in the field log book. Associated paper work (e.g., Chain of Custody forms) will then be completed and will stay with the sample. The samples will be packaged in a manner that will allow the appropriate storage temperature to be maintained during shipment to the laboratory. Samples will be delivered to the laboratory within 24 to 48 hours of collection, depending on required analysis.

5.1 Sample Identification

All samples collected will be labeled with a sample identification code that is compatible with the NYSDEC Equis format. The code will identify the site, sample location, sample matrix and series numbers for sample locations with more than one sample. Samples will be labeled according to the following system:

- Site: - Site name (i.e., Hazardous Waste "HW")
- Sample Location:
  - Soil Boring "SB"
  - Monitoring Well "MW"
  - Water Supply "WS"
  - Dry Well "DW"
  - Surface Soil "SS"
  - Hydropunch "H"
  - Probe "P"
  - Test Pit "TP"
  - Wetland "WET"
- Sample Matrix (as listed in NYSDEC EQUIS reference values):
  - AE – Vapor Extraction Well Effluent
  - AI – Indoor Ambient Air
  - AO – Outdoor ambient Air
  - AQ - Air Quality Control Matrix

- AS – Soil Vapor
- CA – Bottom Ash
- CF – Fly Ash Cinder
- DC – Drill Cuttings
- GE – Gaseous Effluent (Stack Gas)
- GL – Headspace of Liquid sample
- LD – Drilling Fluid
- LE – Liquid Emulsion
- LF – Floating/Free Product LNAPL
- LS - DNAPL
- SE - Sediment
- SF – Filter Sandpack
- SL – Sludge
- SN – Miscellaneous Solid Materials
- SO – Soil
- SS – Surface Soil
- SW – Swab or Wipe
- TA – Animal Tissue
- TP –Plant Tissue
- TQ – Tissue Quality Control Matrix
- U – Unknown
- WC – Drilling Water (for well construction)
- WD – Well Development Water
- WE – Estuary – Brackish Surface Water
- WG – Groundwater
- WH – Rinsate
- WI – Interstitial Water
- WL – Leachate
- WO – Ocean Water – Saline Surface Water
- WP – Drinking Water
- WQ - Water Quality Control Matrix
- WS – Surface Water
- WW – Waste Water
- WZ – Special Water Quality Control Matrix

- Sample Number: - For circumstances where more than one sample of the same type and/or from the same location will be collected, a consecutive sample number will be assigned. When more than one sample is collected from a borehole in a sampling round at different depths, the depth will be indicated on the sample container and in the field log book.

- Quality Assurance/ Quality Control (QA/QC):
  - Matrix Spike "MS"
  - Matrix Spike Duplicate "MSD"
  - Field Blank "FB"
  - Trip Blank "TB"

Based upon the above sample identification procedures, an example of a sample label may be:

Site Sample Location QA/QC

HW-SB-SS-1-(5) - MS

Sample Matrix Sample Number Sample Depth

5.2 Sample Handling, Packaging and Shipping

All samples will be placed in the appropriate containers as specified in the 2005 NYSDEC ASP. The holding time criteria identified in the 7/05 NYSDEC ASP Exhibit I will be followed as specified in Table 4-1.

Prior to packaging any samples for shipment, the sample containers will be checked for proper identification and compared to the field log book for accuracy. The samples will then be wrapped with a cushioning material and placed in a cooler (or laboratory shuttle) with a sufficient amount of bagged ice or "blue ice" packs in order to keep the samples at 4°C until arrival at the laboratory.

All necessary documentation required to accompany the sample during shipment will be placed in a sealed plastic bag and taped to the underside of the cooler lid. The cooler will then be sealed with fiber (duct) or clear packing tape, and custody seals will be placed in such a manner that any opening of the cooler prior to arrival at the laboratory can be detected.

All samples will be shipped to ensure laboratory receipt within 24-48 hours of sample collection in accordance with NYSDEC and method specific requirements. The laboratory will be notified prior to the shipment of the samples.

5.3 Soil Vapor

Sample protocols for the collection of soil vapor samples will consist of the following minimum procedures:

1. Be certain that the sample location is noted on Location Sketch (see Section 8.1).
2. Concrete coring may be required prior to advancing the vapor probes. Water will be applied to the coring to prevent dust generation.
3. Drive the decontaminated stainless steel probe with removable inner rod into the ground to the desired depth.
4. Seal the space between the probe rods and ground surface from the ambient air with plastic sheeting and bentonite, bees' wax or modeling clay.
5. The adequacy of the seal must be tested before and after sampling. Place a 5-gallon bucket over the probe rods and seal with plastic sheeting and bentonite, bees' wax or modeling clay. Fill interior of bucket with tracer gas (helium). Monitor probe with a helium gas detector. Readings of less than 10% are sufficient to verify a tight seal.
6. Connect regulator to Summa canister and verify canister vacuum (reading should be -20 to -33 inches Hg).
7. Connect new tubing to the probe and certified clean Summa canister. Open canister/regulator and keep open until pressure gauge reads <5 inches Hg. Samples should be collected at a rate of 0.2 L per minute for a period of 30 minutes.
8. Close valve on canister, disconnect tubing and remove regulator.
9. Record initial and final pressure on Chain of Custody.
10. Extract probe from the ground and decontaminate according to the procedures in Section 6.0.

5.4 Soil (Surface)

Sampling protocols for the collection of surface soil samples will consist of the following minimum procedures:

1. Be certain that the sample location is noted on Location Sketch (see Section 8.1).

2. If a dedicated sampling device is not used, be certain that the sampling equipment has been decontaminated utilizing the procedures outlined in Section 6.0.

3. Remove laboratory precleaned sample container from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form (see Section 8.0).

4. .At the sample location, clear surface debris (e.g., vegetation, rocks, twigs, etc.). Collect sample at a depth of 0 to 2 inches below the vegetative cover. If the area is paved, samples will be collected 0 to 2 inches below the pavement. If VOCs are the only COC, then the surface soil sample will be collected at a depth of 0 to 6 inches below the vegetative cover. If assessing the impact of soil contamination on ecological resources, then the surface soil sample will be collected from a depth of 0 to 6 inches below the vegetative cover and from a deeper soil interval at 1 to 2 feet below ground surface.Collect an adequate amount of soil using a decontaminated or disposable scoop, and/or sterile wooden tongue depressor. Transfer the sample directly into the sample container.

5. Return the sample container to the cooler.

6. If reusable, decontaminate the sampling equipment according to the procedures described in Section 6.0.

7. Place all disposable personal protective equipment and disposable sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

5.5 Sediment

Sediment samples may be collected from a variety of structures and physical features, including but not limited to, the following:

- Surface water bodies such as rivers, natural or man-made streams, lakes, ponds, or wetlands;
- Swales, gullies, culverts, and troughs;
- Catch basins;
- Dry Wells;
- Storm drains;
- Floor drains or associated collection systems;

- Plumbing and piping;
- Trenches;
- Gutters and roof leader discharge points;
- Sumps;
- Storm sewer and spill containment collection systems;
- Boiler and compressor discharges;
- Surface impoundments; and,
- Discharge and waste disposal systems (i.e., above-ground treatment systems, and underground wastewater treatment systems such as tanks, septic tanks, separators, neutralization pits, septic leach fields, cesspools, seepage pits, and dry wells).

Sampling protocols for the collection of sediment samples will consist of the following minimum procedures:

1. Be certain that any nondisposable sampling equipment (e.g., long handle polyethylene scoop, stainless steel tools) has been decontaminated utilizing the procedures outlined in Section 6.0.
2. Remove laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form.
3. Insert scoop slowly at 0-6 inches into the sediment and remove sample. Sample sediment only after surface water samples have been taken to avoid introduction of sediment into the water.
4. If depth to sediment is greater than the reach of a long handled scoop, the sample may need to be collected utilizing the soil probe or split spoon sampler (see Sections 5.8 and 5.9, respectively).
5. With a sterile wooden tongue depressor, decontaminated stainless steel tool or disposable polyethylene scoop, transfer the sample into the open sample container taking care not to spill sample on the outside of the container or overfill container and replace cover on the sample container.
6. Return sample container to sample cooler.

7. If necessary, decontaminate the sampling equipment according to the procedures outlined in Section 6.0.

8. Place all disposable personal protective equipment and disposable sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

5.6 Drainage Water/Wastewater/Storm Water

Drainage water, wastewater and storm water samples may be collected from a variety of structures and physical features, including but not limited to, the following:

- Swales, gullies, culverts, and troughs;
- Dry Wells;
- Catch basins;
- Storm drains;
- Floor drains or associated collection systems;
- Plumbing and piping;
- Trenches;
- Gutters and roof leader discharge points;
- Sumps;
- Storm sewer and spill containment collection systems;
- Boiler and compressor discharges;
- Surface impoundments; and,
- Discharge and waste disposal systems (i.e., above-ground treatment systems, and underground wastewater treatment systems such as tanks, septic tanks, separators, neutralization pits, septic leach fields, cesspools, seepage pits, and dry wells).

Sampling protocols for the collection of drainage water/wastewater/storm water samples will consist of the following minimum procedures:

1. Be certain sample location is noted on Location Sketch (see Section 8.1).

2. Be certain that all nondisposable sampling equipment (e.g., long handled polyethylene scoop, stainless steel tool) has been decontaminated utilizing the procedures outlined in Section 6.0.

3. Remove laboratory precleaned sample bottles from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form.

4. Lower the scoop or disposable bailer slowly into the water making sure that the sample is taken just below the surface of the water (or at the water/air interface if there is a sheen present) and raise the sample out of the water. Sample water before sediment to avoid introduction of sediment into the water.

5. Gently pour the sample into the sample container, taking care not to spill the sample on the outside of the container or overfill, and replace cover on the sample container. For volatile organic samples, make sure that there are no air bubbles in the sample vial after it has been capped. This is accomplished by filling the vial such that there is a meniscus on top. Carefully slide the septum, Teflon side down, onto the top of the vial and cap the vial. Check for bubbles by turning the vial upside down and tapping it lightly. If the bubbles appear, reopen the vial, remove septum and add more sample (or resample). Replace septum, recap and check for bubbles. Continue until vial is bubble-free.

6. Return sample container to sample cooler. If sample is obtained directly with a sample container, dry the exterior of the container before placing into cooler.

7. If reusable, decontaminate the sampling equipment according to the procedures outlined in Section 6.0.

8. Place all disposable personal protective equipment and disposable sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

5.7 Soil (Test Pit)

Test pit excavation will be conducted using a backhoe or excavator. Sampling protocols for the collection of subsurface soil samples from test pit excavations will consist of the following minimum procedures:

1. Be certain that the sample location is noted on Location Sketch (see Section 8.1).

2. Be certain that the sampling equipment, including the backhoe/excavator bucket, is decontaminated utilizing the procedures outlined in Section 6.0.

3. Remove laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form.

4. Set aside top 2 feet of soil.

5. Lower the bucket into the test pit and remove soil/waste material.

6. Immediately upon retrieval of the soil/waste material, obtain an organic vapor measurement with a PID or FID.

7. Depending upon the organic vapor measurement, odors and visual characteristics, obtain a soil sample from the backhoe bucket with a disposable or decontaminated scoop and/or sterile wooden tongue depressor, place into the open sample containers and replace the container covers.

8. Fill out Test Pit Log Form, including a description of soil/waste with location, depth and material sampled.

9. Return the sample container to the cooler.

10. Backfill test pit using the top 2 feet of soil that was set aside as the top layer.

11. If reusable, decontaminate the sampling equipment according to the procedures described in Section 6.0.

12. Place all disposable personal protective equipment and disposable sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

5.8 Soil (Probe)

Sampling protocols for the collection of subsurface soil samples from hydraulic direct-push sampling probes will consist of the following minimum procedures:

1. Be certain that the sample location is noted on Location Sketch (see Section 8.1).

2. Remove laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form.

3. Drive the probe to the desired sampling depth.

4. Retrieve the soil probe and immediately after opening it, obtain an organic vapor measurement with a FID or PID.

5. Remove a sample aliquot from the soil probe using a disposable scoop, decontaminated stainless steel tool or sterile tongue depressor, place into the open sample container and replace the container cover. If the NYSDEC requests that VOC's be collected utilizing the Encore sampling method than the VOC fraction will be collected immediately from the probe using the Encore sampling method in accordance with USEPA Method 5035. The remaining soil fraction will be homogenized prior to collecting the samples for the remaining parameters. Remove a sample aliquot from the soil probe using a disposable scoop or sterile wooden tongue depressor, place into the open sample container and replace the container cover. Sample container shall be filled in the following order after the collection of the soil fraction for VOC analysis; SVOCs, pesticides/PCBs, metals and cyanide.

6. Return the sample container to the cooler.

7. If reusable, decontaminate the sampling equipment according to the procedures described in Section 6.0.

8. Place all disposable personal protective equipment and disposable sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

5.9 Soil (Borehole, Split Spoon)

Sampling protocols for the collection of subsurface soil samples from split spoons in soil borings will consist of the following minimum procedures:

1. Be certain that the sample location is noted on Location Sketch (see Section 8.1).

2. Be certain that the sampling equipment (split spoon) has been decontaminated utilizing the procedures outlined in Section 6.0.

3. Remove laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form (see Section 8.0).

4. Drill into the soil to the desired depth and drive the split spoon sampler.

5. Retrieve the split spoon and immediately after opening the split spoon, obtain an organic vapor measurement with a PID or FID and fill out Boring Log Form (see Section 8.0).

6. Remove a sample aliquot from the soil probe using a disposable scoop, decontaminated stainless steel tool or sterile tongue depressor, place into the open sample container and replace the container cover. If the NYSDEC requests that VOC's be collected utilizing the Encore sampling method than the VOC fraction will

be collected immediately from the probe using the Encore sampling method in accordance with USEPA Method 5035. The remaining soil fraction will be homogenized prior to collecting the samples for the remaining parameters. Remove a sample aliquot from the soil probe using a disposable scoop or sterile wooden tongue depressor, place into the open sample container and replace the container cover. Sample container shall be filled in the following order after the collection of the soil fraction for VOC analysis; SVOCs, pesticides/PCBs, metals and cyanide.

7. Return the sample container to the cooler.
8. If reusable, decontaminate the sampling equipment according to the procedures described in Section 6.0.
9. Place all disposable personal protective equipment and disposable sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

5.10 Soil (Immunoassay Colorimetric Field Quantification of Analytes)

On-site field screening analysis, when deemed appropriate, will utilize methanol extraction of soils, and immunoassay colorimetric quantification of selected analytes to provide real-time screening results. The selected analytes may include, but are not limited to, Total Benzene, Toluene, Ethylbenzene, and Xylenes (Total BTEX), Naphthalene, Total Petroleum Hydrocarbons (TPH), Polynuclear Aromatic Hydrocarbons (PAHs), and Polychlorinated Biphenyls (PCBs). Immunoassay field-screening analyses will be accomplished using the Total BTEX/Naphthalene/TPH RaPID Assay, PAH RaPID Assay, and PCB RaPID Assay field kits supplied by Strategic Diagnostics, Inc. of Newark, Delaware, or equivalent. These kits produce a field analytical system capable of detecting very low levels of BTEX/Naphthalene, PAHs, and PCBs. Specific sample detection limits are provided with instructions supplied by Strategic Diagnostics, Inc. that are specific for each analysis. Site-specific sampling locations will be provided in the Site-Specific Work Plan.

The standard protocols for conducting on-site field screening utilizing RaPID Assay field test kits should strictly adhere to manufacturer's specification/instructions.

5.11 Groundwater (Probe)

Sampling protocols for the collection of groundwater samples from probes will consist of the following minimum procedures:

1. Be certain sample location is noted on Location Sketch (see Section 8.1).
2. Remove the laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form.
3. Obtain a sample by using dedicated polyethylene tubing equipped with a bottom check valve.
4. Gently pour the sample into the sample container taking care not to spill on the outside of the container or overfill container and replace cover on the sample container. Samples for volatile organic analyses will have no air space in the sample vial prior to sealing. This is accomplished by filling the vial such that there is a meniscus on top. Carefully slide the septum, Teflon side down, onto the top of the vial and cap the vial. Check for bubbles by turning the vial upside down and tapping it lightly. If bubbles appear, reopen the vial, remove the septum and add more sample (or resample). Replace the septum, recap and check for bubbles. Continue until vial is bubble-free.
5. After sample collection, obtain field measurements including pH, conductivity, temperature and turbidity.
6. If a sample is to be collected for metals analysis, the turbidity must be less than 50 NTUs. If the turbidity cannot be reduced to less than 50 NTUs, the sample will be filtered in the field or by the laboratory. Both filtered (soluble metals) and unfiltered (total metals) samples will be analyzed.
7. Return sample containers to sample cooler.
8. Place all disposable personal protective equipment and disposal sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

5.12 Groundwater (Hydropunch)

Sampling protocols for the collection of groundwater samples from hydropunch equipment will consist of the following minimum procedures:

1. Be certain sample location is noted on Location Sketch (see Section 8.1).

2. Using hydropunch equipment drive/punch screen to desired depth.

3. Remove inner sleeve and lower down decontaminated hydropunch bailer or remove filled hydropunch sampler from borehole.

4. Remove the laboratory precleaned sample container from the sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody form.

5. Obtain a volatile organic sample by using a hydropunch bailer or from hydropunch sampler. Gently pour the sample into the sample container taking care not to spill on the outside of the container or overfill container and replace cover on the sample container. Samples for volatile organic analyses will have no air space in the sample vial prior to sealing. This is accomplished by filling the vial such that there is a meniscus on top. Carefully slide the septum, Teflon side down, onto the top of the vial and cap the vial. Check for bubbles by turning the vial upside down and tapping it lightly. If bubbles appear, reopen the vial, remove the septum and add more sample (or resample). Replace the septum, recap and check for bubbles. Continue until vial is bubble-free.

6. Obtain a sample and analyze for field parameters (pH, conductivity, temperature and turbidity).

7. Turbidity must be less than 50 NTUs prior to collection of a sample for metals analysis. If the turbidity of the sample is greater than 50 NTUs, the sample will be filtered in the field or by the laboratory. Both filtered (dissolved metals) and unfiltered (total metals) samples will be analyzed.

8. Collect remaining samples. Gently pour the sample into the sample container, taking care not to spill water on the outside of the container or overfill the container. Replace cover on the sample container.

9. Return sample container to sample cooler.

10. Punch down to next depth and repeat items 3 through 9.

11. Decontaminate hydropunch equipment as described in Section 6.0.

12. Place all disposable personal protective equipment and disposable sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

5.13 Groundwater (Monitoring Well)

Sampling protocols for the collection of groundwater samples from monitoring wells will consist of the following minimum procedures:

1. Measure the depth of water using a decontaminated water level indicator and compute the volume of standing water in the well.

2. Remove three to five times the volume of standing water from the well until field measurements (pH, conductivity, temperature and turbidity) stabilize, or until the well is dry, whichever occurs first. Turbidity should be less than 50 NTUs prior to collection of a sample for metals analysis.

3. Remove the laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form.

4. Obtain a sample by using a disposable polyethylene bailer.

5. If the turbidity of the sample is greater than 50 NTUs, the metals; (iron and manganese) portion of the sample will be filtered in the field or by the laboratory. Both the filtered (soluble metals) and unfiltered (total metals) samples will be analyzed.

6. Gently pour the sample into the sample container taking care not to spill on the outside of the container or overfill container and replace the cover on the sample container. Samples for volatile organic analyses will have no air space in the sample vial prior to sealing. This is done by filling the vial such that there is a meniscus on top. Carefully slide the septum, Teflon side down, onto the top of the vial and cap the vial. Check for bubbles by turning the vial upside down and tapping it lightly. If bubbles appear, reopen the vial, remove the septum and add more sample (or resample). Replace the septum, recap and check for bubbles. Continue until vial is bubble-free.

7. Return sample container to sample cooler.

8. Place all disposable personal protective equipment and disposable sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

5.14 Private Water Supply

Sampling protocols for the collection of groundwater samples from private potable water supply wells will consist of the following minimum procedures:

1. Fill out Water Supply Information Record (see Section 8.0).
2. Remove the laboratory precleaned sample container from the sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody form.
3. If there is a treatment system, identify a location to sample that is ahead of any in-line water treatment unit, if possible. If samples are to be collected from a faucet, disassemble any screens and/or purification system that may be on the faucet, if possible. Note these conditions on the Sample Information Record Form.
4. Allow the cold water to run for approximately five minutes to adequately flush the line before sampling.
5. Collect the cold water directly in the sample container, taking care not to spill on the outside of the container or overfill container, and replace cover on the sample container. Samples for volatile organic analyses will have no air space in the sample vial prior to sealing. This is accomplished by filling the vial such that there is a meniscus on top. Carefully slide the septum, Teflon side down, onto the top of the vial and cap the vial. Check for bubbles by turning the vial upside down and tapping it lightly. If bubbles appear, reopen the vial, remove the septum and add more sample (or resample). Replace the septum, recap and check for bubbles. Continue until vial is bubble-free.
6. Return sample to sample cooler.
7. Reattach water line that may have been disconnected ahead of treatment devise and reassemble screens and/or treatment systems that may have been removed.

5.15 Ambient Air (Summa Canister)

Sampling protocols for the collection of air samples in summa canisters will consist of the following minimum procedures:

1. Be certain sample location is noted on Location Sketch (see Section 8.1).

2. Verify vacuum of Summa canister and connect dedicated regulator. Regulator should be set at a flow rate of <0.2L/min.

3. Label canister and fill out Sample Information Record and Chain of Custody Form.

4. Set canister in breathing zone, approximately 3-4 feet above ground surface.

5. Open valve on canister and monitor the canister vacuum rate at half-hour intervals during the duration of sampling.

6. Close valve on canister and disconnect the regulator.

7. Place canister in shipping containers.

8. Place all disposable personal protective equipment and disposable sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

6.0 DECONTAMINATION PROCEDURES

Whenever possible, all field sampling equipment should be sterile/disposable and dedicated to a particular sampling point. In instances where this is not possible, a field cleaning/ decontamination procedure will be used in order to mitigate cross contamination between sample locations. A decontamination station/pad will be established for all field activities. This will be an area located away from the source of contamination so as not to adversely impact the decontamination procedure, but close enough to the sampling locations to keep equipment transport handling to a minimum after decontamination.

6.1 Field Decontamination Procedures

All non-disposable equipment will be decontaminated at appropriate intervals (e.g., prior to initial use, prior to moving to a new sampling location and prior to leaving the site). Different decontamination procedures are used for various types of equipment that are used to collect samples. When using field decontamination, sampling should commence in the area of the site with the lowest contamination, if known or probable, and proceed through to the areas of highest contamination.

6.2 Decontamination Procedure for Drilling/Probing Equipment

All equipment such as drill rigs and other mobile equipment will receive an initial cleaning prior to use at the site. The frequency of subsequent cleanings while on-site will depend on how the equipment is actually used in relation to collecting environmental samples. Decontamination fluids generated during steam cleaning/decontamination activities, will be collected in New York State Department of Transportation (NYSDOT) approved 55-gallon drums. The drums will be labeled as investigation-derived wastewater and temporarily stored in a secured area of the site on wooden pallets in a plastic-lined containment area pending characterization and proper disposal.

After the initial decontamination, cleaning may be reduced to those areas that are in close proximity to materials being sampled. Drill rig/probe items such as augers, drill/probe rods and drill bits will be cleaned in between sample locations.

Drilling/probing equipment will be decontaminated in the following manner:

- Wash thoroughly with nonresidual detergent (alconox) and tap water using a brush to remove particulate matter or surface film. This is necessary in order to remove any solids buildup on the back of the rig, auger flights, drill rods, drilling head, etc. Any loose paint chips, paint flakes and rust must also be removed.
- Steam clean (212°F).
- Once decontaminated, remove all items from the decontamination area.

Also, following the general cleaning procedures described above, all downhole/drilling items, such as split spoon samplers, Shelby tubes, rock corers, or any other item of equipment which will come in direct contact with a sample during drilling, will be decontaminated by steam cleaning.

6.3 Decontamination Procedure for Sampling Equipment

Teflon, PVC, polyethylene and stainless steel sampling equipment decontamination procedures will be the following:

- Wash thoroughly with nonresidual detergent (alconox) and clean potable tap water using a brush to remove particulate matter or surface film.
- Rinse thoroughly with tap water.
- Rinse thoroughly with acid (HNO_3) (only if metals samples are to be collected).
- Rinse thoroughly with distilled water.
- Rinse in a well ventilated area with methanol (pesticide grade) and air dry.
- Rinse thoroughly with distilled water and air dry.

- Wrap completely in clean aluminum foil with dull side against the equipment. For small sampling items, such as scoops, decontamination will take place over a drum specifically used for this purpose.

The first step, a soap and water wash, will be performed to remove all visible particulate matter and residual oils and grease. This step will be followed by a tap water rinse and a distilled/deionized water rinse to remove the detergent. Next, a high purity solvent rinse will be used for trace organics removal. Methanol has been chosen because it is not an analyte of concern on the Target Compound List. The solvent will be allowed to evaporate and then a final distilled/deionized water rinse will be performed. This rinse removes any residual traces of the solvent. The aluminum wrap will protect the equipment and keep it clean until it is used at another sampling location.

6.4 Decontamination Procedure for Well Casing and Development Equipment

Field cleaning of well casings will consist of a manual scrubbing to remove foreign material and steam cleaning, inside and out, until all traces of oil and grease are removed. This material will then be stored in such a manner so as to preserve it in this condition. Special attention to threaded joints will be necessary to remove cutting oil or weld burn residues.

Materials and equipment that will be used for the purposes of well development will also be decontaminated by steam cleaning. An additional step will involve flushing the interior of any hose, pump, etc. with a nonphosphate detergent solution and potable water rinse prior to the development of the next well. This liquid waste will be disposed of on-site, if possible after testing.

7.0 LABORATORY SAMPLE CUSTODY, SAMPLE RECEIPT, STORAGE, SECURITY, AND DISPOSAL PROCEDURES

A NYSDOH ELAP certified laboratory meeting the requirements for sample custody procedures, including cleaning and handling sample containers and analytical equipment, will be used to analyze samples collected during the site investigation. Upon receipt of shipped samples at the laboratory, the laboratory's sample custodian will inspect the samples for integrity and check the shipment against the chain-of-custody.

When the shipment and the chain-of-custody are in agreement, the sample custodian will enter the samples into the Laboratory Information Management System and will assign each sample a unique laboratory number. This number will be affixed to each sample bottle. The sample custodian will then enter the sample and analysis information into the laboratory computer system.

The selected laboratory must satisfy the sample chain-of-custody requirements by implementing the following standard operating procedure for laboratory/sample security within the laboratory facility:

- Samples are stored in a secure area;
- Access to the laboratory is through a monitored area;
- Visitors sign a visitor's log and are escorted while in the laboratory;
- Only the designated sample custodians have keys to sample storage area(s); and,
- Transfers of samples in and out of storage are documented.

While in the laboratory, samples that require storage at 4°C $\pm$ 2°C will be stored in a locked refrigerator unless they are being used for analysis. The laboratory's sample custodian will be responsible for sample storage and security to ensure that:

- Samples and extracts are stored for 60 days after the final analytical data report has been forwarded to TRC. The samples, extracts, and sample digestion byproducts are then discarded in accordance with Occupational Safety and Health Administration guidance; and,

- Samples are not stored with standards or sample extracts.

The selected laboratory's Standard Operating Procedures will be made available upon request.

8.0 SAMPLE DOCUMENTATION

Proper management and documentation of field and sampling activities is essential to ensure that all necessary work is conducted in accordance with the sampling plan and QAPP in an efficient and high quality manner. Field management procedures will include following proper chain of custody procedures to track a sample from collection through analysis, noting when and how samples are split (if required); preparing a Location Sketch; completing Sample Information Records; completing Chain of Custody Forms' completing Boring, Well and Test Pit Construction Logs; maintaining a daily Field Log Book; preparing Daily Field Activity Reports; completing Field Change Forms; and filling out a Daily Air Monitoring Form. Copies of each of these forms are provided in Appendix A. Proper completion of these forms and the field log book are necessary to support the consequent actions that may result from the sample analysis. This documentation will support that the samples were collected and handled properly.

8.1 Location Sketch

For each sampling point, a Location Sketch will be completed using permanent references and distances to the sampling point noted, if possible.

8.2 Sample Information Record

At each sampling location, a Sample Information Record Form is filled out including, but not limited to, the following information:

- Site name
- Sample crew
- Sample location
- Field sample identification number
- Date
- Time of sample collection

- Weather conditions
- Temperature
- Sample matrix
- Method of sample collection and any factor that may affect its quality adversely
- Well information (groundwater only)
- Field test results
- Analysis to be performed
- Remarks

8.3 Chain of Custody

The Chain of Custody Form will be completed and is initiated at the laboratory with container preparation and shipment to the site. The form remains with the sample at all times and bears the name of the person assuming responsibility for the samples. This person is tasked with ensuring secure and appropriate handling of the containers and samples. When the form is complete, it will indicate that there was no lapse in sample accountability.

A sample is considered to be in an individual's custody if any of the following conditions are met:

- It is in the individual's physical possession, or
- It is in the individual's view after being in his or her physical possession, or
- It is secured by the individual so that no one can tamper with it, or
- The individual puts it in a designated and identified secure area.

In general, Chain of Custody Forms are provided by the laboratory selected to perform the analytical services. At a minimum, the following information will be provided on these forms:

- Project name and address
- Project number
- Sample identification number
- Date
- Time
- Sample location
- Sample type
- Analysis requested
- Number of containers and volume taken
- Remarks
- Type of waste
- Sampler(s) name(s) and signature(s)
- Spaces for relinquished by/received by signature and date/time.

For this particular study, forms provided by the laboratory will be utilized.

The Chain of Custody Form will be filled out and signed by the person performing the sampling. The original of the form will travel with the sample and will be signed and dated each time the sample is relinquished to another party, until it reaches the laboratory or analysis is completed. The field sampler will keep one copy and a copy will be retained for the project file. The sample bottle will also be labeled with an indelible marker with a minimum of the following information:

- Sample number
- Analysis to be performed
- Date of collection

A copy of the completed form will be returned by the laboratory with the analytical results.

8.4 Split Samples

Whenever samples are being split with another party, a Receipt for Samples Form will be completed and signed. A copy of the Chain of Custody Form will accompany this form.

8.5 Field Log Book

Field log books will be bound and have consecutively numbered water resistant pages. All pertinent information regarding the site and sampling procedures will be documented. Notations will be made in log book fashion, noting the time and date of all entries. Information recorded in this logbook will include, but not be limited to, the following:

The first page of the log will contain the following information:

- Project name and address
- Name, address and phone number of field contact
- Waste generator and address, if different from above
- Type of process (if known), generating waste
- Type of waste
- Suspected waste composition, including concentrations

Daily entries will be made for the following information:

- Purpose of sampling
- Location of sampling point

- Number(s) and volume(s) of sample(s) taken
- Description of sampling point and sampling methodology
- Date and time of collection, arrival and departure
- Collector's sample identification number(s)
- Sample distribution and method of storage and transportation
- References, such as sketches of the sampling site or photographs of sample collection
- Field observations, including results of field analyses (e.g., pH, temperature, specific conductance), water levels, drilling logs, and organic vapor and dust readings
- Signature of personnel responsible for completing log entries.

8.6 Daily Field Activity Report

At the end of each day of field work, the Field Operations Manager, or designee, will complete this report noting personnel on-site and summarizing the work performed that day, equipment, materials and supplies used, results of field analyses, problems and resolutions. This report will be signed and subject to review.

8.7 Field Changes and Corrective Actions

Whenever there is a required or recommended investigation/sampling change or correction, a Field Change Form will be completed by the Field Operations Manager and approved by the Project Manager.

9.0 CALIBRATION PROCEDURES AND PREVENTIVE MAINTENANCE

Periodic preventive maintenance may be required for all equipment. Instrument manuals will be kept on file for reference if equipment needs repair. The troubleshooting section of factory manuals may be used in assisting personnel in performingroutine/minor maintenance tasks. The frequency of preventative maintenance for field equipment is indicated in each operating instruction manual.

The following information regarding equipment will be maintained at the project site:

1. Equipment calibration and operating procedures which will include provisions for documentation of frequency, conditions, standards and records reflecting the calibration procedures, methods of usage and repair history of the measurement system. Calibration of field equipment will be performed daily at the sampling site so that any background contamination can be taken into consideration and the instrument calibrated accordingly.

2. A schedule of preventive maintenance tasks, consistent with the instrument manufacturer's specific operation manuals that will be carried out to minimize down time of the equipment.

3. Critical spare parts, necessary tools and manuals will be on hand to facilitate equipment maintenance and repair.

Calibration procedures and preventive maintenance, in accordance with the NYSDEC 2005 ASP for laboratory equipment, will be contained in the laboratory's standard operating procedures (SOP), which will be available upon request.

10.0 CONTROL AND DISPOSAL OF CONTAMINATED MATERIAL

During construction and sampling of the monitoring wells and soil borings, contaminated waste, soil and water may be generated from drill cuttings, drilling fluids, decontamination water, development water and purge water.

10.1 Decontamination Fluids

It is anticipated that decontamination fluids will be generated during steam cleaning activities, which will be collected in New York State Department of Transportation (NYSDOT) approved 55-gallon drums. The drums will be labeled as investigation-derived wastewater and temporarily stored in a secured chain-link fence area of the site on wooden pallets in a plastic-lined containment area pending characterization and proper disposal.

10.2 Drill Cuttings

It is presumed that all drill cuttings generated during soil boring and monitoring well installation activities are contaminated. Therefore, all drill cuttings will be managed in accordance with DER-10 as follows: contained in NYSDOT approved 55-gallon drums or stored on protective sheeting and covered with protective sheeting if cuttings remain on the ground of the day, as stipulated in the Site specific work plan. The soil may also be disposed on site within the borehole that it was generated within 12 inches of the surface (24 inches if site is residential). If the soil is drummed it will be segregated by drill location as is practical. The drums will be labeled as investigation-derived waste soil from the corresponding boring or source area and temporarily stored in a secured area of the site on wooden pallets in a plastic-lined containment area pending characterization and proper disposal. Disposal of IDW will be in accordance with applicable federal, state and local regulations as specified in DER-10.

10.3 Development and Purge Water

It is anticipated that development and purge water will be generated during development and sampling of the monitoring wells. Development and purge water will be contained in NYSDOT approved 55-gallon drums. Groundwater from several monitoring wells maybe combined provided they are associated with the same disposal site and aquifer. The drums will be labeled as investigation-derived wastewater from the corresponding well and temporarily stored in a secured area of the property on wooden pallets in a plastic-lined containment area pending characterization and proper disposal As defined in DER-10 and the approved site specific work plan. It should be noted that NAPL shall never be discharged to the ground.

10.4 Personal Protective Equipment

Personal protective equipment (PPE) will be placed in 55-gallon drums or roll-off containers and secured on-site for proper disposal.

10.5 Dedicated Sampling Equipment

In general, all dedicated soil sampling equipment (Macrocore sampler liners and catchers), groundwater sampling equipment (dedicated disposable polyethylene bailer and dedicated polypropylene line) and soiled disposable sampling equipment (i.e., bailers, tongue depressors, scoops, etc.) will be be placed in 55-gallon drums or roll-off containers and secured on-site for disposal.

11.0 DOCUMENTATION, DATA REDUCTION AND REPORTING

A NYSDOH ELAP certified laboratory meeting the New York State requirements for documentation, data reduction and reporting will be used. All data will be cataloged according to sampling locations and sample identification nomenclature which is described in Section 5.1 of this QAPP Plan. The laboratory analysis will be reported in the NYSDEC ASP Category B deliverables format. In addition the laboratory will be providing an electronic data deliverable (EDD) for each data set in the most current NYSDEC Equis format.

NYSDEC "Sample Identification and Analytical Requirement Summary" and "Sample Preparation and Analysis Summary" forms (for organic and inorganic analysis) will be completed and included with each data package. These forms are contained in Appendix B of this QAPP. The sample tracking forms are required and supplied by the 2005 NYSDEC ASP.

12.0 DATA VALIDATION

Data validation will be performed in order to define and document analytical data quality in accordance with USEPA and NYSDEC requirements that investigation data must be of known and acceptable quality. The analytical and validation processes will be conducted in conformance with the NYSDEC 2005 ASP.

Since the NYSDEC Analytical Services Protocol is based on the USEPA CLP, the USEPA Functional Guidelines for Evaluating Organics and Inorganics Analyses for the Contract Laboratory Program (CLP) will assist in formulating standard operating procedures (SOPs) for the data validation process. The data validation process will ensure that all analytical requirements specific the QAPP are followed. Procedures will address validation of routine analytical services (RAS) results based on the NYSDEC Target Compound List and Target Analyte List for standard sample matrices.

The data validation process will provide an informed assessment of the laboratory's performance based upon contractual requirements and applicable analytical criteria. The report generated as a result of the data validation process will provide a base upon which the usefulness of the data can be evaluated by the end user of the analytical results. The overall level of effort and specific data validation procedure to be used will be equivalent to a "100% validation" of all analytical data in any given data package.

During the review process, it will be determined whether the contractually required laboratory submittals for sample results are supported by sufficient back-up data and QA/QC results to enable the reviewer to conclusively determine the quality of data. Each data package will be checked for completeness and technical adequacy of the data. Upon completion of the review, the reviewers will develop a QA/QC data validation report for each analytical data package.

"Qualified" analytical results for any one field sample will be established and presented based on the results of specific QC samples and procedures associated with its sample analysis group or batch. Precision and accuracy criteria (i.e., QC acceptance limits) will be used in determining the need for qualifying data. Where test data have been reduced by the laboratory, the method of reduction will be described in the report. Reduction of laboratory measurements and laboratory reporting of analytical parameters will be verified in accordance with the procedures specified in the NYSDEC and USEPA program documents for each analytical method (i.e., recreate laboratory calculations and data reporting in accordance with the method specific procedure).

The standard operating guideline manuals and any special analytical methodology required will specify documentation needs and technical criteria and will be taken into consideration in the validation process. Copies of the complete data package and the validation report, including the laboratory results data report sheets, with any qualifiers deemed appropriate by the data reviewer, and a supplementary field QC sample result summary statement, will be provided with the site investigation report.

The following is a description of the two-phased approach to data validation which will be used in the remedial investigation. The first phase is called checklisting and the second phase is the analytical quality review, with the former being a subset of the latter.

- <u>Checklisting</u> - The data package will be checked for correct submission of the contract required deliverables, correct transcription from the raw data to the required deliverable summary forms and proper calculation of a number of parameters.

- <u>Analytical Quality Review</u> - The data package will be closely examined to recreate the analytical process and verify that proper and acceptable analytical techniques have been performed. Additionally, overall data quality and laboratory performance will be evaluated by applying the appropriate data quality criteria to the data to reflect conformance with the specified, accepted QA/QC standards and contractual requirements.

At the completion of the data validation, a Summary Data Validation/Usability Report will be prepared as part of the site investigation report.

If the NYSDEC decides that a complete validation is not required, a Data Usability Summary Report (DUSR) will be prepared.

The DUSR is prepared by reviewing and evaluating the analytical data. The parameters to be evaluated in reference to compliance with analytical method protocols include all chain-of-custody forms, holding times, raw data (instrument print out data and chromatograms), calibrations, blanks, spikes, controls, surrogate recoveries, duplicates and sample data. If available, field sampling notes should also be reviewed and any quality control problems should be evaluated as to their effect on the usability of the sample data.

The DUSR shall describe the samples and analysis parameters reviewed. Data deficiencies, analytical protocol deviations and quality control problems shall be described and their effect on the data discussed.

Resampling and reanalysis recommendations will be made, if necessary. Data qualifications are documented for each sample analyte following the NYSDEC ASP 7/05 guidelines.

13.0 PERFORMANCE AND SYSTEM AUDITS

A NYSDOH ELAP certified laboratory which has satisfactorily completed performance audits and performance evaluation samples will be used to perform sample analyses for the investigation.

14.0 CORRECTIVE ACTION

A NYSDOH ELAP certified laboratory will meet the requirements for corrective action protocols, including sample “clean up” to attempt to eliminate/mitigate matrix interference.

The 2005 NYSDEC ASP includes both mandatory and optional sample cleanup and extraction methods. Cleanup is required by the 2005 NYSDEC ASP in order to meet contract required detection limits. There are several optional cleanup and extraction methods noted in the 2005 NYSDEC ASP. These include: florisil column cleanup, silica gel column cleanup, acid-base partition, steam distillation and sulfuric acid cleanup for PCB analysis.

High levels of matrix interference may be present in waste, soil and sediment samples. This interference may prevent the achievement of ASP detection limits if no target compounds are found. In order to avoid unnecessary dilutions, the optional cleanup methods noted in the 2005 NYSDEC ASP will be required to be performed by the laboratory as necessary.

It should be noted that if these optional cleanup and extraction methods are utilized, holding time requirements will not be exceeded due to negligence of the laboratory. Subsequent to selection of the analytical laboratory for this project, a meeting or conference call will be undertaken with the laboratory to discuss these issues and establish procedures to ensure effective and timely communications among all parties.

APPENDIX A

FIELD FORMS

TRC		BORING LOG	BORING SHEET OF
JOB NAME/ CLIENT	PROJECT NO.	AREA OF CONCERN	
ADDRESS		ELEVATION/DATUM	
DRILLING CONTRACTOR	DRILLER	INSPECTOR	
DRILLING RIG	TYPE/SIZE BIT	START DATE	END DATE
SAMPLER TYPE	HAMMER WEIGHT/DROP	TOTAL DEPTH	WATER LEVEL

SAMPLES					DESCRIPTION OF SOILS	REMARKS
NUMBER	RECOVERY IN FEET	BLOWS PER 6"	DEPTH	WATER	(SAA = Same As Above) f - fine m - medium c - coarse lt - light dk - dark tr - trace ltl - little	(PID, STAINING, ODORS, ETC.) FP = Free Product N/S = No Staining, N/O = No odors SO = Slight Odor, MO = Moderate Odor STO = Strong Odor
1			4			
2			8			
3			12			
4			16			
5			20			

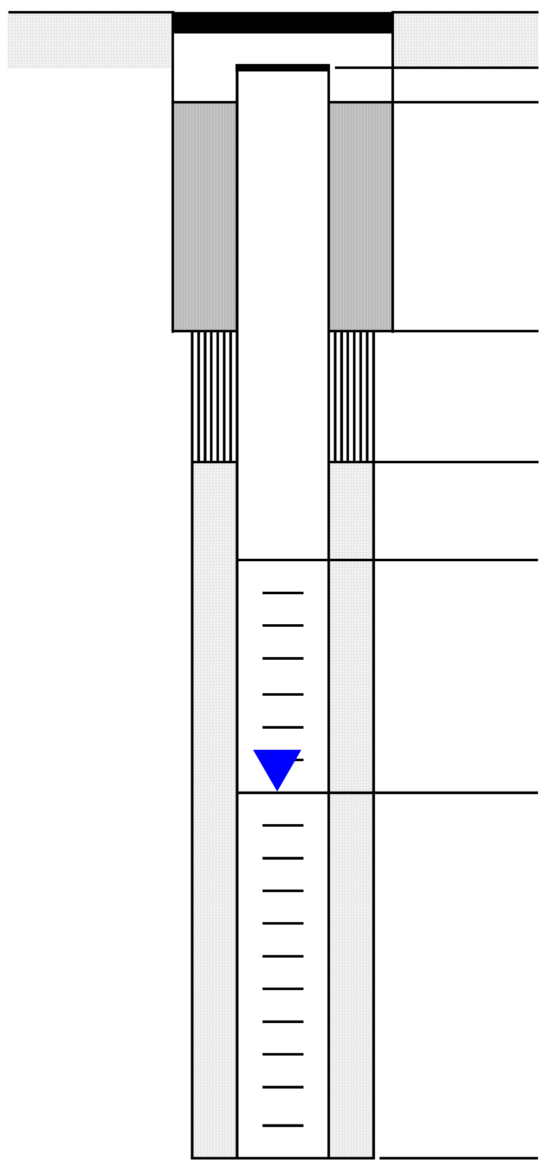
WELL CONSTRUCTION LOG

WELL:

SHEET OF

PROJECT NAME: ______________ WELL NUMBER: ______________
ADDRESS: ______________ DRILLING METHOD: ______________
INSTALLATION DATE: ______________ DRILLER: ______________
DEVELOPMENT DATE: ______________ GAUGING DATE: ______________
HEIGHT OF STICK-UP: ______________ DEPTH TO WATER[2]: ______________
ELEVATION[1]: ______________
DATUM: ______________ DEPTH TO PRODUCT[2]: ______________
CASING MATERIAL: ______________ SCREEN MATERIAL: ______________
FILTER PACK TYPE: ______________ SEAL TYPE: ______________

Depth from Ground Surface (feet) | Elevation[1]



Not to Scale

Notes:
[1]Feet above datum
[2]Feet below top of casing

NOT TO SCALE

Date: ____________________

SAMPLE INFORMATION RECORD

Site: ______________________ **Sample Crew:** ______________________

Sample Location/Well No. ______________________

Field Sample I.D. Number ______________________ **Time** ______________________

Weather ______________________ **Temperature** ______________________

Sample Type:

Groundwater ______________________ **Sediment** ______________________

Surface Water/Stream ______________________ **Air** ______________________

Soil ______________________ **Other (describe, i.e. water, septage, etc.)** ______________________

Well Information (fill out for groundwater samples)

Depth to Water ______________________ **Measurement Method** ______________________

Depth of Well ______________________ **Measurement Method** ______________________

Volume Removed ______________________ **Removal Method** ______________________

Field Test Results

Color ______________ **pH** ______________ **Odor** ______________

Temperature (ºF) __________ **Specific Conductance (umhos/cm)** ______________________

Other (OVA, Methane Meter, etc. ______________________

Constituents Sampled

______________ ______________ ______________ ______________

______________ ______________ ______________ ______________

Remarks:

____

____

____

Well Casing Volumes

GAL/FT	1¼" = 0.077	2" = 0.16	3" = 0.37	4" = 0.65
	1½ =0.10	2½ " = 0.24	3½ = 0.50	6" = 1.46

Rev. 03/09/98

Date: ____________________

LOCATION SKETCH

Project ____ Sample Crew ______________________________

Sample(s) Locations(s) ____

Sample(s) and/or Well Number(s) ____

Location of sample points, wells, borings, etc., with reference to three permanent reference points.
Measure all distances, clearly label roads, wells and permanent features.

N

Date: __________

DAILY EQUIPMENT CALIBRATION LOG

Project Name: ______________________________

Project Number: ______________________________ Calibrated by: ______________________________

Instrument Name and Model Number	Calibration Method	Time	Readings and Observations

Date: ____________________

DAILY FIELD ACTIVITY REPORT

Report Number: ____________________ Project Number: ____________________

Field Log Book Page Number: ____________________

Project: ____________________

Address: ____________________

Weather: (AM) ____________________ Rainfall: (AM) __________ Inches

(PM) ____________________ (PM) __________ Inches

Temperature: (AM) ______ ºF Wind Speed: (AM) ______ MPH Wind Direction: (AM) ______

(PM) ______ ºF (PM) ______ MPH (PM) ______

Site Condition: ____________________

Personnel On Site:	Name	Affiliation	Arrival Time	Departure Time

Subcontractor Work Commencement: (AM) __________ (PM) __________

Subcontractor Work Completion: (AM) __________ (PM) __________

Date: ___________________

DAILY FIELD ACTIVITY REPORT

Work Performed by subcontractor(s) (includes equipment and labor breakdown):

TRC

Date: ___________________

DAILY FIELD ACTIVITY REPORT

General work performed today by TRC:

____

____

____

____

____

List specific inspection(s) performed and results (include problems and corrective actions):

____

____

____

____

____

List type and location of tests performed and results (include equipment used and monitoring results):

____

____

____

____

____

Verbal comments received from subcontractor (include construction and testing problems, and recommendations/resulting actions):

____

____

____

____

____

Prepared by: ______________________________ Reviewed by: ______________________________

TRC

Date:

AIR MONITORING FORM

Project Name: ______________________________

Project Number: ______________________________ Instrument: ________________

Recorded by: ______________________________ Calibration Date: ________________

Weather Conditions: ______________________________

Time	Location	Wind Speed and Direction	Reading	Observations

Recording Procedures/Remarks: ______________________________

Appendix B
Indoor air quality questionnaire and building inventory

As discussed in Section 2.11, products in buildings should be inventoried every time indoor air is sampled to provide an accurate assessment of the potential contribution of volatile chemicals. In addition, the type of structure, floor layout and physical conditions of the building being studied should be noted to identify (and minimize) conditions that may interfere with the proposed testing.

Toward this end, a blank copy of the NYSDOH Center for Environmental Health's Indoor Air Quality Questionnaire and Building Inventory is provided in this appendix. Also provided is an example that demonstrates how the form should be completed properly.

This page is intentionally blank.

NEW YORK STATE DEPARTMENT OF HEALTH
INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY
CENTER FOR ENVIRONMENTAL HEALTH

This form must be completed for each residence involved in indoor air testing.

Preparer's Name ____________________________________ Date/Time Prepared ______________

Preparer's Affiliation ________________________________ Phone No.______________________

Purpose of Investigation____

1. OCCUPANT:

Interviewed: Y / N

Last Name: _________________________ First Name: _________________________

Address: ____

County: _________________

Home Phone: ____________________ Office Phone: ____________________

Number of Occupants/persons at this location _______ Age of Occupants ______________________

2. OWNER OR LANDLORD: (Check if same as occupant ___)

Interviewed: Y / N

Last Name: _________________________First Name: ___________________________

Address: ____

County: _________________

Home Phone: ____________________ Office Phone: ____________________

3. BUILDING CHARACTERISTICS

Type of Building: (Circle appropriate response)

Residential	School	Commercial/Multi-use
Industrial	Church	Other: _________________

If the property is residential, type? (Circle appropriate response)

Ranch	2-Family	3-Family
Raised Ranch	Split Level	Colonial
Cape Cod	Contemporary	Mobile Home
Duplex	Apartment House	Townhouses/Condos
Modular	Log Home	Other:_______________

If multiple units, how many? ________

If the property is commercial, type?

Business Type(s) ____

Does it include residences (i.e., multi-use)? Y / N If yes, how many? ______

Other characteristics:

Number of floors______ Building age______

Is the building insulated? Y / N How air tight? Tight / Average / Not Tight

4. AIRFLOW

Use air current tubes or tracer smoke to evaluate airflow patterns and qualitatively describe:

Airflow between floors

____

____

____

Airflow near source

____

____

____

Outdoor air infiltration

____

____

____

Infiltration into air ducts

____

____

____

5. BASEMENT AND CONSTRUCTION CHARACTERISTICS (Circle all that apply)

a. Above grade construction:	wood frame	concrete	stone	brick
b. Basement type:	full	crawlspace	slab	other ________
c. Basement floor:	concrete	dirt	stone	other ________
d. Basement floor:	uncovered	covered	covered with ________________	
e. Concrete floor:	unsealed	sealed	sealed with _________________	
f. Foundation walls:	poured	block	stone	other ________
g. Foundation walls:	unsealed	sealed	sealed with _________________	
h. The basement is:	wet	damp	dry	moldy
i. The basement is:	finished	unfinished	partially finished	
j. Sump present?	Y / N			
k. Water in sump?	Y / N / not applicable			

Basement/Lowest level depth below grade: ________(feet)

Identify potential soil vapor entry points and approximate size (e.g., cracks, utility ports, drains)

____

____

6. HEATING, VENTING and AIR CONDITIONING (Circle all that apply)

Type of heating system(s) used in this building: (circle all that apply – note primary)

Hot air circulation	Heat pump	Hot water baseboard	
Space Heaters	Stream radiation	Radiant floor	
Electric baseboard	Wood stove	Outdoor wood boiler	Other ___________

The primary type of fuel used is:

Natural Gas	Fuel Oil	Kerosene
Electric	Propane	Solar
Wood	Coal	

Domestic hot water tank fueled by: ____________________________

Boiler/furnace located in:	Basement	Outdoors	Main Floor	Other___________
Air conditioning:	Central Air	Window units	Open Windows	None

Are there air distribution ducts present? Y / N

Describe the supply and cold air return ductwork, and its condition where visible, including whether there is a cold air return and the tightness of duct joints. Indicate the locations on the floor plan diagram.

____

____

____

____

7. OCCUPANCY

Is basement/lowest level occupied? Full-time Occasionally Seldom Almost Never

Level	**General Use of Each Floor (e.g., familyroom, bedroom, laundry, workshop, storage)**
Basement	______________________________
1st Floor	______________________________
2nd Floor	______________________________
3rd Floor	______________________________
4th Floor	______________________________

8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY

a. Is there an attached garage? Y / N

b. Does the garage have a separate heating unit? Y / N / NA

c. Are petroleum-powered machines or vehicles stored in the garage (e.g., lawnmower, atv, car) Y / N / NA
Please specify__________________

d. Has the building ever had a fire? Y / N When?__________________

e. Is a kerosene or unvented gas space heater present? Y / N Where? __________________

f. Is there a workshop or hobby/craft area? Y / N Where & Type? __________________

g. Is there smoking in the building? Y / N How frequently? __________________

h. Have cleaning products been used recently? Y / N When & Type? __________________

i. Have cosmetic products been used recently? Y / N When & Type? __________________

j. Has painting/staining been done in the last 6 months? Y / N Where & When? _______________

k. Is there new carpet, drapes or other textiles? Y / N Where & When? _______________

l. Have air fresheners been used recently? Y / N When & Type? ________________

m. Is there a kitchen exhaust fan? Y / N If yes, where vented?____________

n. Is there a bathroom exhaust fan? Y / N If yes, where vented?____________

o. Is there a clothes dryer? Y / N If yes, is it vented outside? Y / N

p. Has there been a pesticide application? Y / N When & Type?_________________

Are there odors in the building? Y / N
If yes, please describe: ____

Do any of the building occupants use solvents at work? Y / N
(e.g., chemical manufacturing or laboratory, auto mechanic or auto body shop, painting, fuel oil delivery, boiler mechanic, pesticide application, cosmetologist

If yes, what types of solvents are used? ____

If yes, are their clothes washed at work? Y / N

Do any of the building occupants regularly use or work at a dry-cleaning service? (Circle appropriate response)

Yes, use dry-cleaning regularly (weekly) No
Yes, use dry-cleaning infrequently (monthly or less) Unknown
Yes, work at a dry-cleaning service

Is there a radon mitigation system for the building/structure? Y / N Date of Installation: ____________
Is the system active or passive? Active/Passive

9. WATER AND SEWAGE

Water Supply: Public Water Drilled Well Driven Well Dug Well Other: _______

Sewage Disposal: Public Sewer Septic Tank Leach Field Dry Well Other: _______

10. RELOCATION INFORMATION (for oil spill residential emergency)

a. Provide reasons why relocation is recommended: ____

b. Residents choose to: remain in home relocate to friends/family relocate to hotel/motel

c. Responsibility for costs associated with reimbursement explained? Y / N

d. Relocation package provided and explained to residents? Y / N

11. FLOOR PLANS

Draw a plan view sketch of the basement and first floor of the building. Indicate air sampling locations, possible indoor air pollution sources and PID meter readings. If the building does not have a basement, please note.

Basement:

First Floor:

12. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s) and PID meter readings.

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system, if applicable, and a qualifying statement to help locate the site on a topographic map.

13. PRODUCT INVENTORY FORM

Make & Model of field instrument used: ______________________________________

List specific products found in the residence that have the potential to affect indoor air quality.

Location	Product Description	Size (units)	Condition*	Chemical Ingredients	Field Instrument Reading (units)	Photo ** Y / N

* Describe the condition of the product containers as **Unopened (UO), Used (U),** or **Deteriorated (D)**
** Photographs of the **front and back** of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.

NEW YORK STATE DEPARTMENT OF HEALTH
INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY
CENTER FOR ENVIRONMENTAL HEALTH

This form must be completed for each residence involved in indoor air testing.

Preparer's Name Mary Jones Date/Time Prepared 10/22/04 10:00am

Preparer's Affiliation XYZ Consulting Phone No. 518-555-1212

Purpose of Investigation Thomasville Soil Vapor Intrusion Investigation (Site #32141)

1. OCCUPANT:

Interviewed: Y / N (Y circled)

Last Name: Smith First Name: Carol

Address: 25 Main Street Thomasville, New York 25230

County: Albany

Home Phone: 518-556-2222 Office Phone: 518-556-2400

Number of Occupants/persons at this location 2 Age of Occupants 36, 10

2. OWNER OR LANDLORD: (Check if same as occupant ___)

Interviewed: Y / N (N circled)

Last Name: White First Name: Frank

Address: 64 Mountain Road Bainbridge, New York 26390

County: Dutchess

Home Phone: 845-876-1301 Office Phone: 845-227-2430

3. BUILDING CHARACTERISTICS

Type of Building: (Circle appropriate response)

Residential	School	Commercial/Multi-Use
Industrial	Church	Other: ________

Example Correct

If the property is residential, type? (Circle appropriate response)

Ranch	2-Family	3-Family
Raised Ranch	Split Level	Colonial
Cape Cod	Contemporary	Mobile Home
Duplex	Apartment House	Townhouses/Condos
Modular	Log Home	Other:______________

If multiple units, how many? NA

If the property is commercial, type?

Business Type(s) NA

Does it include residences (i.e. multi-use)? Y / N   If yes, how many? ______

Other characteristics:

Number of floors 1   Building age 20 years

Is the building insulated? Y / N   How air tight? Tight / Average / Not Tight

4. AIRFLOW

Use air current tubes or tracer smoke to evaluate airflow patterns and qualitatively describe:

Airflow between floors

Basement air flows up to 1st floor through plumbing waste line and domestic water line floor penetrations

Airflow near source

Yes, furnace/oil tank area open to rest of basement

Outdoor air infiltration

Outdoor air enters at loose bilco doorway openings, and at sill plate near furnace

Infiltration into air ducts

Basement air flows into bottom of hot air unit and in loose cold air return joints.

Example Correct

5. **BASEMENT AND CONSTRUCTION CHARACTERISTICS** (Circle all that apply)

a. Above grade construction: wood frame concrete stone brick

b. Basement type: full crawlspace slab other ________

c. Basement floor: concrete dirt stone other ________

d. Basement floor: uncovered covered covered with ______________

e. Concrete floor: unsealed sealed sealed with ______________

f. Foundation walls: poured block stone other ________

g. Foundation walls: unsealed sealed sealed with ______________

h. The basement is: wet damp dry moldy

i. The basement is: finished unfinished partially finished

j. Sump present? Y N

k. Water in sump? Y / N / not applicable

Basement/Lowest level depth below grade: 6 (feet)

Identify potential soil vapor entry points and approximate size (e.g., cracks, utility ports, drains)

Floor drain in laundry area

6. **HEATING, VENTING and AIR CONDITIONING** (Circle all that apply)

Type of heating system(s) used in this building: (circle all that apply – note primary)

Hot air circulation	Heat pump	Hot water baseboard	
Space Heaters	Stream radiation	Radiant floor	
Electric baseboard	Wood stove	Outdoor wood boiler	Other __________

The primary type of fuel used is:

Natural Gas	Fuel Oil	Kerosene
Electric	Propane	Solar
Wood	Coal	

Domestic hot water tank fueled by: gas

Boiler/furnace located in: Basement Outdoors Main Floor Other ________

Air Conditioning: Central Air Window units Open Windows None

Example Correct

Are there air distribution ducts present? Y / N

Describe the supply and cold air return ductwork, and its condition where visible, including whether there is a cold air return and the tightness of duct joints. Indicate the locations on the floor plan diagram.

Cold air return ductwork on ceiling in basement. Cold air return joints appear loose.

7. OCCUPANCY

Basement / Is lowest level occupied? Full time Occasionally Seldom Almost Never

Level	**General Use of Each Floor (e.g., familyroom, bedroom, laundry, workshop, storage)**
Basement	storage and laundry
1st Floor	living area and bedrooms
2nd Floor	
3rd Floor	
4th Floor	

8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY

a. **Is there an attached garage?** Y / N

b. **Does the garage have a separate heating unit?** Y / N / NA

c. **Are petroleum-powered machines or vehicles stored in the garage** (e.g., lawnmower, atv, car etc.) Y / N / NA
Please specify lawnmower, car

d. **Has the building ever had a fire?** Y / N When? ______

e. **Is a kerosene or unvented gas space heater present?** Y / N Where? ______

f. **Is there a workshop or bobby/craft area?** Y / N Where & Type? ______

g. **Is there smoking in the building?** Y / N How frequently? ______

h. **Have cleaning products been used recently?** Y / N When & Type? w/in week - windex, tilex

i. **Have cosmetic products been used recently?** Y / N When & Type? yesterday - hairspray

Example Correct

j. Has painting/staining been done in the last 6 months? Y / N Where & When? ______________

k. Is there new carpet, drapes or other textiles? Y / N Where & When? carpet in dining room

l. Have air fresheners been used recently? Y / N When & Type? ______________

m. Is there a kitchen exhaust fan? Y / N If yes, where vented? outside

n. Is there a bathroom exhaust fan? Y / N If yes, where vented? ___________

o. Is there a clothes dryer? Y / N If yes, is it vented outside? Y / N

p. Has there been a pesticide application? Y / N When & Type? ______________

Are there odors in the building? Y / N
If yes, please describe: ____

Do any of the building occupants use solvents at work? Y / N
(e.g., chemical manufacturing or laboratory, automechanic or autobody shop, painting, fuel oil delivery, boiler mechanic, pesticide application, cosmetologist etc.)

If yes, what types of solvents are used? hair salon dyes, alcohols, peroxides, acetone

If yes, are their clothes washed at work? Y / N

Do any of the building occupants regularly use or work at a dry-cleaning service? (Circle appropriate response)

~~Yes, use dry-cleaning regularly (weekly)~~	No
Yes, use dry-cleaning infrequently (monthly or less)	Unknown
Yes, work at a dry-cleaning service	

Is there a radon mitigation system for the building/structure? Y / N Date of Installation: June 2000
Is the system active or passive? Active/Passive

9. WATER AND SEWAGE

Water Supply:	Public Water	Drilled Well	Driven Well	Dug Well	Other: _______
Sewage Disposal:	Public Sewer	Septic Tank	Leach Field	Dry Well	Other: _______

10. **RELOCATION INFORMATION (for oil spill residential emergency)**

a. Provide reasons why relocation is recommended: not applicable

b. Residents choose to: remain in home relocate to friends/family relocate to hotel/motel

c. Responsibility for costs associated with reimbursement explained? Y / N

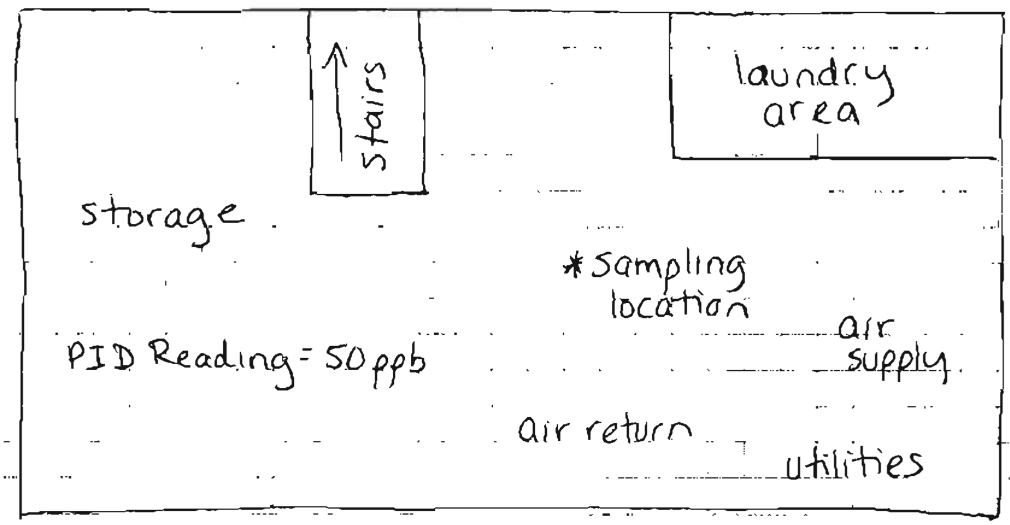
d. Relocation package provided and explained to residents? Y / N

Example Correct

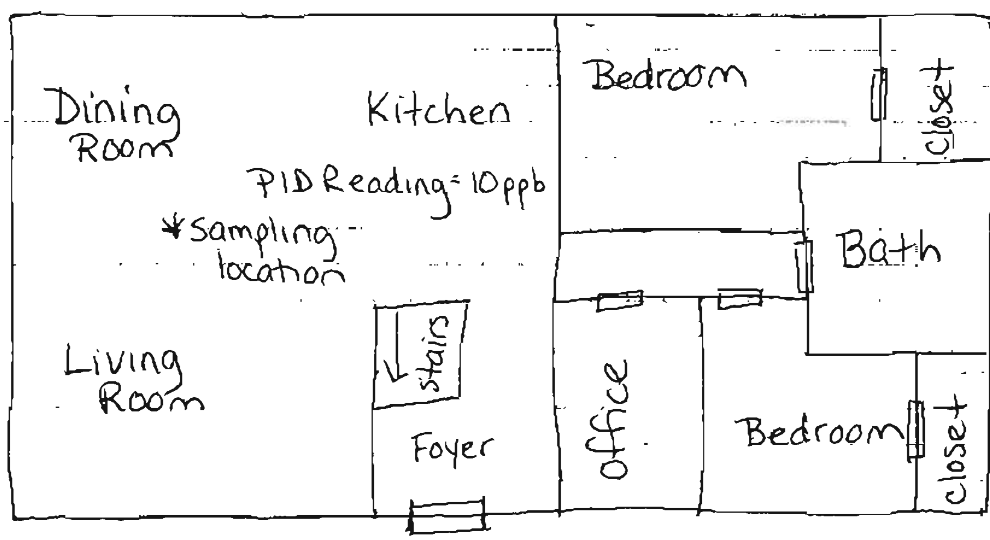
11. FLOOR PLANS

Draw a plan view sketch of the basement and first floor of the building. Indicate air sampling locations, possible indoor air pollution sources and PID meter readings. If the building does not have a basement, please note.

Basement:



First Floor:

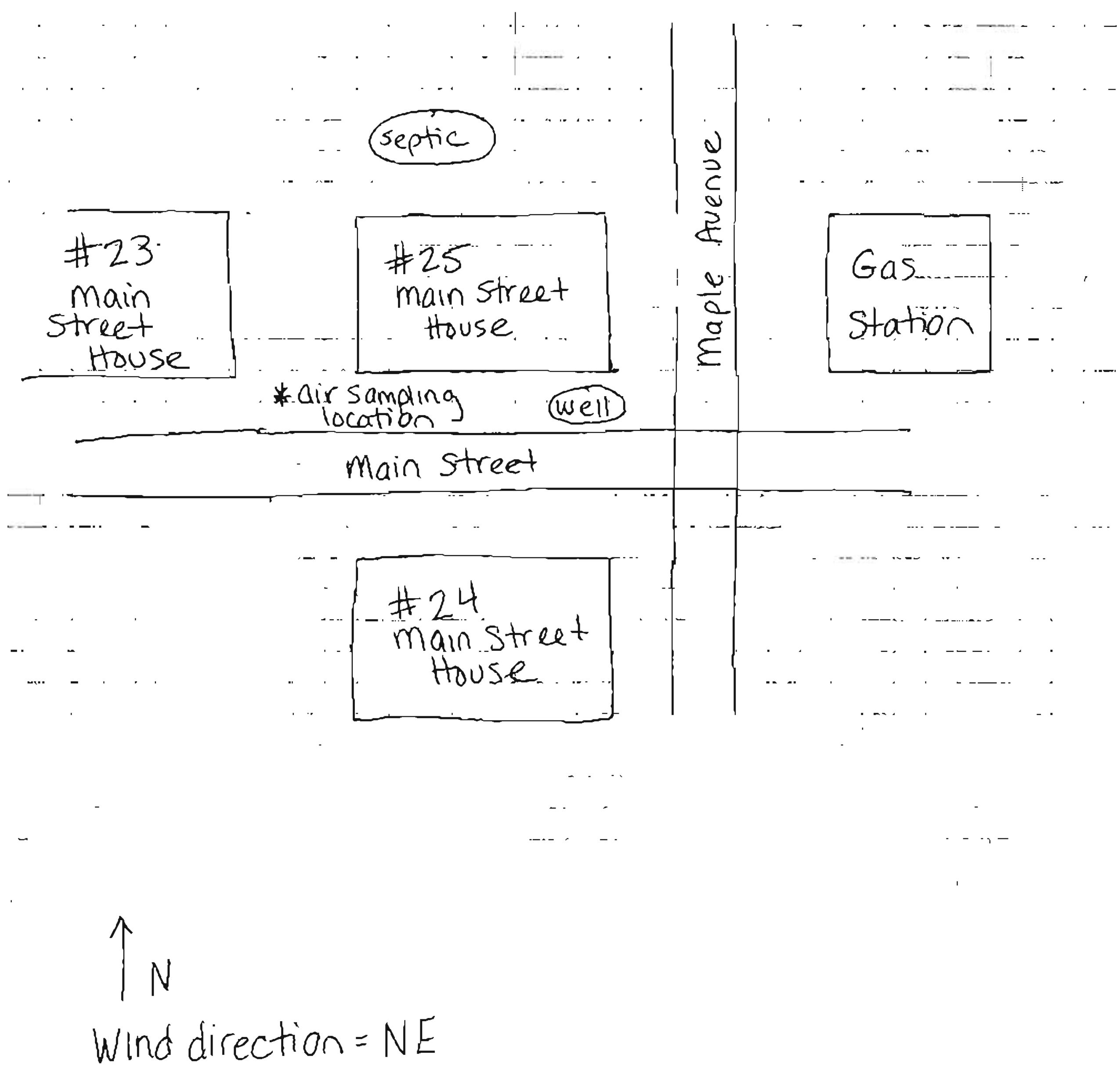


Example Correct

12. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s) and PID meter readings.

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system, if applicable, and a qualifying statement to help locate the site on a topographic map.



Example Correct

13. PRODUCT INVENTORY FORM

Make & Model of field instrument used: RAE photoionization detector

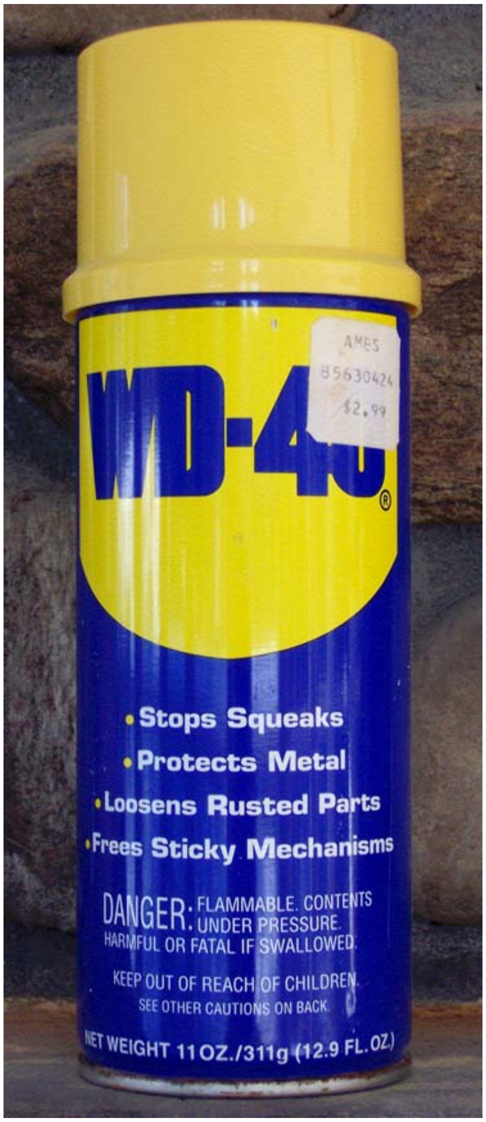
List specific products found in the residence that have the potential to affect indoor air quality.

Location	Product Description	Size (oz.)	Condition*	Chemical Ingredients	Field Instrument Reading	Photo ** Y / N
Kitchen	WD-40	12oz	UO	See photo	10 ppb	Y
garage	mineral spirits	24oz	U	benzene, toluene	15 ppb	N
garage	American Semi-Gloss latex paint	64oz	U	titanium dioxide, ethylene, glycol, aluminum hydroxide, 2,2,4-trimethyl 1-1,3-pentanediol isobutyrate, Vinyl acetate	2 ppb	N
garage	Krylon Semi-gloss oil paint	64oz	D	butane, propane, titanium dioxide, xylene, ethylbenzene, acetone, MEK, butanol, MIK	10 ppb	N
garage	Rustoleum	12oz	U	talc, calcium carbonate, titanium dioxide, xylene, ethylbenzene, acetone, liquified petroleum gases, pentaerythritol	4 ppb	N
garage	Deep Woods Double Strength Insect Repellent	8oz	D	propane, isobutane, N,N-Diethyl-meta-toluamide Di-n-propyl isocinchomeronate	0.5 ppb	N
basement	12 cans latex paint	128oz	U	talc, titanium dioxide, Kaolin clay, 2,24-trimethyl-1,3 pentanediol isobutyrate, vinyl acetate	0	N

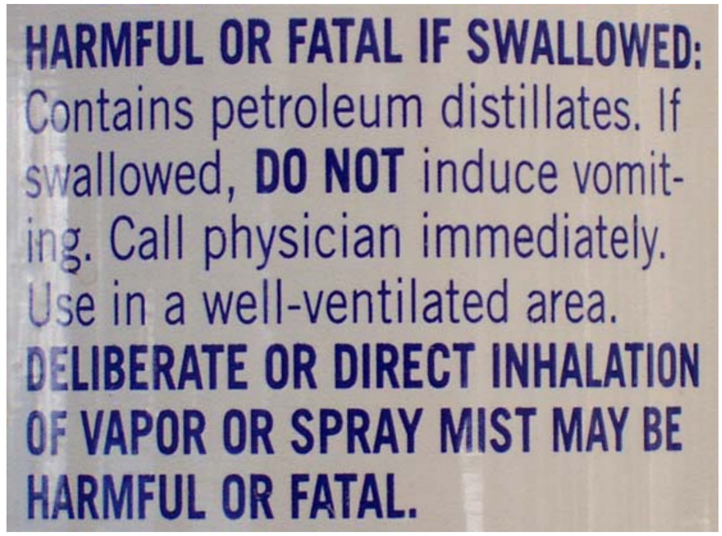
* Describe the condition of the product containers as **Unopened (UO), Used (U),** or **Deteriorated (D)**
** Photographs of the **front and back** of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.

Product Inventory Attachment — 25 Main Street, City

WD-40 FRONT



WD-40 INGREDIENTS



This page is intentionally blank.

APPENDIX B

NYSDEC SAMPLE IDENTIFICATION, PREPARATION AND ANALYSIS SUMMARY FORMS

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FORM S-I

SAMPLE IDENTIFICATION AND
ANALYTICAL REQUIREMENT SUMMARY

NYSDEC Sample ID/Code	Laboratory Sample ID/Code	Analytical Requirements					
		VOA GC/MS (Method #)	BNA GC/MS (Method #)	VOA GC (Method #)	Pest PCBs (Method #)	Metals (Method #)	Other (Method #)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FORM S-IIa

SAMPLE PREPARATION AND ANALYSIS SUMMARY
SEMIVOLATILE (BNA)
ANALYSES

Laboratory Sample ID	Matrix	Date Collected	Date Rec'd at Lab	Date Extracted	Date Analyzed

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FORM S-IIb

SAMPLE PREPARATION AND ANALYSIS SUMMARY
VOLATILE (VOA)
ANALYSES

Laboratory Sample ID	Matrix	Date Collected	Date Rec'd at Lab	Date Extracted	Date Analyzed

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FORM S-IIc

SAMPLE PREPARATION AND ANALYSIS SUMMARY
PESTICIDE/PCB
ANALYSES

Laboratory Sample ID	Matrix	Date Collected	Date Rec'd at Lab	Date Extracted	Date Analyzed

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FORM S-III

SAMPLE PREPARATION AND ANALYSIS SUMMARY
MISCELLANEOUS ORGANIC
ANALYSES

Laboratory Sample ID	Matrix	Analytical Protocol	Extraction Method	Auxiliary Cleanup	Dil/Conc Factor

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FORM S-IV

SAMPLE PREPARATION AND ANALYSIS SUMMARY
INORGANIC ANALYSES

Laboratory Sample ID	Matrix	Metals Requested	Date Rec'd at Lab	Date Digested	Date Analyzed

APPENDIX C

TARGET COMPOUND AND TARGET ANALYTE LISTS

Volatiles Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) for Aqueous Samples

	Volatile Analyte	CAS Number	Trace Water By SIM (µg/L)	Trace Level Water (µg/L)	Low Level Water (µg/L)
1.	Dichlorodifluoromethane	75-71-8		0.50	5.0
2.	Chloromethane	74-87-3		0.50	5.0
3.	Vinyl Chloride	75-01-4		0.50	5.0
4.	Bromomethane	74-83-9		0.50	5.0
5.	Chloroethane	75-00-3		0.50	5.0
6.	Trichlorofluoromethane	75-69-4		0.50	5.0
7.	1,1-Dichloroethene	75-35-4		0.50	5.0
8.	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		0.50	5.0
9.	Acetone	67-64-1		5.0	10.0
10.	Carbon Disulfide	75-15-0		0.50	5.0
11.	Methyl Acetate	79-20-9		0.50	5.0
12.	Methylene chloride	75-09-2		0.50	5.0
13.	trans-1,2-Dichloroethene	156-60-5		0.50	5.0
14.	Methyl tert-Butyl Ether	1634-04-4		0.50	5.0
15.	1,1-Dichloroethane	75-34-3		0.50	5.0
16.	cis-1,2-Dichloroethene	156-59-2		0.50	5.0
17.	2-Butanone	78-93-3		5.0	10.0
18.	Bromochloromethane	74-97-5		0.50	5.0
19.	Chloroform	67-66-3		0.50	5.0
20.	1,1,1-Trichloroethane	71-55-6		0.50	5.0
21.	Cyclohexane	110-82-7		0.50	5.0
22.	Carbon tetrachloride	56-23-5		0.50	5.0
23.	Benzene	71-43-2		0.50	5.0
24.	1,2-Dichloroethane	107-06-2		0.50	5.0
25.	1,4-Dioxane	123-91-1	1.0	25	125
26.	Trichloroethane	79-01-6		0.50	5.0

Volatiles Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) for Aqueous Samples (Continued)

	Volatile Analyte	CAS Number	Trace Water By SIM (µg/L)	Trace Level Water (µg/L)	Low Level Water (µg/L)
27.	Methylcyclohexane	108-87-2		0.50	5.0
28.	1,2-Dichloropropane	78-87-5		0.50	5.0
29.	Bromodichloromethane	75-27-4		0.50	5.0
30.	cis-1,3-Dichloropropene	10061-01-5		0.50	5.0
31.	4-methyl-2-pentanone	108-10-1		5.0	10.0
32.	Toluene	108-88-3		0.50	5.0
33.	Trans-1,3-Dichloropropene	10061-02-6		0.50	5.0
34.	1,1,2-Trichloroethane	79-00-5		0.50	5.0
35.	Tetrachloroethene	127-18-4		0.50	5.0
36.	2-Hexanone	591-78-6		5.0	10.0
37.	Dibromochloromethane	124-48-1		0.50	5.0
38.	1,2-Dibromoethane	106-93-4	0.05	0.50	5.0
39.	Chlorobenzene	108-90-7		0.50	5.0
40.	Ethylbenzene	100-41-4		0.50	5.0
41.	Xylenes (Total)	1330-20-7		0.50	5.0
42.	Styrene	100-42-5		0.50	5.0
43.	Bromoform	75-25-2		0.50	5.0
44.	Isopropylbenzene	98-82-8		0.50	5.0
45.	1,1,2,2-Tetrachloroethane	79-34-5		0.50	5.0
46.	1,3-Dichlorobenzene	541-73-1		0.50	5.0
47.	1,4-Dichlorobenzene	106-46-7		0.50	5.0
48.	1,2-Dichlorobenzene	95-50-1		0.50	5.0
49.	1,2-Dibromo-3-chloropropane	96-12-8	0.05	0.50	5.0
50.	1,2,4-Trichlorobenzene	120-82-1		0.50	5.0
51.	1,2,3-Trichlorobenzene	87-61-6		0.50	5.0

Semivolatiles Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) for Aqueous Samples

	Semivolatile Analyte	CAS Number	Low Water By SIM[1] (µg/L)	Water (µg/L)
1.	Benzaldehyde	100-52-7		5.0
2.	Phenol	108-95-2	0.10	5.0
3.	Bis-(2-chlorothyl) ether	111-44-4		5.0
4.	2-Chlorophenol	95-57-8	0.10	5.0
5.	2-Methylphenol	95-48-7	0.10	5.0
6.	2,2'-Oxybis (1-chloropropane)[3]	108-60-1		5.0
7.	Acetophenone	98-86-2		5.0
8.	4-Methylphenol	106-44-5	0.10	5.0
9.	N-Nitroso-di-n-propylamine	621-64-7		5.0
10.	Hexachloroethane	67-72-1		5.0
11.	Nitrobenzene	98-95-3		5.0
12.	Isophorone	78-59-1		5.0
13.	2-Nitrophenol	88-75-5	0.10	5.0
14.	2,4-Dimethylphenol	105-67-9	0.10	5.0
15.	Bis (2-chloroethoxy) methane	111-91-1		5.0
16.	2,4-Dichlorophenol	120-83-2	0.10	5.0
17.	Naphthalene	91-20-3	0.10	5.0
18.	4-Chloroaniline	106-47-8		5.0
19.	Hexachlorobutadiene	87-68-3		5.0
20.	Caprolactam	105-60-2		5.0
21.	4-Chloro-3-methylphenol	59-50-7	0.10	5.0
22.	2-Methylnaphthalene	91-57-6		5.0
23.	Hexachlorocyclopentadiene	77-47-4		5.0
24.	2,4,6-Trichlorophenol	88-06-2	0.10	5.0
25.	2,4,5-Trichlorophenol[4]	95-95-4	0.20	10.0
26.	1,1'-Biphenyl	92-52-4		5.0
27.	2-Chloronaphthalene	91-58-7		5.0

Semivolatiles Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) for Aqueous Samples (Continued)

	Semivolatile Analyte	CAS Number	Low Water By SIM[1] (µg/L)	Water (µg/L)
28.	2-Nitroaniline[4]	88-74-4		10.0
29.	Dimethylphthalate	131-11-3		5.0
30.	2,6-Dinitrotoluene	606-20-2		5.0
31.	Acenaphthylene	208-96-8	0.10	5.0
32.	3-Nitroaniline[4]	99-09-2		10.0
33.	Acenaphthene	83-32-9	0.10	5.0
34.	2,4-Dinitrophenol[4]	51-28-5	0.20	10.0
35.	4-Nitrophenol[4]	100-02-7	0.20	10.0
36.	Dibenzofuran	132-64-9		5.0
37.	2,4-Dinitrotoluene	121-14-2		5.0
38.	Diethylphthalate	84-66-2		5.0
39.	Fluorene	86-73-7	0.10	5.0
40.	4-Chlorophenyl-phenyl ether	7005-72-3		5.0
41.	4-Nitroaniline[4]	100-01-6		10.0
42.	4,6-Dinitro-2-methylphenol[4]	534-52-1	0.20	10.0
43.	N-Nitrosodiphenylamine	86-30-6		5.0
44.	1,2,4,5-Tetrachlorobenzene	95-34-3		5.0
45.	4-Bromophenyl-phenylether	101-55-3		5.0
46.	Hexachlorobenzene	100-52-7		5.0
47.	Atrazine	108-95-2	0.10	5.0
48.	Pentachlorophenol	111-44-4	0.20	10.0
49.	Phenanthrene	95-57-8	0.10	5.0
50.	Anthracene	95-48-7	0.10	5.0
51.	Carbazole	108-60-1		5.0
52.	Di-n-butylphthalate	98-86-2		5.0

Semivolatiles Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) for Aqueous Samples (Continued)

	Semivolatile Analyte	CAS Number	Low Water By SIM[1] (µg/L)	Water (µg/L)
53.	Fluoroanthene	106-44-5	0.10	5.0
54.	Pyrene	621-64-7		5.0
55.	Butylbenzylphthalate	67-72-1		5.0
56.	3,3'-Dichlorobenzidine	98-95-3		5.0
57.	Benzo (a) anthracene	78-59-1		5.0
58.	Chrysene	88-75-5	0.10	5.0
59.	Bis (2-ethylhexyl) phthalate	105-67-9	0.10	5.0
60.	Di-n-octylphthalate	111-91-1		5.0
61.	Benzo (b) fluoranthene	120-83-2	0.10	5.0
62.	Benzo (k) fluoranthene	91-20-3	0.10	5.0
63.	Benzo (a) pyrene	106-47-8		5.0
64.	Indeno (1,2,3-cd) pyrene	87-68-3		5.0
65.	Benzo (a,h) anthracene	105-60-2		5.0
66.	Benzo (g,h,i) perylene	59-50-7	0.10	5.0

Semivolatile Notes

[1] CRQLs for optional analysis of water and soil samples using SIM (Selected Ion Monitoring) techniques for PAHs and phenols.

[2] Denotes soil, sediment, tissue, or mixed phase samples.

[3] Previously known as bis (2-Chloroisoproply) ether.

[4] Seven semivolatile compounds are calibrated using only a four point initial calibration, eliminating the lowest standard. Therefore, the CRQL values for these eight compounds are 2 times higher for all matrices and levels.

Pesticide Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) For Aqueous and Solid Samples

	Pesticide Analyte	CAS Number	Water (µg/L)	Solids[1] (µg/Kg)
1.	alpha-BHC	319-84-6	0.050	1.7
2.	beta-BHC	319-85-7	0.050	1.7
3.	delta-BHC	319-86-8	0.050	1.7
4.	gamma-BHC (Lindane)	58-89-9	0.050	1.7
5.	Heptachlor	76-44-8	0.050	1.7
6.	Aldrin	309-00-2	0.050	1.7
7.	Heptachlor epoxide[2]	1024-57-3	0.050	1.7
8.	Endosulfan I	959-98-8	0.050	1.7
9.	Dieldrin	60-57-1	0.10	3.3
10.	4,4'-DDE	72-55-9	0.10	3.3
11.	Endrin	72-20-8	0.10	3.3
12.	Endosulfan II	33213-65-9	0.10	3.3
13.	4,4'-DDD	72-54-8	0.10	3.3
14.	Endosulfan sulfate	1031-07-8	0.10	3.3
15.	4,4'-DDT	50-29-3	0.10	3.3
16.	Methoxychlor	72-43-5	0.10	3.3
17.	Endrin ketone	53494-70-5	0.10	3.3
18.	Endrin aldehyde	7421-93-4	0.10	3.3
19.	alpha-Chlordane	5103-71-9	0.050	1.7
20.	gamma-Chlordane	5103-74-2	0.050	1.7
21.	Toxaphene	8001-35-2	5.0	34

Pesticide Notes

[1] There is no differentiation between the preparation of low and medium soil samples in this method for the analysis of pesticides.

[2] Only the exo-epoxy isomer (isomer B) of heptachlor epoxide is reported on the data reporting forms (Exhibit B).

PCB Aroclor Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) For Aqueous and Solid Samples

	Aroclor Analyte	CAS Number	Water (µg/L)	Solids[1] (µg/Kg)
1.	Arochlor-1016	12674-11-2	1.0	33
2.	Arochlor-1221	11104-28-2	1.0	33
3.	Arochlor-1232	11141-16-5	1.0	33
4.	Arochlor-1242	53469-21-9	1.0	33
5.	Arochlor-1248	12672-29-6	1.0	33
6.	Arochlor-1254	11097-69-1	1.0	33
7.	Arochlor-1260	11096-82-5	1.0	33
8.	Arochlor-1262	37324-23-5	1.0	33
9.	Arochlor-1268	11100-14-4	1.0	33

Aroclor PCB Notes

[1] There is no differentiation between the preparation of low and medium soil samples in this method for the analysis of Aroclor PCBs.

Inorganic Target Compound List (TCL) and Contract Required Quantitation Limits (CRQLs) For Aqueous and Solid Samples

	Analyte	CAS Number	ICP-AES[1] CRQL for Water (µg/L)	ICP-AES[1] CRQL for Solids (mg/Kg)	ICP-MS[1] for Water (µg/L)
1.	Aluminum	7429-90-5	200	40	30
2.	Antimony	7440-36-0	60	12	2
3.	Arsenic	7440-38-2	15	3	1
4.	Barium	7440-39-3	200	40	10
5.	Beryllium	7440-41-7	5	1	1
6.	Cadmium	7440-43-9	5	1	1
7	Calcium	7440-70-2	5000	1000	--
8.	Chromium	7440-47-3	10	2	2
9.	Cobalt	7440-48-4	50	10	0.5
10.	Copper	7440-50-8	25	5	2
11.	Iron	7439-89-6	100	20	--
12.	Lead	7439-92-1	10	2	1
13.	Magnesium	7439-95-4	5000	1000	--
14.	Manganese	7439-96-5	15	3	0.5
15.	Mercury[2]	7439-97-6	0.2	0.1	--
16.	Nickel	7440-02-0	40	8	1
17.	Potassium	7440-09-7	5000	1000	--
18.	Selenium	7782-49-2	35	7	5
19.	Silver	7440-22-4	10	2	1
20.	Sodium	7440-23-5	5000	1000	--
21.	Thallium	7440-28-0	25	5	1
22.	Vanadium	7440-62-2	50	10	1
23.	Zinc	7440-66-6	60	12	1
24.	Cyanide[2]	57-12-5	10	1	--

Inorganic Notes

[1] Any analytical method specified in Exhibit D, may be utilized as long as the documented instrument or method detection limits (IDLs or MDLs) are less than one half the Contract Required Quantitation Level (CRQL) requirements. Higher quantitation levels may only be used in the following circumstance:

If the sample concentration exceeds five times the quantitation limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the Contract Required Quantitation Limit. This is illustrated in the example below:

> For lead:
> Method in use = ICP
> Instrument Detection Limit (IDL) = 40
> Sample concentration = 220
> Contract Required Quantitation Level (CRQL) = 3

The value of 220 may be reported even though instrument detection limit is greater than Contract Required Quantitation Limit. The instrument or method detection limit must be documented as described in Exhibit E.

[2] Mercury is analyzed by cold vapor atomic absorption. Cyanide is analyzed by colorimetry/spectrophotometry.

Appendix H

Inspection Checklist

INSPECTION CHECKLIST

O&M Inspection of Pump and Treat System

Former Chromalloy Facility
169 Western Highway, West Nyack, NY
NYSDEC Site No. 344039

Date/Time: ______________________
On-Site Personnel: ______________________

P &T System Operational (Y/N): ______________________

Type of Visit (Bimonthly, Alarm): ______________________
Any existing alarm conditions: ______________________

Totalizer Readings				
Meter ID:	*Type:*	*Cleaned (Y/N):*	*Flow (gpm):*	*Totalizer (gallons):*
RW - 1	Signet			
AST #1 Effluent	Signet			
System Effluent	Mech.			

Water Pressure		
Location ID:	*Time:*	*PSI:*
RW-1		
Pre Bag Filter #1		
Post Bag Filter #1		
Pre Bag Filter #2		
Post Bag Filter #2		
AST #1 Effluent		
AST #2 Effluent		

Bag Filter Differential Pressure			**Bag Filters (10 micron)**
Location ID:	*Time:*	Pres. Diff.	*Changed (Y/N)*
Bag Filter #1			
Bag Filter #2			

Air Strippers		
Location ID:	*Backpressure:*	
AST #1		
AST #2		

Recovery Well #1 Pump	
Hour Meter Reading:	

Bag Filter Drum	
Percent Full	

pH of System	
pH of System	Calibration Ck (Y/N):

System Sampling	
Location ID:	*Sampled (Y/N):*
RW-1 (inf)	
AST #1 Eff (mid)	
Outfall	

Drum Inventory		
Description	*No. of Drums*	*Generation Date*
Bag Filters		
Solids		
Liquid		

System Operation Notes:

Note:
Please email a copy of the completed form to the project manager and save to appropriate project folder.

Appendix I

Excavation Management Plan

APPENDIX I – EXCAVATION WORK PLAN

I-1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the site owner or their representative will notify the Department. Currently, this notification will be made to:

Mr. Randy Whitcher
NYSDEC
DER – Remedial Bureau C, 11th Floor
625 Broadway, Albany, NY 12233
Phone: (518) 402-9662

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent, plans for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control,
- A summary of environmental conditions anticipated in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work,
- A summary of the applicable components of this Excavation Work Plan (EWP),
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120,
- A copy of the contractor's health and safety plan, in electronic format, if it differs from the HASP provided in Appendix E of this document,
- A copy of a Stormwater Pollution Prevention Plan in accordance with the NYSDEC "SPDES General Permit for Stormwater Discharges from Construction Activity" (2010-2015) if applicable. See Section 11.

- Identification of disposal facilities for potential waste streams,
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

I-2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based soil screening will be performed by a qualified environmental professional during all remedial and development excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal, material that requires testing, material that can be returned to the subsurface, and material that can be used as cover soil.

I-3 STOCKPILE METHODS

Soil stockpiles of excavated material will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event and in accordance with the Site SWPPP, if applicable. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by NYSDEC.

I-4 MATERIALS EXCAVATION AND LOAD OUT

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the site.

Loaded vehicles leaving the site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

A truck wash will be operated on-site. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the site until the activities performed under this section are complete.

Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the site are clean of dirt and other materials derived from the site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

I-5 MATERIALS TRANSPORT OFF-SITE

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

All trucks will be washed prior to leaving the site. Truck wash waters will be collected and disposed of off-site in an appropriate manner.

Truck transport routes will be developed along with the description of work and a map of the route provided in the submission to the Department. All trucks loaded with site materials will exit the vicinity of the site using only these approved truck routes. This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport; [(g) community input [where necessary]]

Trucks will be prohibited from stopping and idling in the neighborhood outside the project site.

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

Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

I-6 MATERIALS DISPOSAL OFF-SITE

All soil/fill/solid waste excavated and removed from the site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of soil/fill from this site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials from this site will not occur without formal NYSDEC approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, construction and demolition (C/D) recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Track 1 unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

I-7 MATERIALS REUSE ON-SITE

Chemical criteria for on-site reuse, of material (based on analytical results of confirmatory samples collected for VOCs and metals, according to US EPA Method 8260 and 6010, respectively) must be below NYSDEC 6 NYCRR Part 375, Restricted Use, Protection of Human Health, Commercial SCOs . The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for re-use on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the site will not be reused on-site.

I-8 FLUIDS MANAGEMENT

All liquids to be removed from the site, including excavation dewatering and groundwater monitoring well purge and development waters, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the site, but will be managed off-site.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a SPDES permit.

I-9 COVER SYSTEM RESTORATION

After the completion of soil removal and any other invasive activities the cover system will be restored in a manner that complies with the the ROD and this SMP. The demarcation layer, consisting of orange snow fencing material or equivalent material will be replaced to provide a visual reference to the top of the 'Remaining Contamination Zone', the zone that requires adherence to special conditions for disturbance of remaining contaminated soils defined in this Site Management Plan. If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), (Figures 8 and 9. this will constitute a modification of the cover element of the remedy and the upper surface of the 'Remaining Contamination. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in any updates to the Site Management Plan.

I-10 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the site. The source of the fill material and documentation of the testing performed shall be provided for any fill prior to placement on-site:

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the site.

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d). Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards compared against NYSDEC 6 NYCRR Part 375, Restricted Use, Protection of Human Health, Commercial SCOs. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by NYSDEC. Solid waste will not be imported onto the site.

Trucks entering the site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

I-11 STORMWATER POLLUTION PREVENTION

For construction projects exceeding one (1) acre in size a Stormwater Pollution Prevention Plan (SWPPP) is required and must conform to NYSDEC Division of Water guidelines and the NYSDEC "SPDES General Permit for Stormwater Discharges from Construction Activity" (2010-2015).

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.

Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

I-12 CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for full a full list of analytes (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides and PCBs), unless the site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the periodic reports prepared pursuant to Section 5 of the SMP.

I-13 COMMUNITY AIR MONITORING PLAN

Any intrusive activities shall be accompanied with a Community Air Monitoring Plan. The plan shall be in accordance with the NYSDOH Appendix 1A "Generic Community Air Monitoring Plan", as shown in Appendix I. At a minimum an up-wind and down-wind monitoring station to evaluate ambient air VOC and particulate concentrations shall be set up at each work location. A figure showing the location of air sampling stations based on generally prevailing wind conditions shall be submitted to the Department with the Description of Work. These locations will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and at least two downwind monitoring stations. Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

I-14 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors off-site. If nuisance odors are identified at the site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and

NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the property owner's Remediation Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

I-15 DUST CONTROL PLAN

A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved though the use of a dedicated on-site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.

- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.

- Gravel will be used on roadways to provide a clean and dust-free road surface.

- On-site roads will be limited in total area to minimize the area required for water truck sprinkling.

I-16 OTHER NUISANCES

A plan for rodent control will be developed and utilized by the contractor prior to and during site clearing and site grubbing, and during all remedial work.

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

Appendix J

Effluent Limitations Monitoring Requirements

1166/corr

91-20-2a (1/89)

Site No.:3-44-039
Part 1, Page 1 of 2

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning June 2001
and lasting until June 2006

the discharges from the treatment facility to Hackensack River , water index number NJ-1-9 , Class A , RECEIVING WATER shall be limited and monitored by the operator as specified below:

Outfall Number and Parameter	Discharge Limitations		Units	Minimum Monitoring Requirements	
	Daily Avg.	Daily Max		Measurement Frequency	Sample Type
Outfall 001 - Treated Groundwater Remediation Discharge:					
Flow	Monitor	435,000	GPD	Continuous	Meter
pH (range)	6.0 to	9.0	SU	Daily	Grab
Cadmium, Total	Monitor	42	µg/l	Weekly	Grab
Chromium, Total	Monitor	500	µg/l	Weekly	Grab
Copper, Total	Monitor	144	µg/l	Weekly	Grab
Lead, Total	Monitor	150	µg/l	Weekly	Grab
Nickel, Total	Monitor	1000	µg/l	Weekly	Grab
Zinc, Total	Monitor	1000	µg/l	Weekly	Grab
Arsenic	Monitor	100	µg/l	Weekly	Grab
1,1,1,2-Tetrachloroethane	Monitor	50	µg/l	Weekly	Grab
1,1,1 Trichloroethane	Monitor	10	µg/l	Weekly	Grab
1,1,2 Trichloroethane	Monitor	10	µg/l	Weekly	Grab
1,1 Dichloroethane	Monitor	10	µg/l	Weekly	Grab
1,1 Dichloroethene	Monitor	7	µg/l	Weekly	Grab
Benzene	Monitor	5	µg/l	Weekly	Grab
Carbon Tetrachloride	Monitor	4	µg/l	Weekly	Grab
Chloroform	Monitor	70	µg/l	Weekly	Grab
cis-1,2 Dichloroethene	Monitor	10	µg/l	Weekly	Grab
trans-1,2 Dichloroethene	Monitor	10	µg/l	Weekly	Grab
Methylene Chloride	Monitor	10	µg/l	Weekly	Grab
sec- Butylbenzene	Monitor	50	µg/l	Weekly	Grab
Tetrachloroethene	Monitor	7	µg/l	Weekly	Grab
Trichloroethene	Monitor	10	µg/l	Weekly	Grab
Vinyl Chloride	Monitor	3	µg/l	Weekly	Grab

Note: The treatment facility consists of the dual phase extraction system and the pump-and-treat system installed in compliance with the NYSDEC Record of Decision for the cleanup of the groundwater contamination.

Additional Conditions:

(1) Discharge is not authorized until such time as an engineering submission showing the method of treatment is approved by the Department. The discharge rate may not exceed the effective or design treatment system capacity. All monitoring data, engineering submissions and modification requests must be submitted to:

Chief - Operation Maintenance and Support Section
Bureau of Hazardous Site Control
Division of Environmental Remediation
NYSDEC
50 Wolf Road
Albany, N.Y. 12233-7010

With a copy sent to:
Joe Marcogliese, RWE - 3
NYS Dept. of Env. Con.
200 White Plains Rd., 5th Fl
Tarrytown, NY 10591-5805

(2) Only site generated wastewater is authorized for treatment and discharge.

(3) Authorization to discharge is valid only for the period noted above but may be renewed if appropriate. A request for renewal must be received 6 months prior to the expiration date to allow for a review of monitoring data and reassessment of monitoring requirements.

(4) Both concentration (mg/l or µg/l) and mass loadings (lbs/day) must be reported to the Department for all parameters except flow and pH.

(5) Any use of corrosion/scale inhibitors or biocidal-type compounds used in the treatment process must be approved by the department prior to use.

(6) This discharge and adminstration of this discharge must comply with the attached General Conditions.

(7) ***This condition is applicable only when the max. flow rate of outfall 001 is 7200 GPD and outfall 001 consists of discharge only from the Dual Phase extraction system.***
The measurement frequency for all parameters of outfall 001except flow and pH shall be **Monthly** following a period of **eight** consecutive weekly sampling events that show no exceedance of discharge limits. If the discharge limit for any parameter is exceeded, the measurement frequency for **all** parameters shall again be **weekly**, until a period of eight consecutive sampling events that show no exceedance at which point Monthly monitoring may resume.

Appendix K

Chronological Listing of Primary Documents (OU1 and 2)

Appendix K
Chronological Listing of Primary Documents for Operable Unit 1

Date	Title (Author)
Sep 1987 and Mar 1988	Hydrogeologic Investigation (Geraghty and Miller, Inc. (G&M))
August 29, 1989	Order on Consent Index # W3-0080-87-01 - Field Investigation Program (NYSDEC)
January 7, 1992	Preliminary Hydrogeologic Investigation (G&M)
October 13, 1992	Former Chromalloy Facility listed on the NYSDEC Inactive Hazardous Waste Disposal Site Registry as a Class 2 Site, Site #344039, EPA # NYD980454877.
February 28, 1994	Order on Consent Index # W3-0080-87-01 / Site #3-44-039, Remedial Investigation/Feasibility Study (NYSDEC)
July 1994	Remedial Investigation/Feasibility Study Work Plan (Lawler, Matusky &Skelly Engineers (LMS))
December 1994	Remedial Investigation, Interim Data Report (No. 1) (LMS)
March 1995	RI/FS Modification No. 2 (LMS)
June 1995	Remedial Investigation Report on Hexane Spill (LMS)
July 7, 1995	Letter Re: Hexane Tank Closure (LMS)
August 1995	RI/FS Second Interim Data Report (LMS)
November 1995	RI/FS Report on Delineation Study for Proposed Soil Removal Program (LMS)
January 1996	RI/FS Report on November 1995 Soil Removal Program (LMS)
October 14, 1997	Modification No. 7 Interim Data Report and Work Plan Update (Environmental Alliance (EA))
March 20, 1998	Letter and Stream Sampling Results (RCHD)
April 22, 1998	Letter and Stream Sampling Results (RCHD)
May 13, 1998	Analysis of Borehole Geophysical Surveys (Earth Data Incorporated)
December 18,1998	Groundwater Modeling Report (EA)
December 18, 1998	Feasibility Study (EA)
February 1999	Proposed Remedial Action Plan (NYSDEC)
March 16, 1999	Public Comment to PRAP-OU1. (Sequa)
March 16, 1999	Public Meeting Transcripts (Morgan, Lewis, and Brokvius, LLP)
March 31, 1999	Record of Decision (ROD), OU1 Site #344039 (NYSDEC)
November 5, 1999	Remedial Investigation (EA)
November 5, 1999	Feasibility Study (EA)
May 20, 2000	Soil Erosion Control Plan for Remedial Project (EA)
October 3, 2000	Letter Re Letter stating Division of Air has reviewed air emissions information contained in the May 12, 2000 Alliance letter and the proposal is acceptable. (NYSDEC, Division of Air)
November 8, 2000	Remedial Design Report Transmittal (EA)
December 2, 2000	Letter Re Comments for changes to the November 2000 Alliance Remedial Design Report. (NYSDEC)
March 2001	Pineview Residential letters summarizing VI results (NYSDOH)

Date	Title (Author)
April 12, 2001	Order on Consent Index # W3-0080-99-05, Site # 3-44-039 , OU1 Remedial Design (NYSDEC)
May 4, 2001	Dual Phase Extraction Remedial Design (EA)
May 30, 2001	Letter Re RI/FS Modification No. 9 (EA)
June 1, 2001	RI/FS Modification No. 8 Report (EA)
June 1, 2001	Pump and Treat Remedial Design (EA)
June 29, 2001	Letter Re Building plans and Site Plan submission to Town on Clarkston (EA)
July 5, 2001	Letter Re: Response to NYSDEC comments on DPE and P&T remedial design reports. (EA)
July 15, 2001	Letter Re RI/FS Work Plan Modification No. 10 (EA)
November 6, 2001	Rough Line Lot Stake Out (James E. Drumm, Surveyor)
January 19, 2002	Remediation System As Built Report and Operations and Maintenance Plan (EA)
April 10, 2003	Low Flow Groundwater Sampling and Results Letter (EA)
November 25, 2003	RI/FS Mod No. 11 Report (EA)
October 31, 2006	Groundwater Modeling Update Report (EA)
October 31, 2006	Groundwater Remediation Enhancement Work Plan (EA)
May 10, 2007	Groundwater Remediation Enhancement Work Plan – Response to comments (EA)
June 2007	RI/FS (VI Investigation Report) (EA)
December 5, 2008	Quarterly Update Report (Q3 2008) (August 1 through October 31, 2008) (Payne)
February 13, 2009	RI/FS Mod No 13 Soil Vapor Intrusion (VI) Investigation Update Report (Payne)
February 26, 2009	Quarterly Update Report (Q4 2009) (November 1 2008 through January 31, 2009) (Payne)
2009	2009 Q1-Q4 Quarterly Update Reports (Payne)
March 31, 2009	Remedial Enhancement Pilot Study System As-Built and O&M Status Report (EA)
June, 25, 2009	Interim Data Report – Groundwater Remedial Enhancement Pilot Study System (Payne Firm (Payne))
September 30, 2009	System Performance Monitoring Report - Groundwater Remedial Enhancement Pilot Study System (Payne)
2010	2010 Q1-Q4 Quarterly Update Reports (Payne)
April 9, 2010	RI/FS Mod No 13 Soil Vapor Intrusion (VI) Investigation Update Report (Payne)
November 23, 2010	OU1: Proposal for Minor/Significant Changes to Remedy/OU2 Revised RI/FS Work Plan (Payne)
2011	2011 Q1-Q4 Quarterly Update Reports (Payne/TRC) * Q4 2011 Report includes sampling the DPE Wells
February 4, 2011	OU1: Proposal for Minor/Significant Changes to Remedy (Payne)
November 1, 2011	Quarterly Update Report (Q3 2011) (July 1, 2011 through September 30, 2011) (TRC)
2012	2011 Q1-Q4 Quarterly Update Reports (Payne)
March 8, 2013	Quarterly Update Report (Q4 2012) (October 1, 2012 through December 31, 2012) (TRC)
June 8, 2013	Monitoring Change Frequency, Chromalloy Site, West Nyack, NY Site No. 344039 (NYSDEC)

Appendix K
Chronological Listing of Primary Documents for Operable Unit 2

Date	Title (Author)
May 13, 2003	Surficial Soil Scope of Work (Alliance)
August 4, 2003	Comment/Approval Letter (NYSDEC/NYSDOH)
September 5, 2003	Response to NYSDEC Comments (Alliance)
November 25, 2003	RI/FS Mod. No. 11 Report (Alliance)
July 23, 2004	RI/FS Mod. No. 11, Continuation Report (Alliance)
September 13, 2004	Comment Letter (NYSDEC/DOH)
September 14, 2004	Proposal and Scope of Work for Sampling of Backfill Material (Alliance)
February 25, 2005	RI/FS Mod. No. 11, Continuation Report (Alliance)
August 19, 2005	RI/FS Work Plan – Addendum II - Mod. No. 11, Continued (Alliance)
September 27, 2005	Comment Letter (NYSDEC/NYSDOH)
November 9, 2005	Response to Comments (Alliance)
March 15, 2006	RI/FS Work Plan Addendum III - Mod. No. 11, Continued (Alliance)
June 27, 2006	RI/FS Work Plan – Addendum IV – Mod. No. 11, Continued (Alliance)
December 12, 2007	RI/FS Work Plan – Mod. No. 11, Continued, Chromium Speciation in Soil Investigation Activities Work Scope (Alliance)
February 1, 2008	Approval of 12/12/07 Work Plan (NYSDEC/DOH)
August 27, 2008	RI/FS Mod. No. 11 – Chromium Speciation Soil Investigation Report (Alliance)
October 15, 2008	Letter: Update Plan for OU-II (Payne Firm)
May 4, 2010	RI/FS Work Plan, Mod #11, OU-II, Addendum V, Delineation of Chromium in Soil (Payne Firm)
October 27, 2010	NYSDEC Response to RI/FS Work Plan
November 23, 2010	REVISED RI/FS Work Plan, Mod No. 11, OU-II, Addendum V, Delineation of Chromium in Soil (Payne Firm)
September 14, 2011	Delineation of Chromium in Soil – Interim Report and Field Delineation Plan (RI/FS Mod. 11 Addendum V) (TRC)