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13 February 2006

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Division of Environmental Remediation
21 South Putt Corners Road
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Re: Stewart EFI - Yonkers, NY
VCP Site ID No. - V00691
Revised Voluntary Investigation Work Plan and
Response to NYSDEC Comments

Dear Janet:

This letter is a response to the NYSDEC correspondence dated 5 August 2004 regarding the Stewart EFI Site in Yonkers, NY. The Department's letter provided comments on the document entitled "Voluntary Investigation Work Plan (ERM, February 2004). In addition, we are also attaching a revised Work Plan that incorporates the changes requested by the Department. The comments provided in the 5 August letter are repeated below, followed by a response.

DEC 1. *In addition to the Draft Voluntary Cleanup Program Guide (May 2002), the IWP, site Health and Safety Plan (HASP), and Quality Assurance Project Plan (QAPP) shall be prepared in accordance with Draft DER-10 Technical Guidance for Site investigation and Remediation (December 2002) available at: http://www.dec.state.ny.us/website/der/guidance/der10dr.pdf.*

No response required.

DEC 2. *Please submit the site HASP and QAPP with the revised IWP.*

The Voluntary Investigation Work Plan has been revised to include these additional components (see Sections 4.0 and 5.0).

DEC 3. *Please include standard operating procedures (SOP) for collection of soil, groundwater and soil vapor samples.*

The Voluntary Investigation Work Plan has been revised to include these additional components and is being submitted with this letter.

DEC 4. *Please include Figures 1-2 through 1-4 from the Phase II Site Investigation Report (SIR) (ERM, January 2003), and indicate the locations of the stamping machines and/or heavy equipment/physical constraints that may affect future sampling locations. Please also indicate the location of the previous wells that were attempted and met with shallow bedrock refusal (and refusal depths).*

The additional figures from the Phase II Site Investigation Report have been included in the revised Voluntary Investigation Work Plan. A figure showing the location of the stamping machines is not provided. The plant does not maintain such a plan because the machines are periodically moved.

The locations of the two monitoring wells that were attempted, but not completed due to refusal on bedrock prior to encountering water, are shown on Figure 2-1. The logs for these wells are included in the Phase II Site Investigation Report, which is included in the revised Work Plan as Appendix B. The depth to rock recorded in these two borings is provided below:

BORING ID	DEPTH TO ROCK
ERM-2	11 feet
ERM-3	13 feet

DEC 5. *Please check the proper orientation of the north arrow on Figure 1-2 as it differs from those on previous site plans (i.e., Figures 1-2 through 1-4 of the Phase II SIR). Also please check various locations/directions noted throughout the text for accuracy.*

The north arrow was inadvertently rotated 90° from its proper orientation in the prior version of this figure. This has been corrected in the revised Voluntary Investigation Work Plan. The revised document has also been checked to confirm the accuracy of all directional references.

DEC 6. *The IWP states that the presumed groundwater flow is to the southeast following the slope of the terrain toward the Bronx River. The IWP also states that "the Catskill Aqueduct is about 2,000 feet east and the Hillview Reservoir is about 3,000 southeast (both in the presumed upgradient direction)." If groundwater flow is presumed toward the southeast, then these locations would not be upgradient of the site. Also, the Hillview Reservoir is located southwest of the site. We understand that confirmation of groundwater flow direction will be part of the IWP. However, based on the current and proposed well locations, and the corrected north arrow, downgradient well locations should be added. Proposed MW-4 is now a presumed upgradient well and MW-1 may be more cross-gradient than downgradient of the UST area.*

This passage has been edited and generally simplified in the revised Voluntary Investigation Work Plan. The accuracy of all directional references has been confirmed.

Once the two proposed new wells have been installed and the pump tests performed, an evaluation of ground water flow direction will be completed. Until these results are available it is premature to speculate on which wells may be either upgradient or downgradient. After the ground water flow direction is understood, an evaluation of the ground water monitoring network will be performed, and a determination will be made if additional wells are necessary.

DEC 7. *The IWP states that a 4-hour pump test of each well will be performed. While 4 hours may be adequate to positively identify hydraulic interconnectivity, in order to conclude absence of interconnectivity, the pump tests should be performed for 24 hours.*

The revised Voluntary Investigation Work Plan now calls for 24-hour pump tests of each well.

DEC 8. *It is understood that sampling locations may change depending on the results of the contractor walkthrough. Should this be the case, a revised site plan showing the revised sampling locations and basis for the changes should be provided to the NYSDEC/NYSDOH for review/approval.*

Sampling locations have not been revised due to the contractor review of the work area in the plating room.

DEC 9. *Please provide a project schedule with the revised IWP.*

The revised Voluntary Investigation Work Plan now contains a project schedule.

DOH 1. *It appears that the proposed work plan is insufficient in providing us with the information necessary to evaluate potential human exposures or identify all potential environmental threats at this site. In particular, the consultants stated in the Phase II Investigation Report that, "Little is known regarding the historic degreasing operations or practices at the facility." Yet, no further investigation of chlorinated solvent contamination in additional areas within the facility has been proposed besides the two borings previously conducted in the current vapor degreaser location. The consultant should propose the collection of additional samples within the area of known vapor degreasing unit, the loading dock, and the area of chlorinated solvent storage near the maintenance room at a minimum. I realize that accessibility within the facility is an issue at this site. However, I suggest that a soil vapor survey be conducted throughout/around the facility to identify other areas of potential contamination.*

As discussed in the site meeting on 2 November 2005, a total of six sub-slab soil vapor samples will be collected at the following locations:

- Former degreaser sump;
- Three (3) basement areas; and
- Two (2) solvent storage areas.

The scope of work associated with this sampling is described in detail in the revised Voluntary Investigation Work Plan.

DOH 2. *It appears that there is a need for additional groundwater monitoring wells to be installed at this site. Specifically, due to the specific gravity of chlorinated solvents and their resultant tendency to "sink", additional deep bedrock wells will be necessary to identify if chlorinated solvent contamination was "missed" during previous investigation activities at this site. Also, I recommend that a groundwater monitoring well be installed in the vicinity of the vapor degreaser pit.*

This comment was discussed during the site meeting on 2 November 2005. The Volunteer believes that it is premature to conclude that deeper wells are necessary, given the fact that no evidence of a solvent release has yet been found.

As previously indicated in the response to Comment DEC-6, after the two proposed wells have been installed, and ground water flow direction has been determined, an evaluation will be made regarding the need for additional monitoring wells.

With regard to installing a well at the former degreaser, this was also discussed in the 2 November meeting. Due to the inaccessibility of this area to bedrock drilling equipment, no well is proposed at this location.

DOH 3. *The limited basement areas beneath the facility should be noted on a map. Also, the consultant should describe the ground cover in the open areas around the building (i.e., pavement, grass, etc.)*

The requested information is provided on a new Site Plan in the revised Voluntary Investigation Work Plan.

DOH 4. *In the future, all attempts should be made to assess soil quality down to the top of bedrock below the building. This may include the use of alternative drilling methods to penetrate the sub-floor structure located beneath the existing slab.*

No response required.

DOH 5. *The volunteer should supply additional information regarding the historic "solder reflow operations utilizing cad-tin solder," This information should include the likely location of such operations and a more descriptive explanation of the process.*

Prior to 2001, two "hot tin" stations were utilized in the northwest corner of the plating room. In this operation, brass and steel parts were immersed in molten solder (90% lead and 10% tin). There were a total of four solder pots between the two stations, which encompassed an area approximately 15' x 8' in size. There was no cadmium used in this operation. This passage has been edited accordingly in the revised Voluntary Investigation Work Plan.

DOH 6. *Due to the proximity of potential receptors (i.e., residential structures) if chlorinated solvent contamination is identified in the on-site soil or groundwater, the need for off-site soil vapor sampling will need to be considered.*

As discussed in the site meeting on 11 November 2005, off-site soil vapor sampling is not required at this time.

We trust that these responses fully address the comments provided. Should you have any questions, please feel free to contact us at your convenience.

Very truly yours,

Michael B. Teetsel, CPG
Partner

VOLUNTARY INVESTIGATION WORK PLAN

Stewart EFI Facility
Yonkers, New York
NYSDEC VCP Site No. V-0691-3

February 2006

Prepared for:

Stewart EFI-New York, LLC
630 Central Park Avenue
Yonkers, New York 10704-2000

Prepared by:

ENVIRONMENTAL RESOURCES MANAGEMENT
77 Hartland Street; Suite 300
East Hartford, Connecticut 06108

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1.0 INTRODUCTION AND PURPOSE

1.1 INTRODUCTION

This Work Plan describes a scope of work to complete the environmental investigation of the Stewart EFI property located at 630 Central Park Avenue in Yonkers, New York (the Site). Recognized Environmental Conditions (hereafter referred to as Areas of Concern) were identified as part of the *Phase I Environmental Site Assessment* (ERM, September 2002) and the *Phase II Site Investigation* (ERM, January 2003). These previous Site assessments were performed on behalf of former Site owner Insilco Corporation in preparation for sale of the property to the current owner Stewart EFI, New York, LLC. The purpose of this Work Plan is to:

- Evaluate the Areas of Concern (AOCs), where accessible, for evidence of the release of hazardous materials;
- Summarize the status of AOCs already characterized;
- Evaluate the nature and extent of previously detected zinc in the bedrock aquifer underlying the Site, and the potential for zinc and other possible chemicals of concern (COCs) to impact the surrounding residential properties; and
- Perform hydrologic evaluations of the bedrock aquifer to further assess groundwater flow direction and rates, along with potential contaminant fate and transport mechanisms.

The primary goal of these investigation activities is to evaluate possible impacts of historical and/or current operations at the Site on surrounding residential properties. These adjacent homes, in the absence of surface water bodies and public/private drinking water wells, represent the most sensitive receptor in the Site area. The investigation will also evaluate the nature and extent of groundwater impacts in excess of the applicable standards.

All of the characterization activities proposed in this Work Plan have been developed based on the guidelines in the *Draft Voluntary Cleanup Program Guide* (NYSDEC, May 2002) and the *Draft DER-10: Technical Guidance for*

Site Investigation and Remediation (NYSDEC, December 2002). The proposed investigation will meet the stated goals of these guidance, which include:

1. Defining the nature and extent of contamination, both laterally and vertically;
2. Identify contaminant source areas; and
3. Produce data of sufficient quantity and quality to support the development of a Remedial Work Plan, if required.

The Site will be investigated systematically, as required under the above referenced guidance and in accordance with Voluntary Investigation Agreement (Index No. W3-1005-04-06), executed by Stewart EFI New York, LLC and the NYSDEC. Sampling will be conducted to evaluate for potential COC releases in each of the identified AOCs, within the limits of Site access constraints. As previously discussed, and as observed in the Site meetings held on 28 September and 2 November 2005, access to many portions of the Site building is extremely limited due to low ceilings, narrow doorways, numerous stamping machines weighing several tons each and concrete floors/sub-floors between 10” and 30” thick.

Based on the information gathered as part of the sampling described in this Work Plan and preceding investigations, a Conceptual Model will be developed regarding each potential AOC at the Site. The Conceptual Model, which will be modified as the project progresses, will identify:

- The extent and degree of contamination in the subsurface at each documented AOC;
- If contamination is identified, the nature of the COC release mechanism(s);
- Preferential migration pathways, ultimate discharge locations, and sources of contaminated groundwater in the bedrock aquifer (there is no overburden groundwater at the Site); and

- Transport and attenuation mechanisms and potential receptors of defined soil and groundwater contamination. This aspect of the Conceptual Model will be designed to fulfill the requirements of the Qualitative Human Health Exposure Assessment described in the Guidance Document.

In order to prepare the Conceptual Model, the following items must be evaluated for each AOC:

- Chemicals of Concern (COCs);
- Release Mechanism/Location;
- Environmental setting into which the release occurred;
- Characteristics of subsurface materials in the release area;
- Fate and transport characteristics of the material released; and
- Site characterization and monitoring techniques.

This Work Plan is designed to obtain the information needed to complete the Conceptual Model, and better understand the nature of the AOCs at the Site and the potential for identified releases of COCs to impact off-site properties. As a result of the investigation work already completed at the Site, some of this information has already been obtained for most identified AOCs. Using this information as a starting point, the characterization of the Site will be completed and if required, a Remedial Action Work Plan (RAWP) will be developed.

1.2 SITE DESCRIPTION

The Site is located at 630 Central Park Avenue in Yonkers, Westchester County, New York. The Site is approximately 3.0 acres in size, and is located in an area zoned for industrial/commercial land use.

The facility consists of 240,000± square feet of building space. It is estimated that 70% of the building houses manufacturing operations, with the remainder used for warehousing and offices. Metal stamping operations have been performed at the Site since approximately 1942. The facility was reportedly constructed in approximately 1930 as a warehouse for the Wanamaker Department Stores on previously undeveloped land. The footprint of the Site building occupies about ¾ of the property.

1.3 CHARACTERISTICS OF THE SITE AREA

1.3.1 General Setting

The facility is located on Central Park Avenue between Whittier Avenue and Kettel Avenue, immediately east of the New York State Thruway. Adjacent properties to the north, south and east are single-family residences. West of the Site, across Central Park Avenue, is the New York State Thruway corridor.

The general location of the property and the physiographic features of the surrounding area are shown on Figure 1-1, developed from the United States Geological Survey (USGS) 7.5 minute quadrangle for the area. A site plan is provided as Figure 1-2. A simplified site plan, showing previous sampling locations, is given as Figure 1-3.

1.3.2 Topography and Stormwater Flow

The topography of the Site gently slopes from a topographic high of approximately 210 feet Mean Sea Level (MSL) in the western portion of the site, to approximately 200 feet MSL in the northeast corner of the site (i.e., the general slope of the Site terrain is easterly). The Site is located about equidistant between the Bronx River and the Saw Mill River, however based on the topographic slope, the presumptive direction of regional groundwater flow direction is easterly (toward the Bronx River). It is recognized that the groundwater flow direction is unconfirmed and will be evaluated as part of this investigation.

No suspected wetlands areas were observed on the Site, which, according to the Environmental Data Resources (EDR) report provided in the *Phase I Environmental Site Assessment* (ERM, September 2002) is outside the 100-

year floodplain (the entire Phase I document is provided herein as Appendix A). No surface water bodies are located on-site.

1.3.3 *Groundwater, Soil and Bedrock Characteristics*

Five geologic logs were prepared for each soil boring or monitoring well that extended deeper than two to three feet during the *Phase II Site Investigation* (ERM, January 2003). These logs, along with the entire Phase II report, are provided as Appendix B. The unconsolidated overburden was found to consist of an unstratified mixture of silt, sand and gravel, typical of the glacial ground moraine (till) deposits that outcrop in the local area. No groundwater was encountered in the overburden material. Depth to bedrock was found to vary between eight and twenty feet.

Observations made from the air rotary drill cuttings generated during the installation of MW-1 and MW-2 indicated that the bedrock was dark colored and micaceous. This is typical of the Yonkers Gneiss (Precambrian) that occurs in the vicinity of the site. Published data (Fisher, 1970) describe this unit as a micaceous hornblende gneiss. A significant water bearing fracture was encountered during the drilling of well MW-1 at 34 to 35 feet below grade. In well MW-2, minor fractures that produced little or no water were encountered at 21 and 26 feet below grade.

During the development of well MW-2, depth to water measurements were recorded in MW-1 and the existing production well (MW-3) in an attempt to evaluate if any hydraulic interconnection exists between the three wells. While MW-2 was being pumped, no water level changes were observed in either MW-1 or MW-3. While this suggests a lack of hydraulic interconnection, these results are considered inconclusive due to the short duration of the test (30 minutes) and the low sustainable pumping rate produced by MW-2 (1.25 gpm).

Due to lack of definitive knowledge on the hydraulic interconnection of the water bearing fractures in the shallow bedrock, it was not possible to evaluate the site specific groundwater flow direction during the Phase II Site Assessment.

The basic construction data for the three site wells are provided below.

Well	Well Depth	Casing Length	Depth to Bedrock	Static Depth to Water
MW-1	47 ft	26.8 ft	23 ft	21.05 ft
MW-2	43 ft	15 ft	8 ft	20.80 ft
MW-3	>300 ft	Unknown	Unknown	31.28 ft

Yonkers is serviced by the New York City public water system. The Catskill Aqueduct is about 2,000 feet west of the site and the Hillview Reservoir is about 3,000 feet southwest.

There are no private drinking water wells that service the Site or the surrounding residential properties.

2.0 AREAS OF ENVIRONMENTAL CONCERN

This section describes the AOCs previously identified during the Phase I/Phase II activities performed in 2002. The investigation activities performed to date in each AOC are summarized. Previous sample locations are shown on Figure 1-3.

2.1 AOC-1: PLATING CHEMICAL USAGE AND HISTORIC OPERATIONS

Description

The plating room at the facility has been used for metal parts finishing throughout most of the facility's operational history (see Figure1-3 for location). During previous Phase I & Phase II work, areas of plating chemical spillage were noted within concrete berms under the plating lines, and in concrete sluices and sumps used to convey these chemicals to the on-site wastewater pretreatment facility. Several of these containment areas are lined with chemical-resistant synthetic liners. The plating room floor was recently refinished, and a former wastewater collection sump was filled and covered in the process. The condition of this sump at the time of closure is unknown.

Summary of Investigations to Date

A total of twelve borings were attempted within or immediately outside the plating room during the Phase II investigation. All but one of these borings reached refusal within approximately two feet on what appeared to be either a sub-floor or perhaps shallow bedrock. The locations of all attempted, but uncompleted borings in AOC-1 are shown on Figure 2-1.

One boring (MW2-B1) was completed outside the plating room (see Figure 1-3 for location). None of the samples collected from this boring exhibited sensory evidence of contamination, nor did they produce a response on the PID. As a result, two random samples were selected for laboratory analysis from 1.0 to 4.0 and 6.0 to 8.0 feet below grade. The samples were analyzed for the following:

- Volatile Organic Compounds (VOCs) by Method 8260;
- Poly-aromatic Hydrocarbons (PAHs) by Method 8270;
- Priority Pollutant Metals by Methods 6010 and 7471; and
- Total Cyanide by Method 9012.

The laboratory analytical results for the two soil samples collected outside the plating room are summarized below:

- Neither of these samples contained any VOCs at levels in excess of the New York State Recommended Soil Cleanup Objective (RSCO).
- Low levels of PAHs were detected in the shallow sample. Only one PAH compound (benzo(a)pyrene) marginally exceeded the RSCO.
- The inorganic analyses indicated the presence of zinc marginally above the RSCO value. However, the previous investigation concluded that this appears to be a background condition. No other inorganic analytes exceeded the RSCOs.

A table displaying the full analytical results, as well as the original laboratory data package, is provided in the Phase II report (see Appendix B).

2.2 *AOC-2: OLD SOLVENT DEGREASER AND HISTORIC CHLORINATED ORGANIC SOLVENT USE*

Description

Methylene chloride, tetrachoroethene, trichloroethene and 1,1,1-trichloroethane are used for parts cleaning at the facility. Certain metal product lines are currently finished in a vapor degreaser that is self-contained, relatively new and in very good condition. There is no evidence of any chemical spillage on the concrete floor surrounding this unit. An older vapor degreaser was used prior to the purchase of the new equipment. The older degreaser was in operation for at least 20 years and was set in a poured concrete sump (see Figure 1-3 for location). The older degreaser has recently been dismantled and removed from the Site. The floor and walls of this sump are now fully accessible and appeared to be in good condition during the most recent Site inspections on 28 September and 2 November 2005.

Summary of Investigations to Date

Two borings were installed in the vicinity of the old degreaser (see Figure 1-3). One boring consisted simply of a coring through the concrete base of the sump and collection of one grab sample from the uppermost soil below the slab. This sample was designated DGSump1. The second boring was designated VD-3 and was located immediately outside the entrance to the concrete block room that houses the degreaser unit. This boring was installed by Geoprobe and was the only location inside the building that did not encounter refusal on the sub-floor and/or bedrock within a few feet of the floor. Two samples were collected at this location for laboratory analysis from 6.0 to 8.0 and 13.0 to 15.0 feet below grade. The 13-15 foot horizon was selected based on a positive response on the PID and represents a sample from immediately above the bedrock surface (a potential confining layer); the 6-8 foot sample was selected to be at level slightly below the base of the sump. These samples were analyzed for the following:

- Volatile Organic Compounds (VOCs) by Method 8260;
- Poly-aromatic Hydrocarbons (PAHs) by Method 8270;
- Priority Pollutant Metals by Methods 6010 and 7471; and
- Total Cyanide by Method 9012.

The laboratory analytical results for the three samples collected in the degreaser area are summarized below:

- None of the three samples contained any VOCs (the primary constituents of concern for this area) at levels in excess of the New York State Recommended Soil Cleanup Objective (RSCO). The only VOCs detected were *de minimus* levels of acetone, methylene chloride, trichloroethene, tetrachloroethene and toluene.

- No PAHs were detected.

- The inorganic analyses indicated the presence of zinc marginally above the RSCO value. However, zinc was present at similar levels in all soil samples collected at the site, therefore it appears likely that this is a background condition. The sample collected beneath the sump also contained chromium slightly above the RSCO. No other inorganic analytes exceeded the RSCO.

A table displaying the full analytical results, as well as the original laboratory data package, is provided in the Phase II report (see Appendix B).

2.3 *AOC-3: FORMER UNDERGROUND STORAGE TANKS*

Description

Six (6) underground storage tanks (USTs) were closed in place at the facility in 1996 (see Figure 1-3 for location). Two (2) of these USTs were used for water storage (8,000 gallons each). The remaining four (4) contained No. 4 fuel oil (two 3,000 gallon USTs, and two 5,000 gallon USTs). These tanks were pressure tested and reported to be "tight". They were then filled with a concrete slurry mix and closed in place.

Summary of Investigations to Date

There was no soil sampling conducted to assess subsurface conditions in the UST area, mainly due to the tightness test results and poor accessibility (the shipping department operates in this location). It is also noted that No. 4 fuel oil is viscous product with low volatility, low solubility and generally poor mobility in the environment.

Groundwater sampling was utilized to provide an indirect evaluation of this area during the previous investigation. No chemicals of concern related to No. 4 fuel oil (benzene, toluene, ethylbenzene, xylenes, PAHs) were detected in the three on-site monitoring wells. However, additional groundwater investigation is included in the proposed Scope of Work to further evaluate this inaccessible AOC. As described below in Section 3.0, groundwater sampling and hydrologic evaluations of the existing and proposed bedrock wells will be performed.

2.4 *AOC-4: BEDROCK AQUIFER*

Description

AOC-4 is defined as the bedrock aquifer underlying the Site, which, if contaminated, has the potential to impact the adjacent residential properties to the north, east and south. This is especially true for VOC impacts, which can volatilize and migrate into buildings. It is noted however, that detectable levels of VOCs have not been identified in the bedrock aquifer to date.

Summary of Investigation to Date

Two new bedrock monitoring wells were installed at the Site during the previous Phase II work using air rotary drilling methods. Two overburden wells were attempted using hollow-stem auger drilling techniques, but were not completed due to refusal on the shallow bedrock surface. The two new bedrock wells were constructed with six-inch diameter steel casing set a minimum of five feet into competent bedrock. An open borehole extended below the bottom of the casing to intersect water-bearing fractures in the rock. See Figure 1-3 for the location of both the completed bedrock wells and the hollow-stem auger borings that terminated at the bedrock surface.

The two new wells were sampled along with one existing bedrock production well at the site. Prior to sampling, the depth to groundwater was measured and each well was checked for the presence of light, non-aqueous phase liquid (LNAPL) using an optical interface probe. Each well was then sampled using low-flow sampling methodology to limit entrained solids. Other water chemistry parameters (temperature, specific conductance, pH, dissolved oxygen (DO) and oxidation-reduction potential (ORP) were monitored during the purging process. The sample was collected when three consecutive readings were within the following constraints:

- <15 NTU of turbidity;
- ± 0.2 units for pH;
- ± 5% for conductivity;
- ± 10% for DO and ORP; and
- < 1.0 feet of drawdown.

All groundwater samples were analyzed for the following constituents:

- Volatile Organic Compounds (VOCs) by Method 624;
- Poly-aromatic Hydrocarbons (PAHs) by Method 625;
- Priority Pollutant Metals by Methods 200.7 and 245.1;
- Total Cyanide by Method 335.2; and
- Weak and Dissociable Cyanide by Method 335.2.

During the development of well MW-2, depth to water measurements were recorded in MW-1 and the existing production well (MW-3) in an attempt to evaluate if any hydraulic interconnection exists between the three wells. While MW-2 was being pumped, no water level changes were observed in either MW-1 or MW-3. While this suggests a lack of hydraulic interconnection, these results are considered inconclusive due to the short duration of the test (30 minutes) and the low sustainable pumping rate produced by MW-2 (1.25 gpm).

Due to lack of definitive knowledge on the hydraulic interconnection of the water bearing fractures in the shallow bedrock, it was not possible to evaluate the site-specific groundwater flow direction.

As indicated above, the basic construction data for the three site wells are provided below.

Well	Well Depth	Casing Length	Depth to Bedrock	Static Depth to Water
MW-1	47 ft	26.8 ft	23 ft	21.05 ft
MW-2	43 ft	15 ft	8 ft	20.80 ft
MW-3	>300 ft	Unknown	Unknown	31.28 ft

The laboratory analytical results for the three groundwater samples collected as part of this investigation are summarized below:

- No PAHs were detected in any of the three wells.
- No samples contained VOCs at levels in excess of the New York State Ambient Water Quality Standards
- Well MW-1 did not contain any inorganic constituents above the applicable standards. Well MW-2 was found to contain relatively low levels of arsenic marginally above its standard. Zinc was also detected in MW-2 at high levels far in excess of its standard. The results from MW-3 indicated the presence of chromium at levels marginally above its standard.

A table displaying the full analytical results, as well as the original laboratory data package, is provided in the Phase II report (see Appendix B).

3.0 PROPOSED SCOPE OF WORK

The scope of work proposed herein for each AOC incorporate the guidance of the Voluntary Cleanup Program and the DER-10 publication. Direct evaluation of potential releases will be conducted through the use of soil sampling or soil gas sampling. In addition, indirect investigation of potential releases will be performed via site-wide groundwater sampling. The groundwater investigation will be important in instances where the collection of soil samples in an AOC (or a portion there of) is not possible due to access or other issues.

The proposed sampling data will be used to refine the conceptual model and assess the need for additional investigation work to adequately characterize each AOC. The approach to completing the investigation of this Site may evolve as more information is obtained. The sampling locations, analyses and general approach to characterizing each AOC are presented below. All proposed sample locations are shown on Figure 2-2.

3.1 PRE-INVESTIGATION ACTIVITIES

Prior to initiating any of the intrusive investigation work at the Site, the tasks described below will be completed.

Utility Location

New York One Call, the local utility locating service, will be contacted to have the utilities in the work areas (primarily the exterior bedrock well locations) marked to avoid disturbing these structures during the field work. Considering the extensive amount of utilities in and around the Site, the proposed sampling and monitoring well locations will be marked prior to contacting One Call. As-built plans will also be requested from the appropriate Stewart EFI personnel, as some private underground utilities will not be marked by One Call.

Quality Assurance Project Plan

A Quality Assurance Project Plan (QAPP) has been prepared that details the data quality objectives and analytical requirements for the Site, and is included in Section 4.0 of this Work Plan. All quality assurance protocols are provided in the QAPP. Mitkem, the selected analytical laboratory, will maintain NYSDOH ELAP certification in all categories of CLP and Solid and Hazardous Waste analytical testing for the duration of the project.

Health & Safety Plan

A Health and Safety Plan (HASP) has been prepared for use by all ERM employees while conducting fieldwork at the Site and is included in Section 5.0 of this Work Plan. The HASP includes directions to the nearest hospital and a list of potential contaminants that may be encountered at the Site. The HASP will comply with all applicable OSHA requirements as documented in CFR 1910.120.

Bedrock Fracture Evaluation

The area surrounding the Site will be surveyed for exposed bedrock outcrops/road cuts. The purpose of this survey is to obtain readily available information regarding the bedrock fracture plane strike and dip orientations in the Site area. Aerial photographs, bedrock surface and overburden maps of the Site area will be used to identify potential locations within a 1,000-foot radius of the Site where exposed bedrock surfaces may exist. The area will be traversed by foot and by car in an attempt to gain additional information on the local bedrock geology. Obvious road cuts identified further out from the Site will be evaluated for relevance to the Site condition.

This information will aid in evaluating potential fracture patterns under and immediately surrounding the site, and will be used to aid the evaluation of groundwater flow direction.

Contractor Bid Walkthrough

A Site visit was held on 28 September 2005 with three drilling and concrete cutting contractors to review proposed indoor soil sampling locations in the plating room (AOC 1). The purpose for this Site visit was to evaluate the various boring and well locations for access issues and the applicability of various drilling/coring techniques. We continue to work with these contractors and expect that this process will improve the quality of bids through recognition of the difficult drilling conditions. It is hoped that this process will improve our ability to access and characterize soils under the Site building. Even with this effort, it is possible that soil samples cannot be obtained from AOC 1.

Permits

This task will also include obtaining the permits necessary to conduct the proposed investigation activities. It is anticipated that the following permits will be required:

- City of Yonkers sidewalk-opening permit (for monitoring well installation); and
- Westchester County sewer discharge permit (for discharge of well development water, purge water from groundwater sampling, and groundwater derived from pumping tests).

3.2 AOC-1 (PLATING ROOM) INVESTIGATION

During the previous investigation activities, sub-slab soils in AOC 1 were not accessible using hand or machine driven equipment. As a result, the scope of work focuses on alternative methods for obtaining such samples to evaluate the area as a potential source of groundwater contamination.

A secondary objective of this work will be to assess the thickness of overburden soil underlying the area.

Up to four soil borings will be installed in this area of the Site building. Figure 2-2 shows the area targeted for this sampling effort, which focuses on the location of the former wastewater sump. Boring installation and sample collection procedures will be developed in consultation with qualified contractors as described above in Section 3.2. The number of soil samples collected at each boring location will be determined in the field. It is anticipated that this may vary from one to two samples per boring. If bedrock is encountered immediately below the concrete floor, no soil samples will be collected. If less than five feet of soil is present between the floor and the bedrock surface, one sample will be collected. If the soil column is greater than five feet in thickness, two samples will be collected.

It is expected that soil samples in this AOC will be collected by hand auger or Geoprobe, however the exact method will be selected in consultation with the selected contractor. The sampling equipment will be decontaminated prior to each use by washing in a solution of tap water and Alconox® detergent, followed by a tap water rinse. The vertical soil interval selected for laboratory analysis will be selected based on the depth criteria stated above and any evidence of potential chemical impacts.

The Chemicals of Concern (COCs) for this area are determined based on the substances utilized in standard plating operations and includes metals and cyanide. As a result, all samples collected in this AOC will be analyzed for the following constituents:

- TAL Metals using EPA Methods 6010 and 7471
- Total Cyanide using EPA Method 335.2
- Weak and Dissociable Cyanide using EPA Method 335.2

3.3 AOC-2 (DEGREASER) INVESTIGATION

It is noted that only trace solvent levels were detected in the soil directly below the degreaser sump (below the soil guidance values), and no VOCs were detected in the three bedrock monitoring wells above the applicable standards. However, based on regulatory comments provided on the previous draft work plan, additional investigation will be performed related to historic solvent use in the facility.

Six sub-slab soil gas samples will be collected at the locations shown on Figure 2-2. These sample points will be installed and collected by ERM personnel familiar with the NYSDEC and NYSDOH guidance for sub-slab soil gas sampling. This sampling will be performed in accordance with the protocols provided in the document entitled “Guidance for Evaluating Soil Vapor Intrusion in the State of New York” (NYSDOH, February 2005).

A 3/8-inch diameter probe will initially be installed through a drilled borehole. The borehole will be advanced through the building floor slab using an electric rotary-hammer drill and will extend about three inches into the underlying sub-slab material. The probe will be purged of one volume of air into a 60 cubic centimeter (cc) syringe; the syringe will be removed and capped so that the air purged from the tubing will not be released to the indoor air.

One leak test will be conducted to ensure against infiltration of atmospheric air into the samples. Prior to collection of the first soil gas sample, the concrete surface around the probe will be covered with plastic sheeting, and helium will be injected under the sheeting during purging. A sample of the purge air will be tested on-Site using a portable helium indicator. Once it is confirmed that helium (and atmospheric air) is not infiltrating the sample, soil gas sampling will commence.

The soil gas samples will be collected using six liter Summa® canisters that have been certified clean by the laboratory prior to use. Each sample canister will be attached to the 3/8-inch diameter probe and the flow regulator will be set for an approximate 2-hour fill time. The sample canisters will be checked after approximately 80% of the specified sample collection period has elapsed to ensure the vacuum has not been compromised. If after 80% of the elapsed sampling time, the vacuum on the canisters is less then or equal to 3.0 psi, the sampling event will be terminated and the sample will be sent for analysis to the laboratory noting the shortened sampling duration.

One duplicate sample will be collected. This is done by connecting a second canister before purging through a ¼ -inch stainless steel "tee" fitting between the probe discharge tubing and the stainless steel valve.

Each soil gas sample will be analyzed using EPA Method TO-15. Further detail on the soil gas sample collection procedure may be found in Appendix C (Standard Operating Procedures).

3.4 AOC-3 (ABANDONED FUEL OIL USTs) INVESTIGATION

No additional soil investigation activities are proposed. Access issues (this portion of the building is completely covered with operating metal stamping machines), and the fact that the four fuel oil tanks tested tight prior to being properly abandoned in-place, make additional soil sampling in this area unnecessary. Further evaluation will be conducted as part of the additional groundwater investigation described in Section 3.6.

3.5 AOC-4: BEDROCK GROUNDWATER

As discussed above, the existing data gathered during the previous Phase II Assessment work does not suggest the presence of soil-borne sources of contamination or significant impacts to groundwater. Aside from elevated levels of zinc identified in the well outside the plating room (MW-2), no other contaminants were present in soil or groundwater significantly above the allowable limits. However, several data gaps are noted, as indicated below.

1. Understanding of the bedrock fracture geometry and hydraulic connectivity between water bearing fractures at the Site;
2. Groundwater flow direction across the Site;
3. Hydraulic conductivity in the bedrock aquifer (as measured in each well); and
4. Vertical and lateral extent of contaminants, and whether the data from the existing well network is representative of aquifer conditions at the Site.

An investigation is outlined below that is designed to address these data gaps. This scope of work will include additional well installation, groundwater sampling, borehole geophysics and pump tests. Each of these components are presented in detail.

<u>Additional Well Installations</u>

The existing bedrock well network of three wells will be supplemented with two additional wells installed outside the Site building. The potential presence of overburden groundwater will be evaluated during the installation of these new wells, however it is expected that the two new wells will be installed into bedrock. If overburden groundwater is encountered, the benefit, if any, of sampling the overburden aquifer will be evaluated. The two additional bedrock wells will be located as follows:

- <u>MW-4:</u> This well will be installed south of the Site building in the satellite parking area along Central Park Avenue. This well will provide additional aerial coverage of the bedrock aquifer in the Site area.
- <u>MW-5</u>: This well will be located outside the northeast corner of the Site building, in close proximity to the production well located inside the site building. This well location is in close proximity to the inactive production well will provide information on potential vertical flow within the bedrock aquifer, and additional information regarding potential off-site migration of contaminants.

These two wells, along with the three existing wells, will serve to form a monitoring network for all of the AOCs identified at the Site. The locations of the proposed and existing wells relative to the AOCs are shown on Figure 2-2.

Bedrock borings will be advanced using a truck-mounted drill rig employing air-rotary drilling techniques. Permanent steel casing will be set in the top of bedrock and boreholes will be advanced to a total depth of 60 feet or less, depending on where water is encountered. Soil samples will be collected in five-foot intervals for geologic characterization of the overburden. Each borehole will be advanced to its target depth, at which time the borehole will be developed to remove rock "flour" generated during drilling activities. Any purge water generated during well development, sampling or pump testing activities will be containerized in drums for characterization and proper disposal. The disposal method will be determined based on the characterization sampling results and may include: direct discharge to the sanitary sewer (under a general discharge permit); discharge to the sanitary sewer via the facility plating wastewater treatment facility; or off-site disposal.

<u>Groundwater Sampling</u>

Following development, the boreholes will be allowed to equilibrate for a minimum of 48 hours prior to sampling. In each of the wells at the Site (three existing and two new), the depth to groundwater will be measured and each well will be checked for the presence of light, non-aqueous phase liquid (LNAPL) using an optical interface probe, prior to sample collection.

Each well will be sampled using low-flow sampling methodology to limit entrained solids. Water chemistry parameters (turbidity, temperature, specific conductance, pH, dissolved oxygen (DO) and oxidation-reduction potential (ORP) will be monitored during the purging process. The sample will be collected when three consecutive readings were within the following constraints:

- <15 NTU of turbidity;
- ± 0.2 units for pH;
- ± 5% for conductivity;
- ± 10% for DO and ORP; and
- < 1.0 feet of drawdown.

All groundwater samples will be analyzed for the following constituents:

- Volatile Organic Compounds (VOCs) by Method 624;
- Poly-aromatic Hydrocarbons (PAHs) by Method 625;
- TAL Metals by Methods 200.7 and 245.1;
- Total Cyanide by Method 335.2; and
- Weak and Dissociable Cyanide by Method 335.2.

All site wells will also be surveyed for vertical control by a licensed New York land surveyor. This information will be used to determine the potentiometric head in each well and to allow the groundwater flow direction to be determined.

Geophysical Logging

Following development, the boreholes will be allowed to equilibrate for 48 hours and borehole geophysical logging will be conducted on all of the wells using the following instruments:

- Optical televiewer (OTV)
- Acoustic televiewer (ATV)
- Heat-pulse flowmeter
- Fluid temperature
- Fluid resistivity
- Caliper
- Natural gamma

The borehole geophysical logging data will be used to define intervals containing transmissive and non-transmissive fractures.

Bedrock Aquifer Pump Testing

Additional hydrogeologic testing will be conducted using the existing and proposed bedrock wells to evaluate hydraulic parameters of the bedrock aquifer at the Site. Such activities will include the following:

- Installation of pressure transducers in the three existing bedrock wells during the drilling of the additional bedrock wells to evaluate hydraulic interconnectivity;
- Perform a 24-hour pump test in each well once the new wells are installed to evaluate groundwater flow rates in the bedrock aquifer and to further evaluate fracture interconnectivity between the wells;
- An updated elevation survey to establish groundwater flow in the shallow bedrock and deeper bedrock aquifer zones.

3.7 DATA VALIDATION

The validation of the laboratory analytical data will be performed according to the protocols and QC requirements of the USEPA CLP and the SW-846 analytical methods, the USEPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review (October 1999 and February 1994 respectively), the USEPA Region 2 CLP Data Review SOPs, and the reviewer's professional judgment. Documentation of the validation will be provided in a Data Usability Summary Report (DUSR). See Section 4 for more information regarding data validation detailed in the QAPP.

3.8 EXPOSURE PATHWAY ANALYSIS

3.8.1 Objectives

A qualitative human health exposure assessment (HHEA) for the site will be prepared based on the findings of the current investigation. The objectives of the HHEA are to identify potential exposure pathways for contaminants at the site, identify potential on-site and off-site receptors, and qualitatively evaluate potential exposures to these receptors. This work plan was developed based on guidance in NYSDEC's Draft Voluntary Cleanup Program Guide (2002). The approach for evaluating impacts to human health is described below.

3.8.2 *Methodology*

The evaluation of potential exposures to human health will consist of the following steps:

- Identification of potential exposure pathways;
- Identification of chemicals of potential concern for each pathway; and
- Qualitative evaluation of exposure pathways.

Each of these steps is described below.

<u>Identification of Potential Exposure Pathways</u>

In this step, current and future potential exposure pathways for chemicals at the site will be identified. In order for there to be a complete exposure pathway, five elements must be present: (1) a contaminant source; (2) contaminant release and transport mechanisms; (3) a point of exposure; (4) a route of exposure; and (5) a receptor population.

<u>Identification of Chemicals of Potential Concern</u>

Chemicals of potential concern for each complete exposure pathway will be identified by comparing the maximum detected concentrations of chemicals in each of the relevant media at the site to applicable Standards, Criteria and Guidance (SCGs). Those chemicals for which SCGs are exceeded will be further evaluated in the following step.

Qualitative Evaluation of Potential Exposure Pathways

In this step, a qualitative assessment of exposures associated with the potential chemicals of concern for each of the exposure pathways will be prepared. This step will identify site-specific factors influencing the impact of exceedences of SCGs, where appropriate.

3.8.3 Report Preparation

A final HHEA report will be prepared. The HHEA will include the findings of the evaluation of human health exposures described in this section. The HHEA will be incorporated into the Voluntary Investigation report described in Section 3.9.

3.9 REPORTING

3.9.1 Progress Reports

Once the implementation of investigation and/or remediation activities have commenced, Quarterly Progress Reports (QPRs) will be submitted on, or before the 20th of April, July, October and January, and will report on the prior three month's activities. Each QPR will address the following topics:

- Accomplishments during the reporting period.
- Problems encountered during the reporting period.
- Compliance with project schedule and budget.
- Projected changes in Scope of Work.
- Submission of laboratory analytical data

3.9.2 Voluntary Investigation Report

The Voluntary Investigation Report will be prepared following completion of the field activities, and the reduction, validation and interpretation of the data. This report will provide a summary of the Scope of Work, methods, results, conclusions and recommendations derived from the study. It will present a conceptual model of the Site including any available waste disposal history, the environmental setting, contamination assessment, and hydrogeologic model. The Voluntary Investigation Report will also identify any data gaps that require further study and recommend remedial action, if required. Further details concerning essential components to this report are discussed below.

- Summary of Site History and Conditions: The report will include all of the information collected during the historic records and file search and a section detailing the geologic and hydrogeologic conditions.
- Summary of Field Work: The report will include a detailed summary of investigative and analytical methods related to the fieldwork performed during the investigation. This account will include figures and tables to show sample locations, parameters analyzed for, etc.
- Site Conceptual Model: The intent of the conceptual model is to integrate the Site information into a qualitative description of the source(s), nature and extent of chemical releases to the environment. This includes an evaluation of fate and transport mechanisms, potential migration pathways and potential receptors.
- Summary of Analytical Data: Using tables and maps, the report will summarize to the extent possible, all of the analytical data collected during the investigation and historical records search.
- Comparison to State Standards, Criteria and Guidelines (SCGs): The report will identify SCGs to compare with the data collected. The concentrations of each contaminant detected will be compared to the SCGs to assess any potential public health and environmental concerns.
- Evaluation of Data Collected: The completeness of the data collected during the investigation will be evaluated. Any data gaps or other areas where additional information is desirable will be identified. Recommendations will be made on ways to fill these data gaps, if required.
- Human Health Exposure Assessment: The HHEA findings regarding potential human health exposures will also be provided in this report.

3.10 SCHEDULE

A proposed schedule for the additional investigation work has been prepared and is shown in Figure 3-1.

4.0 QUALITY ASSURANCE PROJECT PLAN

4.1 PURPOSE

This QAPP was prepared for the investigation activities described above in Section 3.0. It establishes the guidelines for generating reliable data (i.e. scientifically valid, defensible, comparable and of known precision and accuracy). This QAPP details the quality assurance protocols to be used by ERM and laboratory personnel, as well as a project description, and project organization and responsibilities.

4.1.1 Scope Of Work

The additional investigation work has been designed to supplement previous investigative efforts conducted at the property and complete the environmental investigation of the AOCs identified as part of the previous investigations. The project scope has been tailored to:

- Evaluate the AOCs, where accessible, for evidence of the release of hazardous materials;
- Define the nature and extent of potential contamination, both laterally and vertically;
- Identify contaminant source areas;
- Determine the nature and extent of groundwater impacts in excess of the applicable standards;
- Evaluate the nature and extent of previously detected zinc in the bedrock aquifer underlying the Site, and the potential for zinc and other possible chemicals of concern (COCs) to impact the surrounding residential properties;
- Perform hydrologic evaluations of the bedrock aquifer to further assess groundwater flow direction and rates, along with potential contaminant fate and transport mechanisms; and
- Produce data of sufficient quantity and quality to support the development of a Remedial Work Plan, if required.

4.1.2 *Definitions*

The following definitions are included for terms that are used in the QAPP.

- *Accuracy* - the degree of agreement of a measurement with an accepted reference value. Accuracy is generally reported as a percent recovery, and calculated as:

$$\frac{\text{Measured Value}}{\text{Accepted Value}} \times 100$$

- *Analyte* - the chemical or property for which a sample is analyzed.
- *Comparability* - the expression of information in units and terms consistent with reporting conventions; the collection of data by equivalent means; or the generation of data by the same analytical method. Aqueous samples shall be reported as µg/l solid samples shall be reported in units of mg/kg, dry weight.
- *Completeness* - the percentage of valid data obtained relative to that which would be expected under normal conditions. Data are judged valid if they meet the stated precision and accuracy goals.
- *Duplicate* - two separate samples taken from the same source by the same person at essentially the same time and under the same conditions that are placed into separate containers for independent analysis. Duplicate samples are intended to assess the effectiveness of equipment decontamination, the precision of sampling efforts, the efforts of ambient environmental conditions on sensitive analyses (e.g., volatile organics analysis [VOA]), and the potential for contaminants attributable to reagents or decontamination fluids. Identifying such potential sources or error is essential to the success of the sampling program and the validity of the environmental data. Each QC sample is described below. As a minimum, each set of ten or fewer field samples should include a trip blank, a duplicate and one sample collected in a sufficient volume to allow the laboratory to perform a matrix spike.
- *Episode* - a continuous period of time during which sampling activities are undertaken. Cessation of activities for more than 48 hours terminates the episode.
- *Field Blanks* - field blanks (sometimes referred to as "equipment blanks" or "sampler blanks") are the final analyte-free water rinse from equipment decontamination in the field and are collected at least

one during a sampling episode. If analytes pertinent to the project are found in the field blank, the results from the blanks will be used to qualify the levels of analytes in the samples. This qualification is made during data validation. The field blank is analyzed for the same analytes as the sample that has been collected with that equipment.

- *Precision* - a measure of the agreement among individual measurements of the sample property under prescribed similar conditions. Precision is generally reported as Relative Standard Deviation (RSD) or Relative Percent Difference (RPD). Relative standard deviation is used when three or more measurements are available and is calculated as:

$$\text{RSD} = \frac{\text{Standard Deviation}}{\text{Arithmetic Mean}} \times 100$$

Relative percent difference is used for duplicate measurements and is calculated as:

$$\text{RPD} = \frac{\text{Value 1 - Value 2}}{\text{Arithmetic mean}} \times 100$$

- *Quality Assurance (QA)* - all means taken in the field and inside the laboratory to make certain that all procedures and protocols use the same calibration and standardization procedures for reporting results; also, a program which integrates the quality planning, quality assessment, and quality improvements activities within an organization.

- *Quality Control (QC)* - all the means taken by an analyst to ensure that the total measurement system is calibrated correctly. It is achieved by using reference standards, duplicates, replicates, and sample spikes. Also, the routine application of procedures designed to ensure that the data produced achieve known limits of precision and accuracy.

- *Replicate* - two aliquots taken from the same sample container and analyzed separately. Where replicates are impossible, as with volatile organics, duplicates must be taken.

- *Trip Blanks* - trip blanks are samples that originate from analyte-free water taken from the laboratory to the sampling location and returned to the laboratory with the volatile organic samples. One trip blank should accompany each cooler containing VOAs; it should be stored at the laboratory with the samples, and analyzed with the sample set. Trip blanks are only analyzed for VOAs.

4.1.3 Data Quality Objectives

4.1.3.1 Overall Data Quality Objectives

Data Quality Objectives (DQO) are quantitative and qualitative statements specifying the quality of the environmental data required to support the decision-making process that guides the site investigation and any subsequent corrective actions. DQO define the total uncertainty in the data that is acceptable for each specific activity during the investigation. This uncertainty includes both sampling error and analytical error. Ideally, the prospect of zero uncertainty is the objective; however, the very process by which data is collected in the field and analyzed in the laboratory contribute to the uncertainty of the data. It is the overall objective to keep the total uncertainty to a minimal level such that it will not hinder the intended use of the data.

In order to achieve the project DQO, specific data quality requirements such as detection limits, criteria for accuracy and precision, sample representativeness, data comparability and data completeness must be specified. The overall objectives and requirements are established such that there is a high degree of confidence in the measurements.

The parameters that will be used to specify data quality requirements and to evaluate the analytical system performance for soil and ground water samples are precision, accuracy, representativeness, completeness and comparability (PARCC).

4.1.3.2 Field Investigation Quality Objectives

One objective of the field investigation with respect to soil and ground water sampling is to maximize the confidence in the data in terms of PARCC. In order to permit calculation of precision and accuracy for the soil and ground water samples, duplicates, trip blanks, and field blanks will be collected.

Precision will be calculated as RPD if there are only two analytical points. Percent relative standard deviation (% RSD) will be used to calculate precision if there are more than two analytical points. The submission of field blanks will provide a check with respect to accuracy. The submission of blanks will monitor chemicals that may be introduced during sampling, preservation, handling, shipping and/or the analytical process. The data quality objective for field blanks for soil samples is to meet or exceed the USEPA Contract Laboratory Program (CLP) Contract Required Quantization Limits (CRQLs). In the event that the blanks are contaminated and/or poor precision is obtained, the associated data will be appropriately qualified. Through the submission of field QC samples, the distinction can be made between laboratory problems, sampling technique considerations, sample matrix effects, and laboratory artifacts.

4.1.3.3 Laboratory Data Quality Objectives

All samples collected during the additional implementation of this VCP work plan will be submitted to Mitkem Corporation of Warwick, RI for analysis. Mitkem is a New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) CLP certified laboratory meeting requirements for documentation, data reduction and reporting. Mitkem also holds certification in all categories of Solid and Hazardous Waste analytical testing.

The analytical laboratory will demonstrate analytical precision and accuracy by the analysis of various QC samples (i.e., laboratory duplicates, spike samples, matrix spike duplicates and laboratory control samples). Precision, as well as instrument stability, will also be demonstrated by comparison of calibration response factors from the initial calibration to that of the continuing calibrations. Laboratory accuracy will be evaluated by the addition of surrogate and matrix spikes compounds, and will be presented as percent recovery. Precision will be presented as RPD, % RSD, or percent difference (%D), whichever is appropriate for the number and type of QC samples analyzed. Laboratory blanks can also be used to demonstrate the accuracy of the analyses and possible effects from laboratory artifact contamination.

4.2 *PROJECT STAFFING*

All personnel involved in an investigation and in the generation of data are implicitly a part of the overall project and quality assurance program. In addition, certain individuals have specifically delegated responsibilities. Persons with specific QA/QC roles during these additional investigations are the Project Manager (PM), the Field Team Leader (FTL) and the Quality Assurance Officer (QAO). In the following sections, the roles and responsibilities of key personnel are identified.

Project Name:	Stewart EFI – Yonkers, NY
Volunteer:	Stewart EFI New York, LLC
ERM Project Director:	Michael B. Teetsel, CPG
ERM Project Manager:	Kent Murdick
ERM QA/QC Officer:	Andrew Coenen
ERM Field Team Leader:	To be determined

4.2.1 *Project Manager*

The PM will report to the Volunteer and the Project Director. The PM will be responsible for scheduling, communicating with the Volunteer, technical review of field activities and the overall quality of the project and project deliverables. The PM should have experience in the management and coordination of multi-disciplinary field investigation projects.

4.2.2 *QA/QC Officer*

The QA/QC Officer will have overall responsibility for QA/QC review of all analytical data generated during the field investigation; data validation and qualification of analytical results in terms of data usability. The QA/QC Officer should be experienced in the validation of analytical data and the protocols and QC requirements of the analytical methods listed in the NYSDEC ASP and the data validation guidance, USEPA CLP National Functional Guidelines for Organic (Inorganic) Data review (February 1994) and USEPA Region II CLP Data Review SOP.

4.2.3 *Field Team Leader*

The FTL will report to the PM and will be responsible for the day-to-day management and coordination of field staff. The FTL will be responsible for the quality of the field activities and will be experienced in field investigation projects.

4.3 *FIELD QUALITY ASSURANCE/QUALITY CONTROL*

4.3.1 *Equipment Maintenance*

In addition to the laboratory analyses conducted during the course of this investigation, field measurements will be collected for total volatile organics (air monitoring), pH, conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity in ground water. A maintenance, calibration, and operation program will be implemented to ensure that routine calibration and maintenance is performed on all field instruments. The program will be administered by ERM's QAO and the field team members. All instruments utilized on the project will properly serviced as per the maintenance and calibration procedures outlined in the manufacturer's Operation and Field Manuals accompanying the respective instruments.

4.3.2 *Equipment Calibration*

Trained field team members will be familiar with the field calibration, operation, and maintenance of the equipment. They will perform field calibrations, checks, and instrument maintenance daily and prior to use. The photoionization detector (PID) will be calibrated on a periodic basis with isobutylene. The pH, conductivity, DO and turbidity meters will be calibrated by a trained team member using standard calibration solutions. Field maintenance, calibration and equipment operation will follow the procedures outlined in the manufacturer's Operation and Field Manuals accompanying the respective instruments. All maintenance and calibration shall be documented in the project field notes.

The FTL shall be responsible for documenting instrument calibration/maintenance for each measuring device. This documentation will be kept in the project field notes and shall include at least the following information, where applicable.

- name of device and/or instrument calibrated;
- device/instrument serial and/or I.D. number;
- frequency of calibration;
- date of calibration;
- results of calibration;
- name of person performing the calibration;
- identification of the calibration standards; and
- buffer solutions (pH meter only).

4.3.3 *Equipment Decontamination*

In order to minimize the potential for cross-contamination, all drilling and sampling equipment shall be properly decontaminated prior to and after each use.

4.3.3.1 General Procedures

All heavy equipment will be decontaminated in a designated clean area. Sampling equipment and probes will be decontaminated in an area covered by plastic near the sampling location. All solvents and wash water used in the decontamination process will be collected and drummed for off-site disposal. All disposable sampling equipment will be properly disposed of in dry containers.

Extraneous contamination and cross-contamination shall be controlled by wrapping the sampling equipment with aluminum foil when not in use and changing and disposing of the sampler's gloves between samples. Decontamination of sampling equipment shall be kept to a minimum in the field, and wherever possible, dedicated sampling equipment shall be used. Personnel directly involved in equipment decontamination shall wear appropriate protective equipment.

4.3.3.2 Heavy Equipment (drill rigs, etc.)

All downhole drilling equipment shall be decontaminated by steam cleaning prior to performance of the first boring/well installation and between all subsequent borings/well installations. This shall include all hand tools, casing, augers, drill rods and bits, tremie pipe and other related tools and equipment. The steam cleaning equipment shall be capable of generating live-steam with a minimum temperature of 212 degrees Fahrenheit (°F). This equipment will be decontaminated before exiting the property.

All water used during drilling and/or steam cleaning operations shall be from a potable source. The drilling contractor is responsible for obtaining all permits from the local potable water purveyor and any other concerned authorities, and provision of any required back-flow prevention devices. The equipment shall be cleaned to the satisfaction of the FTL.

4.3.3.3 Sampling Equipment

All sampling equipment requiring decontamination will be cleaned before each use as follows:

- Laboratory-grade glassware detergent and tap water scrub to remove visual contamination;
- Generous tap water rinse; and
- Distilled and deionized (ASTM Type II) water rinse.

Since dedicated new lengths of polyethylene tubing shall be used for low-flow sampling each well, the tubing shall not be decontaminated. Pneumatic bladder pumps will be used for low-flow sampling and new, clean bladders will be used for each sample. The pneumatic pump housing shall be decontaminated prior to each use as follows:

- Potable water rinse.
- Alconox detergent and potable water scrub.
- Potable water rinse.
- Distilled/deionized water rinse.

4.3.3.4 Meters and Probes

All meters and probes that are used in the field (other than those used solely for air monitoring purposes and YSI flow through cells which are used post sample collection location) will be decontaminated between use as follows:

- phosphate-free laboratory detergent solution;
- tap water rinse; and
- deionized water rinse.

4.3.4 *Field Records*

Proper management and documentation of field activities is essential to ensure that all necessary work is conducted in accordance with the Work Plan and QAPP in an efficient and high quality manner. Field management procedures include following proper chain of custody procedures to track a sample from collection through analysis, noting when and how samples are split (if required), making regular and complete entries in the field logbook, and the consistent use and completion of field management forms. It is an absolute requirement that the field logbook be used to document all field activities, as this documentation will support that the samples were collected and handled properly making the resultant data complete, comparable and defensible. Field logbook procedures are identified below.

The sample team or individual performing a particular sampling activity shall be required to keep a weather proof field notebook. Field notebooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during projects and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings. In a legal proceeding, notes, if referred to, are subject to cross-examination and are admissible as evidence. The field notebook entries should be factual, detailed, and objective. All entries are to be signed and dated. All members of the field investigation team are to use this notebook, which shall be kept as a permanent record. The field notebook shall be filled out at the location of sample collection immediately after sampling. It shall contain sample descriptions including: sample number, sample collection time, sample location, sample description, sampling method used, daily weather conditions, field measurements, name of sampler, and other site-specific observations. The field notebook shall contain any deviations from protocol and why, visitor's names, or community contacts made during sampling, geologic and other site-specific information which may be noteworthy.

4.4 SAMPLE PREPARATION AND CUSTODY

4.4.1 Sample Identification

In order to provide for proper identification in the field, and proper tracking in the laboratory, all samples must be labeled in a clear and consistent fashion using the procedures and protocols described below and within the following subsections.

- Sample labels will be waterproof and have a pre-assigned, unique number that is indelible.
- Field personnel must maintain a field logbook. This logbook must be water resistant with sequentially numbered pages. Field activities shall be sequentially recorded in the logbook.
- The logbook, along with the chain-of-custody form, must contain sufficient information to allow reconstruction of the sample collection and handling procedure at a later time.
- Each sample shall have a corresponding notebook entry which includes:

    - Sample ID number
    - Sample point location and number
    - Date and time
    - Analysis for which sample was collected
    - Additional comments as necessary
    - Samplers' name

- Each sample must have a corresponding entry on a chain-of-custody manifest.
- The manifest entry for sampling is to be completed before sampling is initiated at any other well by the same sampling team.

- In cases where the samples leave the immediate control of the sampling team (i.e., shipment via common carrier) the shipping container must be sealed.

Each sample collected shall be designated by an alpha-numeric code that shall identify the type of sampling location, the specific location, the matrix sampled, and a specific sample designation (identifier). Site-specific procedures are described below.

Sample identifications shall contain a sequential code consisting of three segments. The first segment shall designate the project number. The second segment shall identify the location type and specific sample location. Location types shall be identified by a two letter code, for example: Monitoring well (MW), etc. The specific sampling location shall be identified using a two-digit number.

The third segment shall identify the matrix type and a sample designation or identifier to identify the sample depth, the sampling event number, or other designation depending on the sample type. The matrix type shall be designated by a two-letter code, for example: Ground Water (GW). The sample identifier shall be represented by a two-digit numeric code. Sampling events, or rounds, such as for ground water sampling shall be numbered in a sequence beginning with "01", which corresponds to the round of sampling.

The following shall be a general guide for sample identification:

First Segment	Second Segment	Third Segment
Project Number 22375	Location Type and Specific Location AOC01 or MW05	Matrix Sample Identifier GW01
	<u>LOCATION TYPE:</u> MW = Monitoring Well AOC = Area of Concern TB = Trip Blank FB = Field Blank	<u>MATRIX TYPE:</u> GW = Ground Water SW = Surface Water AQ = Other Aqueous SS = Soil SED = Sediment

An example of a sample identification is as follows: for a monitoring well sample obtained at the location of well MW-3 with a screen interval of 15-25 feet in depth, the sample identification shall be 22375/MW03/GW25. For blank samples, the first field blank taken from the ground water sampling apparatus would be identified as 558/FB01/AQ01, and the first Trip Blank would be identified as 558/TB01/AQ01.

4.4.2 *Sample Containers*

- The analytical laboratory shall provide all sample containers.
  - If glass bottles are used, extra glass bottles will be obtained from the laboratory to allow for accidental breakage that may occur.
  - If sample preservation is required, the necessary preservatives will be placed in the sample bottles by the laboratory.
- The sample bottles will be handled carefully so that any preservatives are not inadvertently spilled.

4.4.3 *Sample Preservation and Shipment*

All samples collected during the additional investigation and remedial work will be preserved cooling to 4 degrees Celsius (°C) and maintained at this temperature until time of analysis. All laboratory glassware will be delivered to the Site with any required chemical preservatives already in the container.

Immediately following collection of the samples, they shall be placed in a cooler with "freezer-pacs" in order to maintain sample integrity. All VOC sample bottles to be filled to capacity with no headspace for volatilization. If necessary to meet a maximum recommended holding time, the samples are to be shipped by overnight courier to the laboratory.

The shipping container used will be designed to prevent breakage, spills and contamination of the samples. Tight packing material is to be provided around each sample container and any void around the "freezer-pacs". The container is to be securely sealed, clearly labeled, and accompanied by a chain-of-custody record. Separate shipping containers should be used for "clean" and samples suspected of being heavily contaminated. During winter months, care should be taken to prevent samples from freezing. Sample bottles will not be placed directly on "freezer-pacs".

All samples shall be shipped to the analytical laboratory by overnight courier within one day of collection. The samples must be stored at or near 4°C and analyzed within applicable holding times.

4.4.4 *Sample Custody*

4.4.4.1 *Chain of Custody*

The primary objective of the sample custody procedures is to create an accurate written record that can be used to trace the possession and handling of all samples from the moment of their collection, through analysis, until their final disposition. All field sampling personnel shall adhere to proper sample custody procedures because samples collected during an investigation could be used as evidence in litigation. Therefore, possession of the samples must be traceable from the time each sample is collected until it is analyzed at the laboratory.

4.4.4.2 Custody Transfer to Field Personnel

The FTL shall maintain custody of samples collected during this investigation. All field personnel are responsible for documenting each sample transfer and maintaining custody of all samples until they are shipped to the laboratory. Chain-of-Custody records will be completed at the time of sample collection and will accompany the samples inside the cooler for shipment to the selected laboratory.

The Chain-of-Custody Record will be signed by each individual who has the samples in their possession. Preparation of the Chain-of-Custody Record is as follows:

- For every sample, the Chain-of-Custody Record will be initiated in the field by the person collecting the sample. Every sample shall be assigned a unique identification number that is entered on the Chain-of-Custody Record.
- The record will be completed in the field to indicate project, sampling team, etc.
- If the person collecting the sample does not transport the samples to the laboratory or deliver the sample containers for shipment, the first block for Relinquished By __________, Received By __________ will be completed in the field.
- The person transporting the samples to the laboratory or delivering them for shipment will sign the record form as Relinquished By ____________.
- If the samples are shipped to the laboratory by commercial carrier, the original Chain-of-Custody Record will be sealed in a watertight container and placed in the shipping container which will be sealed prior to being given to the carrier. The carbonless copy of the Chain-of-Custody Record will be maintained in the field file.

- If the samples are directly transported to the laboratory, the chain-of-custody will be kept in possession of the person delivering the samples.
- For samples shipped by commercial carrier, the waybill will serve as an extension of the Chain-of-Custody Record between the final field custodian and the laboratory.
- Upon receipt in the laboratory, the Sample Custodian or designated representative, shall open the shipping containers, compare the contents with the Chain-of-Custody Record, and sign and date the record. Any discrepancies will be noted on the Chain-of-Custody Record.
- If discrepancies occur, the samples in question will be segregated from normal sample storage and the FTL immediately notified.
- Chain-of-Custody Records will be maintained with the records for a specific project, becoming part of the data package.

4.4.4.3 Custody Transfer to Laboratory

All samples collected during the additional investigation and remedial work will be submitted to a NYSDOH ELAP CLP certified laboratory meeting requirements for documentation, sample login, internal chain of custody procedures, sample/analysis tracking, data reduction and reporting. The laboratory shall follow all requirements pertaining to laboratory sample custody procedures contained in the NYSDEC ASP (revised 1995).

In general, the following procedures will be followed upon sample receipt. The laboratory shall not accept samples collected by project personnel for analysis without a correctly prepared Chain-of-Custody Record.

The first steps in the laboratory receipt of samples are completing the Chain-of-Custody Records and project sample log-in form. The laboratory Sample Custodian, or designee, will note that the shipment is accepted and notify the Laboratory Manager or the designated representative of the incoming samples.

Upon sample receipt, the laboratory Sample Custodian, or designee, will:

- Examine all samples and determine if proper temperature has been maintained during shipment. If samples have been damaged during shipment, the remaining samples will be carefully examined to determine whether they were affected. Any samples affected shall also be considered damaged. It will be noted on the Chain-of-Custody Record that specific samples were damaged and that the samples were removed from the sampling program. Field personnel will be notified as soon as possible that samples were damaged and that they must be resampled, or the testing program changed, and provide an explanation of the cause of damage.
- Compare samples received against those listed on the Chain-of-Custody Record.
- Verify that sample holding times have not been exceeded.
- Sign and date the Chain-of-Custody Record and attach the waybill to the Chain-of-Custody Record.
- Denote the samples in the laboratory sample log-in book which contains the following information:
  - Project identification number
  - Sample numbers
  - Type of samples
  - Date received in laboratory
  - Record of the verified time of sample receipt (VTSR)
  - Date put into storage after analysis is completed
  - Date of disposal.

The last two items will be added to the log when the action is taken.

- Notify the Laboratory Manager of sample arrival.
- Place the completed Chain-of-Custody Records in the project file.

The VTSR is the time of sample receipt at the laboratory. The date and time the samples are logged in by the Sample Custodian or designee, will agree with the date and time recorded by the person relinquishing the samples.

4.4.5 *Sampling Packaging And Shipping*

Sample bottles and samples shall either be delivered/picked up daily by the analytical laboratory, or delivered/shipped via overnight courier. Once the samples have been collected, proper procedures for packaging and shipping shall be followed as described below.

4.4.5.1 *Packaging*

Prior to shipment, samples must be packaged in accordance with current United States Department of Transportation (USDOT) regulations. All required government and commercial carrier shipping papers must be filled out. The procedure below should be followed regardless of transport method:

- Samples will be transported in metal ice chests or sturdy plastic coolers (cardboard or Styrofoam containers are unacceptable).
- Remove previously used labels, tape and postage from cooler.
- Ship filled sample bottles in same cooler in which empty bottles were received.
- Affix a return address label to the cooler.
- Check that all sample bottles are tightly capped.
- Check that all bottle labels are complete.
- Be sure chain-of-custody forms are complete.
- Wrap sample bottles in bubble pack and place in cooler.
- Pack bottles with extra bubble pack, vermiculite, or Styrofoam "peanuts". Be sure to pack trip blank, if applicable.
- Keep samples refrigerated in cooler with bagged ice or frozen cold packs. Do not use ice for packing material; melting will cause bottle contact and possible breakage.
- Separate and retain the sampler's copy of chain-of-custody and keep with field notes.
- Tape paperwork (chain-of-custody, manifest, return address) in zipper bag to inside cooler lid.

- Close cooler and apply signed and dated custody seal in such a way that the seal must be broken to open cooler.
- Securely close cooler lid with packing or duct tape. Be sure to tape latches and drain plugs in closed position.

4.4.5.2 Shipping

Samples should arrive at the lab as soon as possible following sample collection to ensure holding times are not exceeded. All samples must be hand delivered on the same day as sampling or sent via overnight courier. When using a commercial carrier, follow the steps below.

- Securely package samples and complete paperwork.
- Weigh coolers for air transport.
- Complete air bill for commercial carrier (air bills can be partially completed in office prior to sampling to avoid omissions in field). If necessary, insure packages.
- Keep customer copy of air bill with field notes and chain-of-custody form.
- When coolers have been released to transporter, call receiving laboratory and give information regarding samplers' names, method of arrival.
- Call the lab on day following shipment to be sure all samples arrived intact. If bottles are broken, locations can be determined from chain-of-custody and resampled.

4.5 FIELD QA/QC BLANKS

General guidance and the specific requirements regarding the collection of QA/QC samples are presented separately below.

4.5.1 Trip Blanks

A laboratory supplied trip blank shall be an aliquot of distilled, deionized water which shall be sealed in a sample bottle prior to initiation of each day of field work. The trip blank shall be used to determine if any cross-contamination occurs between aqueous samples during shipment. Trip blanks are analyzed for aqueous VOCs only. Glass vials (40 ml) with teflon-lined lids shall be used for VOC blanks. A trip blank shall be prepared by the laboratory prior to each day of field sampling for aqueous volatiles. The sealed trip blank bottles shall be placed in a cooler with the empty sample bottles and shall be brought to the property by the laboratory personnel. If multiple coolers are required to store and transport aqueous VOC samples, then each cooler must contain an individual trip blank.

4.5.2 Field Blanks

Field blanks shall be taken to evaluate the cleanliness of sampling equipment, sample bottles and the potential for cross-contamination of samples due to handling of equipment and sample bottles, and contaminants present in ambient air. Field blank samples shall be performed on the sample bailers and/or soil sampler. The frequency of field blanks taken shall be one per decontamination event for each type of sampling equipment, and each media being sampled (e.g., a ground water bailer for ground water, and a hand auger for soil sampling), at a minimum of one per equipment type and/or media per day.

Where required, field blanks shall be obtained prior to the occurrence of any analytical field sampling event by pouring deionized or potable water over a particular piece of sampling equipment and into a sample container. The analytical laboratory shall provide field blank water and sample jars with preservatives for the collection of all field blanks. Glass jars shall be used for organic blanks. The field blanks as well as the trip blanks shall accompany field personnel to the sampling location. The field blanks shall be analyzed for the same analytes as the environmental samples being collected that day and shall be shipped with the samples taken subsequently that day.

Field blanks shall be taken in accordance with the procedure described below:

- Decontaminate sampler using the procedures specified in this plan.
- Pour distilled/deionized water over the sampling equipment and collect the rinsate water in the appropriate sample bottles.
- The sample shall be immediately placed in a sample cooler and maintained at a temperature of 4°C until receipt by the laboratory.
- Fill out sample log, labels and chain-of-custody forms, and record in field notebook.

4.6 ANALYTICAL LABORATORY

4.6.1 Analytical Methods

All samples collected during the additional investigation and remedial work will be submitted to Mitkem Corporation of Warwick, RI. Mitkem is a NYSDOH ELAP CLP certified laboratory meeting requirements for documentation, data reduction and reporting. Mitkem also holds certification in all categories of Solid and Hazardous Waste analytical testing.

The data collected during the course of the additional investigation and remedial work will be used to determine the presence and concentration of certain compounds and analytes in soil and ground water at specific locations described in Section 3.0 of this Work Plan. Samples of soil and ground water will be collected and analyzed for some or all of the constituents listed below as outlined in Section 3.0 of this Work Plan. The analyses and analytical methodologies generally employed for investigation of these media are:

- TAL Metals in Soil - EPA Methods 6010 and 7474
- TAL Metals in Groundwater - EPA Methods 200.07 and 245.1.
- Total Cyanide in Soil and Groundwater - EPA Method 335.2

- Weak and Dissociable Cyanide in Soil and Groundwater - EPA Method 335.2
- Volatile Organic Compounds in Groundwater - EPA Method 624
- Poly-Aromatic Hydrocarbons in Groundwater - EPA Method 625
- Volatile Organic Compounds in Air – EPA Method TO-15

Samples of soil and ground water analytical results can be used to qualitatively determine the presence or absence of these constituents at sampled locations and to quantitatively determine the concentration of these constituents at specific areas.

4.6.2 Instrument Calibration

The laboratory calibration procedures and frequency for the required analytical methods to be followed by the selected laboratory are specified in the NYSDEC ASP CLP Analytical Method Procedures (10/95) and the individual USEPA SW-846 analytical method procedures. The selected laboratory's calibration schedule will adhere to all analytical method requirements.

4.6.3 Laboratory QA/QC

4.6.3.1 Duplicate Samples

Duplicate samples shall be analyzed to check laboratory reproducibility of analytical data. At least 5% (one out of every 20 samples) of the total number of collected samples shall be duplicated to evaluate the precision of the methods used. All duplicate samples shall be submitted to the analytical laboratory as a "blind duplicate", having a fictitious sample identification name and time of sample collection. Each blind duplicate shall be cross-referenced to document in the field notes and on the master sample log to record which real sample it is a duplicate of.

4.6.3.2 Matrix Spike/Matrix Spike Duplicate

Matrix spike/matrix spike duplicates for organic analysis are performed at a predetermined frequency according to the appropriate analytical method. Further, re-analyses are required at times, due to determination of anomalous results during analysis. To ensure the laboratory has sufficient volume for matrix spike/matrix spike duplicate (MS/MSD) analysis, triple sample volume must be submitted for aqueous organic extractable and volatile samples once per every 20 samples in a sample delivery group (SDG).

4.7 DATA VALIDATION

4.7.1 Field Data

Field data generated in accordance with the project-specific Work Plan will primarily consist of field temperature, pH, turbidity and specific conductance data, and data associated with soil boring advancement, monitoring well installation and development, and soil classification. This data will be validated by review of the project documentation to check that all forms specified in the Work Plan and this QAPP have been completely and correctly filled out and that documentation exists for the required instrument calibration. This documentation will be considered sufficient to provide that proper procedures have been followed during the field investigation.

4.7.2 Laboratory Data

Data validation is the assessment of data quality with respect to method requirements and technical performance of the analytical laboratory. Analytical data packages will be examined to ensure that all required lab components are included, all QA/QC requirements were performed, and the data use restrictions are well defined.

All sample data will be quantitatively and qualitatively evaluated in a validation process consistent with the requirements in Appendix B of the Guidance Document. The validation of the analytical data will be performed according to the protocols and QC requirements of the USEPA CLP and the SW-846 analytical methods, the USEPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review (October 1999 and February 1994 respectively), the USEPA Region 2 CLP Data Review SOPs, and the reviewer's professional judgment.

Summary documentation regarding QA/QC results will be completed by the laboratory using NYSDEC ASP forms and will be submitted with the raw analytical data packages (NYSDEC ASP B deliverables) for all media samples and QC samples.

A Data Usability Summary Report (DUSR) will be prepared in order to evaluate the analytical data generated on this project. The DUSR will be prepared in accordance with the applicable NYSDEC guidelines.

4.8 REPORTING

4.8.1 Field Data

The proper management and documentation of field activities is essential to ensure that all necessary work is conducted in accordance with the Work Plan and QAPP in an efficient and high quality manner. Field data will be recorded and reported by field personnel through the use of the field logbook, field management forms and chain of custody forms described in the preceding sections.

Good field management procedures include following proper chain of custody procedures to track a sample from collection through analysis, noting when and how samples are split (if required), making regular and complete entries in the field logbook, and consistently using and completing field management forms. Proper completion of these forms and the field logbook 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, making the resultant data complete, comparable and defensible.

4.8.2 Laboratory Data

The QAPP will require the selected laboratory to supply all required data deliverables (USEPA CLP deliverable format) necessary to enable validation of the data. The analytical data will be transferred electronically from the laboratory to ERM to minimize transcription errors.

The analytical results of all samples collected as part of the additional investigation and remedial work shall be reported following 1995 NYSDEC ASP (Rev-95) requirements. All laboratory analytical data generated as a result of all NYSDEC ASP CLP analytical methods will be reported as ASP CLP data deliverables, and NYSDEC Category B deliverables for all other analytical methods associated with the Phase II investigation. The CLP and Category B data deliverables include all backup QA/QC documentation necessary to facilitate a complete validation of the data.

The CLP SOW for organics requires laboratory verification of temperature upon opening the shipping cooler. After the sample aliquot is taken from the vial, the laboratory is to verify and record the sample pH. (See CLP SOW OLM 03.2, § 4.3.1.3.3 and § 10.3.) Both temperature and pH will be included in all data packages for data validation review.

In addition, NYSDEC "Sample Identification and Analytical Requirement Summary" and "Sample Preparation and Analysis Summary" forms (for

VOC Analysis) will be completed and included with each data package. The sample tracking forms are required and supplied by the 1995 NYSDEC ASP.

4.8.3 Corrective Actions

The NYSDOH ELAP CLP certified laboratory utilized for this project shall meet the requirements for corrective action protocols typical for performing contract laboratory services. Laboratory corrective action may include instrumentation maintenance, methods modification, cross contamination/carry over issues, sample tracking practices, laboratory information management (LIMs), etc.

5.0 HEALTH AND SAFETY PLAN

5.1 INTRODUCTION

This Health and Safety Plan (HASP) has been developed by ERM for the Voluntary Investigation of the Former Insilco Property in Yonkers, NY. The procedures set forth in this HASP are designed to reduce the risk of exposure to chemical substances and physical or other hazards that may be present. The procedures described herein were developed in accordance with the publications indicated below:

- Safety and Health Standards 29 CFR 1910 (General Industry), US Department of Labor, Occupational Safety and Health Administration (OSHA). Hereafter, referred as "29 CFR 1910."
- OSHA 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response, U.S. Dept. of Labor, OSHA.
- OSHA Safety and Health Standards 29 CFR 1926 (Construction Industry), U.S. Department of Labor, OSHA.
- OSHA Safety and Health Standards 29 CFR 40 Part 61 Nation Emissions Standards of Hazardous Air Pollutants, U.S. Dept. of Labor, OSHA.
- OSHA Safety and Health Standards 29 CFR 40 Part763 Asbestos, U.S. Dept. of Labor, OSHA.
- Standard Operating Safety Guides, U.S. Environmental Protection Agency (EPA), Office of Emergency and Remedial Response.
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health (NIOSH).

The recommended health and safety guidelines within this HASP will be modified if future information changes the activities to be performed or the characterization of the area in which work is to be performed.

ERM considers the health, safety, and well being of its employees to be of unconditional importance. Reflecting that concern, it is the policy of management to support the implementation of the Health and Safety Program. The proper resources (financial and human resources) are provided to ensure operation of a comprehensive program. The following policies will be employed:

- Prevention of occupational illnesses, accidents, resulting personal hardship, and financial loss takes precedence in the conduct of our business. Objectives of the Health and Safety Program include the identification of and the elimination or control of all hazards to personnel, products, equipment, and facilities.
- The active participation and involvement of all levels of management are essential to the success of the program. The Health and Safety Program Manager (HSPM) directs, reviews, and evaluates Health and Safety Program activities. The HSPM reports directly to the Presidents of ERM.
- All levels of supervision are responsible for maintaining safe working conditions, instructing each subordinate in proper health and safety practices, and enforcing health and safety program specifications. In addition, each supervisor is responsible for discussing the specifications of the HASP with each employee, and verifying that each employee understands/complies with health and safety directives.
- All employees have personal responsibility to conscientiously follow health and safety procedures, and to notify the project manager of potential or existing hazards to worker health or safety, so that they may be corrected prior to initiation or continuation of work.

Safe conduct is a condition of employment. Disregard for company safety rules are a serious infraction, and disciplinary action will be taken as outlined in this Section.

5.2 ERM PROJECT PERSONNEL AND RESPONSIBILITIES

ERM Project Director (PD) Michael Teetsel

Responsible for all work and conducts ultimate Quality Assurance/Quality Control (QA/QC) overview.

ERM Project Manager (PM): Kent Murdick

Manages day-to-day activities; reports to PD.

ERM Project Health and Safety Coordinator: Brian Winsor

Directs development of HASP; provides technical advice on health and safety issues.

ERM Site Safety Officer (SSO): To be determined.

Responsible for implementation of HASP; reports to PM and PD.

5.3 FIELD ACTIVITIES

The additional investigation work has been designed to supplement previous investigative efforts conducted at the property and complete the environmental investigation of the AOCs identified as part of the Phase I and II Environmental Site Assessments. The project scope has been tailored to:

- Evaluate the AOCs, where accessible, for evidence of the release of hazardous materials;
- Define the nature and extent of potential contamination, both laterally and vertically;
- Identify contaminant source areas;
- Determine the nature and extent of groundwater impacts in excess of the applicable standards;
- Evaluate the nature and extent of previously detected zinc in the bedrock aquifer underlying the Site, and the potential for zinc and other possible chemicals of concern (COCs) to impact the surrounding residential properties;
- Perform hydrologic evaluations of the bedrock aquifer to further assess groundwater flow direction and rates, along with potential contaminant fate and transport mechanisms; and
- Produce data of sufficient quantity and quality to support the development of a Remedial Work Plan, if required.

5.4 *HAZARD IDENTIFICATION AND CONTROL*

Hazard Identification Process

Prior to initiating any new project activity or when there is a change in site conditions, the Site Safety Officer (SSO) will assist project team members in completing a Job Hazard Analysis (JHA). A copy of the JHA form is located in Attachment 1.

Chemical Hazards

Chemicals may be introduced into the body by ingestion, inhalation, or absorption through the skin. Since not all chemicals have the same level of toxicity, the length of time for the exposure and the concentration of the chemical are important in determining the risk. Inhalation and skin contact are the most common routes of entry. Chemicals can be introduced into the body by ingestion when chemicals present on the hands are transferred to food or cigarettes.

Based on historical soil and groundwater sampling, the chemicals of concern may be encountered at the site are listed in Tables 5-1 and 5-2 along with pertinent health and safety information.

Ambient Air Monitoring

Ambient air monitoring will be conducted by the ERM and coordinated by the Project Manager and the Site Health and Safety Officer. The air monitoring protocol that will be followed will be the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (CAMP). The CAMP is included as Attachment 2. Additional monitoring might also be conducted under any of the following circumstances.

- Work begins on a different portion of the site.
- Change in job tasks.
- Change in weather.
- Change in ambient levels of hazardous constituents as indicated by the sense of smell or changes in the physical appearance of the soil or groundwater.
- When new hazardous substances are encountered.

Ambient air monitoring will be conducted using direct-reading real-time instruments as indicated in Table 5-3. This table also provides action levels for upgrading the level of personal protective equipment (PPE) from Level D to Level C. The MiniRae will be used for continuous perimeter monitoring and a Photovac photoionization detector (PID) with an 11.6 eV bulb or a flame ionization detector (FID) will likely be used for ambient air in breathing zone. Not all work at the site will require ambient air monitoring for all contaminants. During the mobilization phase of a particular project task or activity, either the Project Manager or the SSO will determine what contaminants may be encountered in order to have the appropriate instrumentation on-site. The Project Health and Safety Consultant is available to assist the Project Manager or the SSO in determining the appropriate instrumentation.

Direct reading instrumentation will be calibrated daily per manufacturer's instructions. Cylinders of the appropriate calibration gas will be required for fieldwork lasting longer than one day.

The NYSDOH CAMP (Attachment 2) will be followed for air monitoring procedures and outlines the steps to be taken by the SSO when the action levels of the various contaminants are exceeded.

Action Levels

Action levels have been established above which work in Level D personal protective equipment (PPE) shall not be allowed (see Table 5-3).

Real-time, direct reading instruments will be used to monitor for airborne VOCs and dust. The action levels are as follows:

- VOCs: 25 ppmv on a photo-ionization detector
- Dust: 5.0 mg/m^3 on a dust monitor

Should sustained readings above these action levels be detected in the breathing zone, work will be halted until a suitable control is put into place. This could be an engineering control (e.g., venting or dust suppression), or upgrading to Level C PPE.

Site-Specific and Task-Specific Hazards and Control Strategies

The hazards and control strategies associated with planned work activities are summarized in Table 5-4. During the mobilization phase of a specific work task, the project team can quickly review the hazards and control strategies by locating the task or activity to be performed on the table. Hazards that are common to all activities performed at the site at listed first. The hazards listed for a particular task or activity includes the common hazards.

5.5 PERSONAL PROTECTIVE EQUIPMENT

The level of PPE selected for a task is based on the following:

- Type and measured concentration of the chemical substance in the ambient atmosphere and its toxicity.
- Potential for exposure to substances in air, splashes of liquids or other direct contact with material due to work being done.
- Knowledge of chemicals on-site along with properties such as toxicity, route of exposure, and contaminant matrix.

In situations where the type of chemical, concentration, and possibilities of contact are not known, the appropriate level of protection must be selected based on professional experience and judgment until the hazards can be better identified.

In addition to summarizing the general PPE requirements for tasks performed at the site, Table 5-5 also serves as the written certification that the PPE Hazard Assessment has been conducted.

The type of respiratory protection required will be based on the results of ambient air monitoring, the results of any models used to predict ambient air concentrations, and the professional judgment of either the SSO or the Project Health and Safety Coordinator.

As required by 29 CFR 1910.134, *Respiratory Protection*, a cartridge change-out schedule will be developed if it is necessary to upgrade to Level C based on either the results of ambient air monitoring, the results of any models used to predict ambient air concentration; or the professional judgment of the Project Health and Safety Coordinator. At a minimum, new respirator cartridges must be placed on the respirator at the beginning of the shift and after lunch.

5.6 HEAT AND COLD STRESS

Heat Stress

The timing of these activities may be such that heat stress may pose a threat to the health and safety of Site personnel. Acclimation periods and work/rest regimens will be implemented as necessary so that personnel do not suffer adverse effects from heat stress. Heat stress, if necessary, will be monitored in accordance with the American Conference of Governmental and Industrial Hygienists (ACGIH) Threshold Limit Values (TLV) for Heat Stress or equivalent when the temperature is greater than 80°F. The following work/rest regimen will be utilized:

Temp °F	Work-Rest Regimen
80	Work Break Every 2 hours.
82	75% Work - 25% Rest, each hour.
85	50% Work - 50% Rest, each hour.
88	25% Work - 75% Rest, each hour.
90	Delay work until cooler temperatures prevail.

Special clothing and an appropriate diet and fluid intake will be recommended for all Site personnel to further reduce these temperature-related hazards. A good rule of thumb to prevent dehydration from heat stress is that fluid intake should equal fluid loss from the body, which can be accomplished through frequent small intakes of water. Potable water and/or a drink substitute (i.e., Gatorade) will be available for employee consumption.

Cold Stress

The timing of investigative or remediation activities may be such that cold stress may also present a threat to the health and safety of Site employees. Work/rest schedules, with rest in a warming shelter, will be implemented as necessary to reduce adverse effects from cold exposure. Cold stress, if necessary, will be monitored in accordance with the ACGIH TLV for Cold Stress or equivalent. The addition of wind speed and the resulting wind chill will be considered when determining an appropriate work/rest schedule and appropriate clothing.

Site personnel will be encouraged to consume water to avoid dehydration. Potable water and/or a drink substitute (i.e., Gatorade) shall be available for employee consumption. Workers will wear adequately insulated clothing to limit exposure to cold.

5.7 SAFE WORK PRACTICES AND STANDARD OPERATING PROCEDURES

5.7.1 General Site Provisions

Smoking and Eating Areas

Smoking will only be allowed in designated areas. Upon mobilization at the site, the SSO will establish smoking areas per site-specific or client-specific requirements. Individuals caught smoking outside the designated smoking areas will be subject to disciplinary action up to and including immediate termination.

Upon mobilization at the site, the SSO will establish eating and break areas per site-specific or client-specific requirements. Eating will only be allowed in the designated areas and the areas will be maintained in a clean and sanitary condition.

Temporary Facilities

This project will not require any temporary facilities.

Standard Operating Procedures

The following standard operating procedures will be adhered to at all times.

- All personnel entering the site must check in with the SSO.
- All individuals entering the site must demonstrate to the SSO that they have been adequately trained as defined in Section 10.
- All individuals must be familiar with emergency communication methods and how to summon emergency assistance.
- Use of alcoholic beverages before, during operations, or immediately after hours is absolutely forbidden. Alcohol can reduce the ability to detoxify compounds absorbed into the body as the result of minor exposures and may have negative effects with exposure to other chemicals. In addition, alcoholic beverages will dehydrate the body

and intensify the effects of heat stress.

- Horseplay of any type is forbidden.
- All unsafe conditions will be immediately reported to the SSO, who will document such conditions in the field log. The SSO will be responsible for ensuring that the unsafe condition is correctly as quickly as possible.
- Smoking, matches, and lighters are only allowed in the designated smoking area.
- Avoid contact with potentially contaminated substances. Avoid, whenever possible, kneeling on the ground, or leaning or sitting on trucks, equipment or the ground. Do not place equipment on potentially contaminated surfaces.

5.7.2 *Safe Work Practices*

Ergonomics

Ergonomic risk factors include repetitive motion, force, awkward posture, and vibration. The key to preventing ergonomic injuries is education of personnel relative to the hazards and risk factors and implementation of proper controls and work practices.

Several tasks associated with this project have the potential to cause back injuries, if proper lifting techniques are not followed. Site workers should not lift objects that are beyond their physical capabilities and the use of mechanical devices such as forklifts is encouraged. In addition, when shoveling, site workers should not twist their backs while moving materials with the shovel. The proper technique is to move the feet.

Proper lifting techniques are summarized below.

- Place feet shoulder width apart with toes pointing slightly out.
- Bend at your knees keeping back straight.
- Get a good grip on the object and pull object close to your body.
- Tighten abdominal muscles.
- Keep your head up, looking forward, and lift with your legs while

maintaining a straight back.

- Keep load close to your body and ensure your view is not obstructed.
- If one end of the load is heavier than the other, the heavier end should be closest to your body.
- Move your feet to relocate the object as opposed to twisting your back.
- When placing the object down, bend your knees and use your leg muscles while keeping your back straight.

Pre-Drilling/Pre-Excavation and Probing Protocol

The ERM Subsurface Clearance Policy will be followed to clear all drilling or excavation locations for subsurface utilities. The Project Manager will be responsible for ensuring the following issues have been adequately addressed:

- Review historic subsurface utility maps to the extent they are available and applicable.
- Contact New York One-Call to identify underground pipelines, utility lines, and fiber optic cable in the public right-of-way.
- If necessary, arrange for private utility markout on the Site property.
- Identify if any drilling or excavation location falls in a Critical Zone, as defined below.

Critical Zone Definition
10 feet (3 meters) distance from all suspected underground lines.
10 feet (3 meters) distance from the edge of any tank, pump island, pump gallery, manifold, electrical transformer, compressor, production well, loading rack, or other process equipment with associated underground lines.

- All ground disturbance points must be physically cleared for obstructions as part of the ground disturbance activity to ensure that there are no underground utilities or infrastructure at each ground disturbance location. The required clearance depth is given below.

Minimum Depth of Subsurface Clearance Required	
Non-critical zone area	4 feet (1.3 m) or below frost line
Critical zone	7 feet (2.3 meters)

- The approved methods for subsurface clearance is provided below.

Subsurface Clearance Methods	
Hand digging	Performed using a shovel. A post-hole digger should not be used to loosen soil in the excavation.
Hand augering	The auger is to be turned slowly and not forced through the soil. Non-conductive or insulated augers are recommended if electrical utilities are an issue.
Compressed air excavation Pressurized water excavation	Soil should be broken up with an air lance and simultaneously vacuumed to remove loose soils. Alternatively a low volume/high pressure water lance may be used to break-up cohesive/dense soils while vacuuming. Current test/experience indicates that water lances operating at pressures below 5,000 psi and at rates below 12 gpm are unlikely to damage typical fiberglass/metal lines/tanks and utilities.

- Under no circumstances will drilling or excavation be performed within 3 feet (one meter) from the utility.

5.7.3 Fall Protection

This project does not involve working from heights more than six feet above grade.

5.7.4 Weather Related Events

Weather related events that may impact fieldwork include, but are not limited to, rain, snow, thunder, and lightning. The SSO will be responsible for determining what site work can be performed safely in the rain and at what point work will cease due to either quality or safety issues. In the event of thunder and/or lightning, all work will be suspended until 15 minutes have elapsed from the last clap of thunder or flash of lightning.

During rain, lightning and/or thunder events, site workers should seek shelter in either a building or vehicle.

5.7.5 Night Work

This project will not involve activities being performed at night.

5.7.6 Noise

Employees performing any noisy task, such as but not limited to, operating heavy equipment, drilling, using power tools, or employees working within 20 feet of the person performing the task will wear hearing protection consisting of either earplugs or earmuffs. Personnel operating a drilling rig or standing within 20 feet of a drilling rig during operation will also wear hearing protection.

5.8 EMPLOYEE TRAINING

All employees and subcontractors working on-site, who may be exposed to hazardous substances, health hazards, or safety hazards and their supervisors and management responsible for the site will receive training meeting the requirements of 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER) before they are permitted to engage in any job task. Employees will not be permitted to participate in or supervise field activities until they have been trained to a level required by their job function and responsibility. Once on-site all site workers will receive training covering at a minimum the following.

- Names of personnel and alternates responsible for site safety and health
- Safety, health and other hazards present on the site

- Use of PPE
- Safe use of engineering controls and equipment on the site
- Medical surveillance requirements including recognition of symptoms and signs that might indicate overexposure to hazards.

Subcontractor Training

The SSO will verify that subcontractor personnel have received all appropriate training as required by this HASP prior to their arriving on-site. <u>Verification will consist of reviewing written training documentation such as copies of training certificates or cards.</u> Copies of the written training documentation will be retained in the project file. Subcontractor personnel will not be allowed to work at the site unless said training documentation is available.

Daily Tailgate Safety Meeting

A tailgate safety meeting will be conducted each morning. The daily safety meeting meetings will include awareness concerns such as special concerns regarding health and safety, pollution prevention or a discussion of recent incidents or safety observations. Issues such as any changes to the HASP will be addressed daily. The meetings will include a discussion of what tasks will be completed that day and how those tasks will be conducted safely. The meetings will be documented in the project field notes.

5.9 MEDICAL SURVEILLANCE

All ERM employees are enrolled in a medical surveillance program. All employees receive an initial medical examination and consultation prior to assignment to any job site. In addition, employees receive an annual medical examination, a medical examination upon termination of employment, and a medical examination when the employee exhibits signs or symptoms relating to possible overexposure to hazardous substances or when an injury or exposure above published exposure limits has occurred in an emergency situation.

Additional medical surveillance should be provided for employees who:

- Are or may be exposed to hazardous substances or health hazards at or above published exposure levels for these substances for 30 days or more a year;
- Wear a respirator for 30 days or more a year or as required by 29 CFR 1910.134, *Respiratory Protection*; and
- Are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.

5.10 SITE CONTROL MEASURES

The drilling location and surrounding area will be considered the work zone. Drilling will take place in different areas and new work zones will be delineated by the SSO as the drill rig is moved and during monitoring well sampling. The work area will be delineated using traffic cones and/or "Caution" tape. The SSO will ensure that no one enters the work zone without the proper training and requirements. All personnel entering the Work Zone will sign the project sign-in sheet in Attachment 4. Furthermore, all ERM personnel and subcontractor will sign-in at the start of each workday and sign out at the end of each workday.

5.11 DECONTAMINATION PROCEDURES

Decontamination involves the orderly controlled removal of contaminants from both personnel and equipment. The purpose of decontamination procedures is to prevent the spreading of contaminated materials into uncontaminated areas. All site personnel should limit contact with contaminated soil, groundwater or equipment in order to reduce the need for extensive decontamination.

Personnel Decontamination

The following decontamination procedures will be utilized:

- Clean rubber boots with water.
- Remove all PPE and dispose of the PPE in the designated drums.
- Wash hands and any skin that may have come in contact with affected soil or groundwater with moistened disposable towels, such as baby wipes, or soap and water.

Equipment Decontamination

All downhole drilling equipment shall be decontaminated by steam cleaning prior to performance of the first boring/well installation and between all subsequent borings/well installations. This shall include all hand tools, casing, augers, drill rods and bits, tremie pipe and other related tools and equipment. The steam cleaning equipment shall be capable of generating live steam with a minimum temperature of 212^{o} degrees Fahrenheit. The equipment shall be cleaned to the satisfaction of the ERM's Hydrogeologist.

5.12 CONFINED SPACE ENTRY PROCEDURES

Entry into permit-required confined spaces is not anticipated or permitted.

5.13 SPILL CONTAINMENT PROGRAM

The project activities involve the use of drums or other containers, the drums or containers will meet the appropriate DOT regulations and will be inspected and their integrity assured prior to being moved. Operations will be organized so as to minimize drum or container movement. Drums or containers that cannot be moved without failure will be over packed into an appropriate container.

In the event of an unexpected release of hydraulic fluid, engine oil, gasoline or diesel fuel, the release material will be absorbed with sorbent pads, which will be placed in a designated drum for disposal. Impacted soil will be excavated and placed on plastic sheeting and covered until characterization and/or disposal can be arranged.

5.14 SITE COMMUNICATION

Cell phones will be used for communication between the project team and the client and office.

5.15 COMMUNICATION AND REVIEW OF SITE-SPECIFIC HEALTH AND SAFETY PLAN

An initial review of the site-specific HASP will be held either prior to mobilization or after mobilization but prior to commencing work at the site to communicate HASP details and answer questions to individuals working at the site. Daily tailgate safety meetings will be held each morning to review work practices for the day and to discuss safety issues. Any new hazard or safety information will be disseminated at the daily tailgate safety meeting or as needed throughout the day.

5.16 EMERGENCY RESPONSE PLAN

This section describes possible contingencies and emergency procedures to be implemented at the site.

Personnel Roles and Lines of Authority

The SSO has primary responsibility for site evacuation and notification in the event of an emergency situation. This includes taking appropriate measures to ensure the safety of site personnel and the public. Possible actions may involve the evacuation of personnel from the site area and ensuring that corrective measures have been implemented, appropriate authorities notified, and follow-up reports completed. If the SSO is not available, the ERM Project Geologist/Engineer will assume these responsibilities. Subcontractors are responsible for assisting the SSO in their mission within the parameters of their scope of work.

Emergency Alarms

Because of the small work area and mobility of work areas, an emergency evacuation plan and meeting place will decide on the drilling or sampling locations.

Reporting Emergencies

All, including any late developing or aggravated injuries, must receive prompt medical attention. For non-life threatening injuries or illnesses site workers should be transported to the hospital. For life threatening injuries or illnesses, the local emergency responders should be contacted via 911.

The SSO is responsible for reporting all injuries, illnesses, fires, spills/releases, property damage or near misses to the following individuals.

- Injured/involved employee's supervisor
- ERM Project Manager
- ERM Partner-In-Charge
- ERM Project Health and Safety Consultant
- Client Contact

Emergency Contacts

In case of an emergency, the SSO will contact the following as appropriate.

Title/Name	*Phone Numbers*
ERM Project Director Michael B. Teetsel, C.P.G	Work: 860-466-8530 Mobile: 860-324-6207
Project Manager Kent Murdick	Work: 631-756-8900 Mobile: 516-250-9001
Site Safety Officer Kent Murdick	Work: 631-756-8900 Mobile: 516-250-9001
Project Geologist/Engineer To be determined	Work: 631-756-8900
Project Health and Safety Coordinator Brian Winsor	Work: 860-466-8500
Ms. Janet Brown, P.E. NYSDEC	Work: 845-255-3826
Local Emergency Responders – all services	Phone: 911
Hospital: St. John's Riverside Hospital	Phone: 914-964-4444

Incident Investigations

An ERM Incident Form (Attachment 4) will be completed and forwarded to the Project Manager within 24 hours of an incident. All incidents will be investigated in a timely manner. The SSO and/or the Project Manager will schedule the investigation and include project supervision (ERM, subcontractors, and client), the injured/involved employee(s) and the Project Health and Safety Coordinator. Root cause analysis will be performed to assess the apparent cause and identify corrective measures to be implemented to prevent re-occurrence. The last page of the Incident Form is used to document the investigation.

Directions to Nearest Hospital

The nearest hospital is *St. John's Riverside Hospital*. Directions to the hospital and a map to the hospital from the Site are provided in Attachment 5.

St. John's Riverside Hospital
967 N. Broadway
Yonkers, NY 10701
914-964-4444

Emergency Drills

In accordance with the HAZWOPER Standard emergency response plans will be rehearsed regularly as part of the overall training program for site operations. The frequency of this drill (rehearsal) is outlined on Table 5-6. Drills do not need to be elaborate. A tabletop scenario during the daily safety meeting is an adequate drill.

5.17 SAFETY EQUIPMENT

A first aid kit containing first aid items for minor incidents only and a fire extinguisher is maintained in each ERM vehicle. If you are driving a personal vehicle or a rental vehicle, please rent a first aid kit and fire extinguisher from the equipment room, or be aware of the locations of these items within the facility.

5.18 *CERTIFICATION OF FAMILIARITY WITH PLAN BY SITE PERSONNEL*

By signing below, your signature certifies that you have read, understand and will abide by the contents of this HASP.

Name	Signature	Company	Date

Attachment 1

Job Hazard Analysis

ERM

JOB HAZARD ANALYSIS

Required for those field projects that do not require a HASP (see Project Safety Evaluation Checklist). JHAs also are used to supplement HASPs.

Prior to conducting fieldwork a Job Hazard Analysis must be completed and reviewed with all members of the Project Team. At the time of site mobilization, the job Hazard Analysis will be verified and reviewed again with the Project Team at the beginning of each day as fieldwork continues.

Client:	W.O.#
Project Name:	
Location:	
ERM Project Director:	Date:
ERM Project Manager:	Revision No.:
ERM Project Team:	
Subcontractors:	

Field Work Description

NOTE: For any hazards that are not applicable for your task, mark the left hand column with N/A. Do not leave any hazards blank.

Hazard Identification	Describe Hazard Control (appropriate for site)
Job Location/Setting:	☐ Industrial facility ☐ Commercial are ☐ Urban area ☐ Residential area ☐ Undeveloped/vacant ☐ Lone worker
☐ Chemicals at site List or attach separate page:	☐ MSDS or chemical information available to project team for each chemical (required) ☐ PPE (see PPE Section) ☐ Exposure monitoring ☐ Decontamination: Specify methods:
☐ Chemicals ERM will take to site	☐ Attach copies of MSDSs for all chemicals to en to clients site.
☐ Dust-Describe source	☐ PPE (*see* PPE Section) ☐ Exposure monitoring (see monitoring section) ☐ Dust suppression
☐ Confined Space	Coordinator ERM Health and Safety for assistance

Hazard Identification	Describe Hazard Control (appropriate for site)
☐ Slips (Wet Surface), Trips and Falls ☐ fall less than 6 feet ☐ fall more than 6 feet	☐ Clean/ dry surfaces ☐ Barricade the unsafe area ☐ Eyes on path ☐ Relocate the work area ☐ Use alternate route ☐ Use a construction platform ☐ Tie-off to equipment ☐ Move work to ground level ☐ Fall restraint, guardrails, short lanyard
☐ Electrical Shock	☐ Area around electrical equipment dry ☐ Energy isolation or Lock-out/Tag-out (LOTO) ☐ Grounding ☐ GCFI ☐ Shielding on equipment
☐ Combustible materials, Fire, Explosion	☐ Remove combustible materials ☐ Relocate work ☐ Isolation/ LOTO ☐ Area air monitoring ☐ PPE/ Flame Retardant Clothing (FRC) (See PPE Section) ☐ Fire watch ☐ Fire extinguisher available
☐ Heat/Cold Stress	☐ Work/Rest regimen ☐ Task rotation, shared tasks ☐ Source of cool water/electrolyte replacement drinks ☐ Ventilation
☐ Noise - Describe source	☐ PPE (see PPE Section) ☐ Relocate work ☐ Control noise source
☐ Lighting/ Visibility	☐ Adequate for task ☐ Nighttime considerations ☐ PPE (see PPE Section) ☐ Safety cones
☐ Lifting, Pulling, Pushing, Repetitive Motion	☐ Get equipment designed for the job ☐ Proper technique ☐ Smaller, lighter loads ☐ Prepared for "unexpected release" ☐ Move feet to turn with load
☐ Airborne/Flying Material	☐ Cover/Shield source ☐ PPE (see PPE Section) ☐ Positioning
☐ Rotating/Moving Equipment and Pinch Points	☐ Energy isolation, Lock-out/Tag-out (LOTO) ☐ Guarding, barricading ☐ No loose clothing ☐ Positioning
☐ Sharp Objects	☐ Guarding ☐ PPE (see PPE Section) ☐ Positioning
☐ Falling Objects	☐ Secure objects ☐ Guarding, covers ☐ PPE (see PPE Section) Barricading
☐ Hazards from others working in	☐ Communication: Specify Method

☐ Hazards to other working in vicinity	☐ Communication: Specify Method

Hazard Identification	Describe Hazard Control (appropriate for site)
☐ Environmental Spill	☐ Containment ☐ Waste Plan ☐ Waste containers ☐ Other
☐ Overhead lines/subsurface lines	☐ Spotter ☐ Verify clearance with client ☐ One-Call ☐ Mark line
☐ Site-specific training required	☐ Specify training requirement
☐ Client-specific safety procedure/policy required?	☐ Specify client specific safety procedure or policy (attach a copy)
☐ Client permit required?	☐ Specify method for obtaining permit:
☐ Subcontractor on-site	☐ Obtain proof of required (including site-specific) training ☐ Obtain proof of required (including site-specific) medical surveillance
☐ Other Hazards	☐ Description:

Exposure Monitoring

The following equipment will be used to monitor personnel exposure:

Emergency Plan required for every site job

Method of obtaining assistance	
Evacuation Route	
Prevailing wind direction	
Emergency call list	911 or Other emergency #: ERM Project Manager: ERM Project Director: Client Coordinator: Subcontractor Coordinator:
Emergency assembly area	

Emergency Plan

First aid equipment availability	
Nearest Medical Assistance Address: Phone Number:	Direction or attach map:

Personal Protective Equipment Required (Check boxes to indicate PPE requirements)

☐ Field clothes (long or short sleeve shirt, long pants)
☐ Disposable coveralls: specify type____
☐ High visibility or reflective vests
☐ Flame Retardant Clothing
☐ Hard-hat
☐ Steel toe boots/shoes
☐ Disposable shoe covers
☐ Respiratory Protection
- ☐ Half-face cartridge respirator, cartridge type: ______________________________
- ☐ Cartridge change frequency ____________________________________
- ☐ Other respirator type

☐ Gloves: specify type(s)

☐ Hearing protection: specify type(s)

☐ Eye Protection: specify type

PPE Hazard Assessment Certified by:
(Note: PPE can be certified by any knowledgeable staff member) Date: _____

Project team (including subcontractors) has seen, been briefed and understand the contents of this job Hazard Analysis.

Name	Signature	Date

Attachment 2

Community Air Monitoring Plan

New York State Department of Health
Generic Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of 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 investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

~ If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

~ If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

~ If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

~ If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

~ If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

Last Updated: June 20, 2000

Attachment 3

Daily Safety Meeting Form

DAILY SITE SAFETY LOG

Site:
Project:
Time on: ______ Time off: ______
Weather/Temperature: ____
Wind Direction: ____________

Site Safety Talk: Yes_________ No_________

Topics: ________________________________
____
____
____

Daily Safety Inspection:

Time:_______ Initials:____________ Time:_______ Initials:_____

Comments:____
Instrument Calibration:

Instrument Calibration:

Instrument	Time	Calibration Gas	Calibration Conc.	Calibrated?

Comments:____

Personal Protective Equipment: Universal Equipment - hard hat, safety glasses and work boots.

Task 1:__________________ Task 2:__________________ Task 3:__________________

DAILY SITE SAFETY LOG (continued)

Date:____________

Air Monitoring:

Concentration

Time/Location:	Inst:	Settings:	Inst:	Settings:
____________	________	________	________	
____________	________	________	________	
____________	________	________	________	
____________	________	________	________	
____________	________	________	________	
____________	________	________	________	
____________	________	________	________	
____________	________	________	________	
____________	________	________	________	
____________	________	________	________	

Comments (including upgrade, non-compliance, etc.):

____

____

____

____

____

Site Safety Officer:____________Signature:________Date:____________

Attachment 4

Project Sign-in Sheet

SITE SIGN-IN SHEET

Site:

Date:____________________

Employee	**Company**	**Time In**	**Time Out**

Attachment 5

ERM Incident Reporting Form

ERM

Incident Report

Instructions: Aim to complete **Part 1 of this form within 24 hours** after the incident and complete **Part 2 within 3 working days** after the incident. In addition to the Project Manager and OpCo Health and Safety Coordinator, who are primarily involved with the investigation, please ensure that the following individuals are made aware of the incident at least verbally within 24 hours and receive the completed incident form as soon as it is completed: **Office Manager; Corporate H&S Director, OpCo President,** and **Regional CEO**. The OpCo H&S Coordinator should keep paper or electronic copies of these reports. If a piece of information does not apply, put N/A in the block.

I. INJURY AND ILLNESS DATA AND SUMMARY

Date and time of incident Date: Time:	Location of incident (Name and address)	
Time injured employee started work on day of incident	Weather conditions	
Reported by	Date reported	List any witnesses
Project Number	Project Manager	Principal-in-Charge
Injured employee's name	Injured employee's department or practice area	
Injured sub-contractor's name	Injured sub-contractor's employer	
Injured person's sex Male ☐ Female ☐	Injured employee's date of hire at ERM	
Type of Incident (circle one) First aid/minor injury Vehicle accident	All other injuries Property damage	Near miss

ERM

Incident Report

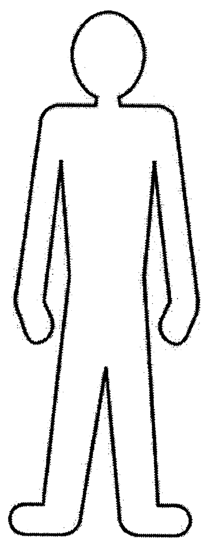
What activity/task was taking place just prior to the incident? (Describe the activity/task as well as tools, equipment and material involved that set the stage for the incident. What was the worker doing?)
What changed about the situation or task to cause the incident? How did the incident happen? (Describe in detail the incident.)
If the incident involved an injury, describe it. (e.g., cut to left ring finger, sprained right ankle, snake bite to left shin, pulled muscles in the lower back)
Immediate actions taken (Describe actions taken and by whom immediately after the incident occurred.)
What object or substance directly harmed the employee? (Examples, concrete floor, chlorine, H2S, manhole cover. If this question does not apply to the incident, write N/A.)
If medical treatment was given away from worksite, state name and mailing address of both the facility and treating health care professional.

Was employee treated in an emergency room? Yes ☐ No ☐	Was employee hospitalized overnight as an in-patient? Yes ☐ No ☐

Additional Consequences of incident (Describe damage to property/equipment, consequences to other employees or community, schedule.)

Incident Report

ERM

If the employee died, give date of death.
Is the incident recordable/reportable under any governmental requirement? (To be completed by OpCo Health and Safety Coordinator) Yes ☐ No ☐ Name of person making determination
How many photos of the scene were taken?
(If completed manually) Please note the position of the injury on the diagram and sketch any other instructive diagrams here as well. 

Name of person completing form		Signature of person completely form
Title of person completing form	Phone number of person completing form	Date form completed

Incident Report

ERM

Instructions: This side of the form will be completed as directed by the OpCo Health and Safety Coordinator

II. CAUSES AND PLANS TO PREVENT RECURRENCE

Actions leading to incident. (Circle all that apply and explain.)

Failure to observe warning	Failure to use PPE	Failure to warn	Other
Delayed discovery	Procedure not followed	Abuse/misuse of equipment	

Conditions leading to incident. (Circle all that apply and explain.)

Temperature/weather	Inadequate maintenance	Nature (animal, insects, plants)
Lack of PPE	Lack of proper instructions	Construction deficiencies
Improper design/engineering	Improper/defective tools/ equipment	Other

Job factors leading to incident. (Circle all that apply and explain.)

Leadership/supervision	Work practices	Defective tools/equipment
Inadequate communication	Inadequate training	Inadequate inspections
Inadequate work procedures/practices		Other

Personal factors leading to incident. (Circle all that apply and explain.)

Physical capability	Physical stress/fatigue	Mental stress
Knowledge of task	Employee skills	Attention to details
Other		

ERM

Incident Report

Corrective Actions	Person responsible	Deadline	Date completed
1)	1)	1)	1)
2)	2)	2)	2)
3)	3)	3)	3)
4)	4)	4)	4)

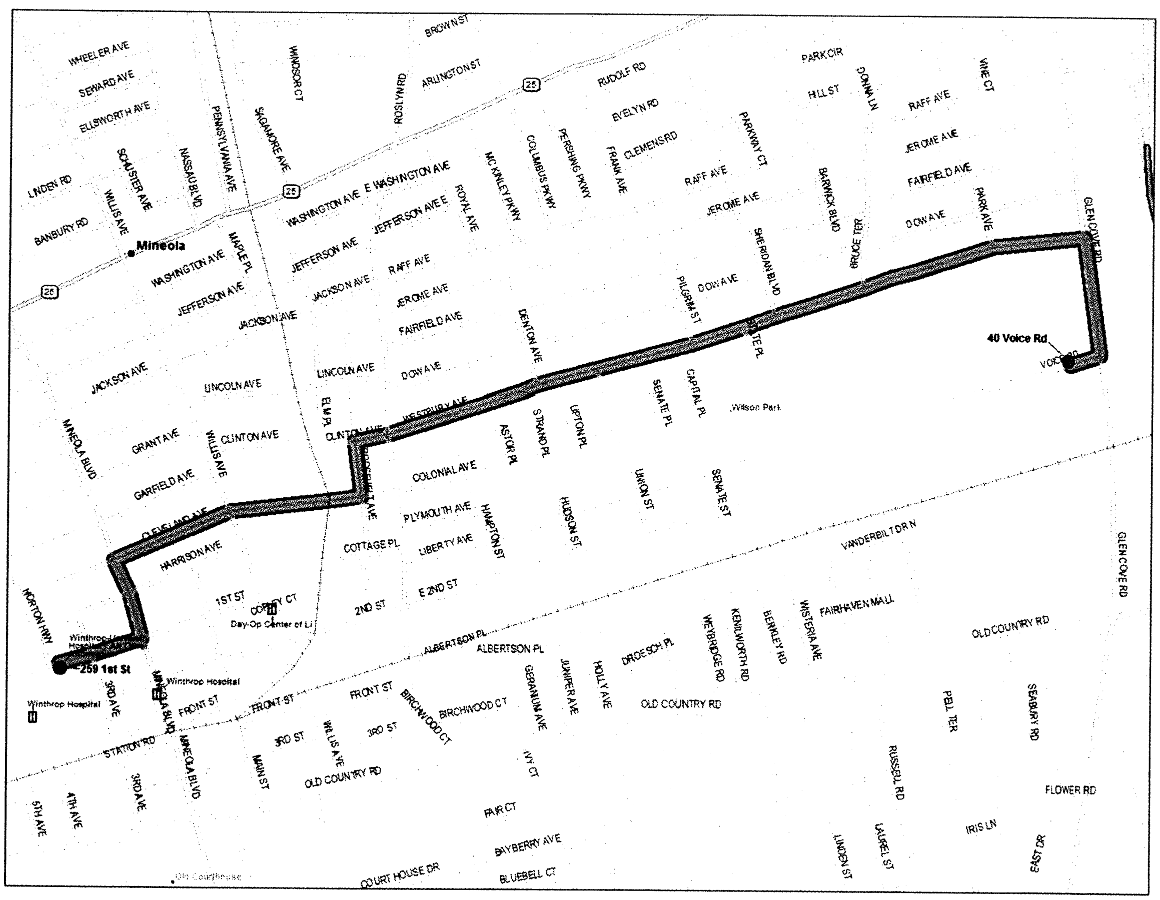
Attachment 6

Hospital Route Map and Directions

Hospital Route Map and Directions

Distance (miles)	Turn	Road	Est. Time (hr:min.)	Total (mi.)
		<Start> 40 Voice Road		
0.1	Start (NE)	Voice Road	0:00	
0.1	Turn left	Glen Cove Rd.	0:01	0.1
0.7	Turn left	Westbury Ave.	0:01	0.8
0.3	Turn left	Roosevelt Ave.	0:01	1.1
0.2	Turn right	Cleveland Ave.	0:01	1.3
0.2	Turn left	Mineola Blvd.	0:01	1.5
0.3	Turn right	First Street	0:01	1.8
0.1		<Finish> 259 First St.	0:06	1.96

Est = Estimated



TABLES

TABLE 4-1
SAMPLE TOTAL SUMMARY

Activity	*Analytical Parameters*	*Matrix*	*Number of Samples*	*Blind Field Duplicates* [1]	*MS/MSD Pairs* [2]	*Field Blanks* [3]	*Trip Blanks* [4]	*Sample Totals*
AOC 1 Soil Sampling	TAL Metals - USEPA SW-846 Methods 6010B & 7471A	Soil	8 [5]	1	1	1	0	12
	Total Cyanide - USEPA SW-846 Method 9012B	Soil	8 [5]	1	1	1	0	12
AOC 2 Soil Gas Sampling	TO-15A (Summa Canisters)	Air	6	1	0	0	0	7
AOC 4 Groundwater Sampling	Volatile Organic Compounds - USEPA Method 624	Aqueous	5	1	1	2	2	12
	Polyaromatic Hydrocarbons - USEPA Method 625	Aqueous	5	1	1	2	0	10
	TAL Metals – USEPA Methods 200.7 & 245.1	Aqueous	5	1	1	2	0	10
	Total Cyanide – USEPA Method 335.2	Aqueous	5	1	1	2	0	10
	Weak and Dissociable Cyanide - SM 18th Method 4500-CN I.	Aqueous	5	1	1	2	0	10

Notes:

1. Duplicates are generally collected at a minimum frequency of five percent (1 per 20 field samples). More frequent collection may be warranted based on field conditions/observations and/or at the discretion of the Field Team Leader.
2. MS/MSD Pairs (two samples) will be collected at a minimum frequency of five percent (1 per 20 field samples). More frequent collection may be warranted based on field conditions/observations and/or at the discretion of the Field Team Leader. No MS/MSD will be collected for air samples.
3. Field Blanks will be collected at a minimum frequency of one per day for aqueous samples. More frequent collection may be warranted based on field conditions/observations and/or at the discretion of the Field Team Leader. It is assumed the sampling might take 2 days. No field blank will be collected for air samples.
4. Trip Blanks will be collected at the rate of one per aqueous sample shipment when VOCs are collected. No trip blank will be collected for air samples.
5. The actual number of soil samples collected at each soil boring location will be determined in the field.

TABLE 4-2
DETAILED SUMMARY OF SAMPLING PROGRAM
ANALYTICAL METHODS, PRESERVATIVES, HOLDING TIMES AND CONTAINERS

Matrix	*Analytical Parameters*	*Analytical Method Reference*	*Sample Preservation*	*Holding Time* [2]	*Container* [3, 4, 5]
Soil	TAL Metals	USEPA SW-846 Methods 6010B & 7471A	Cool, 4°C	180 days (all metals except Mercury) 26 days (Mercury only)	1 – 8 oz glass jar
	Total Cyanide	USEPA SW-846 Method 9012B	Cool, 4°C	14 days	1 – 8 oz glass jar
Air	Volatiles in Air	TO-15A	NA	14 days (method HT is 30 days)	1 – 6 Liter Summa Canister
Aqueous	TCL VOCs	USEPA Method 624	Cool 4°C, pH<2 (HCl)	10 days	3 – 40 ml glass Teflon-lined cap
	PAHs	USEPA Method 625	Cool, 4°C	5 days / 40 days	2 – 1 liter amber glass bottles
	TAL Metals	USEPA Methods 200.7 & 245.1	Cool, 4°C, pH<2 (HNO_3)	180 days (all metals except Mercury) 26 days (Mercury only)	1 - 500 ml poly bottle
	Total Cyanide	USEPA Method 335.2	Cool, 4°C, pH>12 (NaOH)	As Soon As Possible	1 - 500 ml poly bottle
	Weak and Dissociable Cyanide	SM 18th Edition Method 4500-CN I	Cool, 4°C	None Regulated	1 - 500 ml poly bottle

Notes:

1. VOCs and Metals holding times are days from the Validated Time of Sample Receipt (VTSR) until analysis.
2. PAH holding times are days from VTSR until extraction / days from extraction to analysis.
3. As specified by Mitkem, Warwick, RI.
4. Soil TAL Metals and Total Cyanide can be collected into the sample jar.
5. Aqueous Total Cyanide and Weak and Dissociable Cyanide can be collected into the sample jar.

TABLE 4-3
SOIL
TARGET ANALYTE LIST METALS AND TOTAL CYANIDE
REPORTING LIMITS AND METHOD DETECTION LIMITS

Analyte List	*CAS Number* [1]	*Reporting Limits (mg/kg)* [2, 3]	*Method Detection Limits (mg/kg)* [2, 3, 4]
Aluminum	7429-90-5	10	0.34
Antimony	7440-36-0	1	0.056
Arsenic	7440-38-2	1	0.076
Barium	7440-39-3	10	0.13
Beryllium	7440-41-7	0.3	0.0061
Cadmium	7440-43-9	0.3	0.0055
Calcium	7440-70-2	40	1.8
Chromium	7440-47-3	1	0.014
Cobalt	7440-48-4	2.5	0.022
Copper	7440-50-8	1.5	0.21
Iron	7439-89-6	10	0.87
Lead	7439-92-1	0.5	0.041
Magnesium	7439-95-4	25	0.81
Manganese	7439-96-5	2.5	0.067
Mercury	7439-97-6	0.033	0.007
Nickel	7440-02-0	2.5	0.026
Potassium	7440-09-7	50	4.6
Selenium	7782-49-2	1.5	0.067
Silver	7440-22-4	1.5	0.019
Sodium	7440-23-5	50	7.5
Thallium	7440-28-0	1	0.079
Vanadium	7440-62-2	2.5	0.021
Zinc	7440-66-6	2.5	0.056
Cyanide	57-12-5	1	0.12

Notes:
1. Chemical Abstracts Service (CAS) Registry Number.
2. As per Mitkem, Warwick, Rhode Island.
3. Reporting Limits and Method Detection Limits (MDLs) will vary per sample depending on that sample's percent moisture.
4. Subject to change throughout the course of the project if the laboratory is required to update their MDLs.

TABLE 4-4
AIR
COMPOUND LIST AND REPORTING LIMITS

Compound List	*CAS Number* [1]	*Molecular Weight*	*Reporting Limit (ppbv)* [2]	*Reporting Limit (ug/m³)* [2]
Acetone (2-propanone)	67-64-1	58.08	5.0	12
Benzene	71-43-2	78.11	0.20	0.64
Bromodichloromethane	75-27-4	163.83	0.20	1.3
Bromoethene	593-60-2	106.96	0.20	0.87
Bromoform	75-25-2	252.75	0.20	2.1
Bromomethane (Methyl bromide)	74-83-9	94.95	0.20	0.78
1,3-Butadiene	106-99-0	60.14	0.20	0.49
2-Butanone (Methyl ethyl ketone)	78-93-3	72.11	0.50	1.5
Carbon disulfide	75-15-0	76.14	0.50	1.6
Carbon tetrachloride	56-23-5	153.84	0.20	1.3
Chlorobenzene	108-90-7	112.56	0.20	0.92
Chloroethane	75-00-3	64.52	0.20	0.53
Chloroform	67-66-3	119.39	0.20	0.98
Chloromethane (Methyl chloride)	74-87-3	50.49	0.20	0.41
3-Chloropropene (allyl chloride)	107-05-1	76.53	0.20	0.63
2-Chlorotoluene (o-Chlorotoluene)	95-49-8	126.59	0.20	1.04
Cyclohexane	110-82-7	84.16	0.20	0.69
Dibromochloromethane	124-48-1	242.74	0.20	2.0
1,2-Dibromoethane	106-93-4	187.88	0.20	1.5
1,2-Dichlorobenzene	95-50-1	147.01	0.20	1.2
1,3-Dichlorobenzene	541-73-1	147.01	0.20	1.2
1,4-Dichlorobenzene	106-46-7	147.01	0.20	1.2
Dichlorodifluoromethane (Freon 12)	75-71-8	120.92	0.20	0.99
1,1-Dichloroethane	75-34-3	98.97	0.20	0.81
1,2-Dichloroethane	107-06-2	98.96	0.20	0.81
1,1-Dichloroethene	75-35-4	96.95	0.20	0.79
cis-1,2-Dichloroethene	156-59-2	96.95	0.20	0.79
trans-1,2-Dichloroethene	156-60-5	96.95	0.20	0.79
1,2-Dichloropropane	78-87-5	112.99	0.20	0.92
cis-1,3-Dichloropropene	10061-01-5	110.98	0.20	0.91
trans-1,3-Dichloropropene	10061-02-6	110.98	0.20	0.91
1,2-Dichlorotetrafluoroethane (Freon 114)	76-14-2	170.93	0.20	1.4
Ethylbenzene	100-41-4	106.16	0.20	0.87
4-Ethyltoluene (p-Ethyltoluene)	622-96-8	120.2	0.20	0.98
n-Heptane	142-82-5	101.2	0.20	0.83
Hexachlorobutadiene	87-68-3	260.76	0.20	2.1

TABLE 4-4 (continued)
AIR
COMPOUND LIST AND REPORTING LIMITS

Compound List	*CAS Number* [1]	*Molecular Weight*	*Reporting Limit (ppbv)* [2]	*Reporting Limit (ug/m^3)* [2]
n-Hexane	110-54-3	86.18	0.20	0.70
Methylene chloride	75-09-2	84.94	0.50	1.7
4-Methyl-2-pentanone (MIBK)	108-10-1	100.16	0.50	2.05
MTBE (Methyl tert-butyl ether)	1634-04-4	88.15	0.50	1.8
Styrene	100-42-5	104.14	0.20	0.85
Tertiary butyl alcohol (TBA)	75-65-0	74.12	5.0	15
1,1,2,2-Tetrachloroethane	79-34-5	167.86	0.20	1.4
Tetrachloroethene	127-18-4	165.85	0.20	1.4
Toluene	108-88-3	92.13	0.20	0.75
1,2,4-Trichlorobenzene	120-82-1	181.46	0.50	3.7
1,1,1-Trichloroethane	71-55-6	133.42	0.20	1.1
1,1,2-Trichloroethane	79-00-5	133.42	0.20	1.1
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	187.38	0.20	1.5
Trichloroethene	79-01-6	131.4	0.20	1.07
Trichlorofluoromethane (Freon 11)	75-69-4	137.38	0.20	1.1
1,2,4-Trimethylbenzene	95-63-6	120.19	0.20	0.98
1,3,5-Trimethylbenzene	108-67-8	120.19	0.20	0.98
2,2,4-Trimethylpentane	540-84-1	132.38	0.20	1.08
Vinyl chloride	75-01-4	62.5	0.20	0.51
m+p-Xylene	179601-23-1	106.16	0.20	0.87
o-Xylene	95-47-6	106.16	0.20	0.87
1,2-Dichloroethene (total)	540-59-0	96.95	0.20	0.79
1,4-Dioxane	123-91-1	88.11	5.0	18
Isopropyl Alcohol	67-63-0	61.09	5.0	12.5
Methyl Butyl Ketone	591-78-6	100.16	0.50	2.05
Methyl methacrylate	80-62-6	100.1	0.50	2.05
Naphthalene	91-20-3	142.2	0.50	2.9
Tetrahydrofuran	109-99-9	72.11	5.0	15

Notes:
1. Chemical Abstracts Service (CAS) Registry Number.
2. As specified by Severn Trent Laboratories (STL) Burlington, Vermont. Sub-contract lab for Mitkem.

TABLE 4-5
AQUEOUS
VOLATILE TARGET COMPOUND LIST (TCL) AND REPORTING LIMITS

Target Compound List	*CAS Number* [1]	*Reporting Limits (μg/l)* [2]
Chloromethane	74-87-3	5
Bromomethane	74-83-9	5
Vinyl chloride	75-01-4	5
Chloroethane	75-00-3	5
Methylene chloride	75-09-2	5
Acetone	67-64-1	5
Carbon disulfide	75-15-0	5
1,1-Dichloroethene	75-35-4	5
1,1-Dichloroethane	75-34-3	5
cis-1,2-Dichloroethene	156-59-2	5
trans-1,2-Dichloroethene	156-60-5	5
Chloroform	67-66-3	5
1,2-Dichloroethane	107-06-2	5
2-Butanone	78-93-3	5
Bromochloromethane	74-97-5	5
1,1,1-Trichloroethane	71-55-6	5
Carbon Tetrachloride	56-23-5	5
Bromodichloromethane	75-27-4	5
1,2-Dichloropropane	78-87-5	5
cis-1,3-Dichloropropene	10061-01-5	5
Trichloroethene	79-01-6	5
Dibromochloromethane	124-48-1	5
1,1,2-Trichloroethane	79-00-5	5
Benzene	71-43-2	5
trans-1,3-Dichloropropene	10061-02-6	5
Bromoform	75-25-2	5
4-Methyl-2-pentanone	108-10-1	5
2-Hexanone	591-78-6	5
Tetrachloroethene	127-18-4	5
1,1,2,2-Tetrachloroethane	79-34-5	5
1,2-Dibromoethane	106-93-4	5
Toluene	108-88-3	5
Chlorobenzene	108-90-7	5
Ethylbenzene	100-41-4	5
Styrene	100-42-5	5
Xylenes (total)	1330-20-7	5

TABLE 4-5 continued)
AQUEOUS
VOLATILE TARGET COMPOUND LIST (TCL) AND REPORTING LIMITS

Target Compound List	*CAS Number* [1]	*Reporting Limits (μg/l)* [2]
1,3-Dichlorobenzene	541-73-1	5
1,4-Dichlorobenzene	106-46-7	5
1,2-Dichlorobenzene	95-50-1	5
1,2-Dibromo-3-chloropropane	96-12-8	5
1,2,4-Trichlorobenzene	120-82-1	5

Notes:
1. Chemical Abstracts Service (CAS) Registry Number.
2. As per Mitkem, Warwick, RI. May change during investigation.

TABLE 4-6
AQUEOUS
POLYAROMATIC HYDROCARBON (PAH) COMPOUND LIST
AND REPORTING LIMITS

Compound List	*CAS Number* [1]	*Reporting Limits (μg/l)* [2]
Acenaphthene	83-32-9	10
Acenaphthylene	208-96-8	10
Anthracene	120-12-7	10
Benzo(a)anthracene	56-55-3	10
Benzo(b)fluoranthene	205-99-2	10
Benzo(k)fluoranthene	207-08-9	10
Benzo(g,h,i)perylene	191-24-2	10
Benzo(a)pyrene	50-32-8	10
Chrysene	218-01-9	10
Dibenz(a,h)anthracene	53-70-3	10
Fluoranthene	206-44-0	10
Fluorene	86-73-7	10
Indeno(1,2,3-cd)pyrene	193-39-5	10
Naphthalene	91-20-3	10
Phenanthrene	85-01-8	10
Pyrene	129-00-0	10

Notes:
1. Chemical Abstracts Service (CAS) Registry Number.
2. As per Mitkem, Warwick, RI. May change during investigation.

TABLE 4-7
AQUEOUS
TARGET ANALYTE LIST METALS, TOTAL CYANIDE,
AND WEAK AND DISSOCIABLE CYANIDE
REPORTING LIMITS AND METHOD DETECTION LIMITS

Analyte List	*CAS Number* [1]	*Reporting Limits Water (μg/L)* [2]	*Method Detection Limits (μg/L)* [2, 3]
Aluminum	7429-90-5	200	14
Antimony	7440-36-0	20	1.2
Arsenic	7440-38-2	20	1.6
Barium	7440-39-3	200	2.1
Beryllium	7440-41-7	5	0.15
Cadmium	7440-43-9	5	0.1
Calcium	7440-70-2	800	33
Chromium	7440-47-3	20	0.38
Cobalt	7440-48-4	50	0.15
Copper	7440-50-8	30	6.3
Iron	7439-89-6	200	19
Lead	7439-92-1	10	0.46
Magnesium	7439-95-4	500	20
Manganese	7439-96-5	50	1.8
Mercury	7439-97-6	0.2	0.047
Nickel	7440-02-0	50	0.59
Potassium	7440-09-7	1000	160
Selenium	7782-49-2	30	0.98
Silver	7440-22-4	30	0.91
Sodium	7440-23-5	1000	130
Thallium	7440-28-0	20	1.2
Vanadium	7440-62-2	50	0.47
Zinc	7440-66-6	50	2.3
Cyanide	57-12-5	20	9.1
Weak And Dissociable Cyanide	57-12-5	20	9.1

Notes:
1. Chemical Abstracts Service (CAS) Registry Number.
2. As per Mitkem, Warwick, Rhode Island.
3. Subject to change throughout the course of the project if the laboratory is required to update the MDLs.

TABLE 4-8
SOIL AND AQUEOUS
ANALYTICAL LABORATORY DATA QUALITY OBJECTIVES (DQOs)
INORGANIC CONSTITUENT ANALYSES

QC Analytes	Blind Field Duplicate Precision (% RPD)	Method Blanks	Calibration ICV & CCV	MS Accuracy (% Rec.)	Laboratory Duplicate Precision (% RPD)	Serial Dilution Precision (% D)	Lab Check Sample Accuracy (% Rec.)
all analytes	For water	< ±		75-125 [1]	< 20 [2]	< 10 [3]	80-120%
aluminum	< 50 for	RL	90-110				for all
antimony	all	for all	90-110				analytes
arsenic	Analytes	Analytes	90-110				except
barium			90-110				cyanide
beryllium			90-110				90-110%
cadmium	For soil :		90-110				For water
calcium	< 100 for		90-110				
chromium	all		90-110				For soil :
cobalt	Analytes		90-110				Manufacturer's
copper			90-110				Control Limits
iron			90-110				
lead			90-110				
magnesium			90-110				
manganese			90-110				
mercury			80-120				
nickel			90-110				
potassium			90-110				
selenium			90-110				
silver			90-110				
sodium			90-110				
thallium			90-110				
vanadium			90-110				
zinc			90-110				
cyanide			85-115				

Notes:
1. Spike recovery limits do not apply when the sample concentration exceeds the spike added concentration by a factor of 4 or more.
2. Limit is ± 20% if values are ≥ 5x RL; limit is ± RL if values are <5x RL; no limit if both values are < instrument detection limit (IDL). For soils limits are ± 35% RPD and ± 2x RL.
3. Limit applies only when the analyte concentration in the original sample (I) is > 50 x MDL; if I < 50x MDL then no limit.

QC = Quality Control; RPD = Relative Percent Difference; RL = Reporting Limits;
ICV = Initial Calibration Verification Check; CCV = Continuing Calibration Verification Check;
MS = Matrix Spike Sample; % Rec. = Percent Recovery

TABLE 4-9
AIR
ANALYTICAL LABORATORY DATA QUALITY OBJECTIVES (DQOs)

QC Compounds	*Surrogate Compound Accuracy (% Rec.)* [1]	*Blind Field Duplicate Precision (RPD)*	*Method Blanks*	*LCS Accuracy (% Rec.)* [1]
All compounds	NA [1]	< 50	≤ RL	60 – 140

Notes:
1. Air samples are not spiked with surrogates and an MS/MSD is not performed.

QC = Quality Control
% Rec. = Percent Recovery
RPD = Relative Percent Difference
RL = Reporting Limit
LCS = Lab Check Sample

TABLE 4-10
AQUEOUS
ANALYTICAL LABORATORY DATA QUALITY OBJECTIVES (DQOs)
FOR PRECISION AND ACCURACY
VOLATILE ANALYSES

Matrix	*QC Compounds*	*Surrogate Accuracy (% Rec.)* [1]	*Blind Field Duplicate Precision (% RPD)*	*Method Blanks*	*MS/MSD Accuracy (% Rec.)* [1]	*MS/MSD Precision (% RPD)* [1]	*Blank Spike Accuracy (% Rec.)* [1]
Aqueous	all compounds		< 50	≤ 5 x RL			
	Acetone			for	38-161	40	38-161
	Benzene			methylene	81-120	40	81-120
	Bromodichloromethane			chloride,	90-114	40	90-114
	Bromoform			acetone,	77-130	40	77-130
	Bromomethane			2-butanone,	73-122	40	73-122
	2-Butanone			toluene	64-139	40	64-139
	Carbon disulfide				53-137	40	53-137
	Carbon tetrachloride			≤ RL	79-125	40	79-125
	Chlorobenzene			for	82-118	40	82-118
	Chloroethane			other	72-118	40	72-118
	Chloroform			compounds	89-118	40	89-118
	Chloromethane				60-118	40	60-118
	Dibromochloromethane				80-124	40	80-124
	1,1-Dichloroethane				83-116	40	83-116
	1,2-Dichloroethane				83-123	40	83-123
	1,1-Dichloroethene				67-121	40	67-121
	cis-1,2-Dichloroethene				83-120	40	83-120
	trans-1,2-Dichloroethene				71-124	40	71-124
	1,2-Dichloropropane				81-116	40	81-116
	cis-1,3-Dichloropropene				78-119	40	78-119
	trans-1,3-Dichloropropene				85-118	40	85-118
	Ethylbenzene				80-122	40	80-122
	2-Hexanone				53-145	40	53-145
	4-Methyl-2-pentanone				57-138	40	57-138
	Methylene chloride				59-132	40	59-132
	Styrene				77-128	40	77-128
	1,1,2,2-Tetrachloroethane				76-125	40	76-125
	Tetrachloroethene				73-121	40	73-121
	Toluene				81-121	40	81-121
	1,1,1-Trichloroethane				81-122	40	81-122
	1,1,2-Trichloroethane				44-159	40	44-159
	Trichloroethene				77-121	40	77-121
	Vinyl chloride				65-113	40	65-113
	Xylene (total)				81-121	40	81-121
	Dibromofluoromethane	78-117					
	1,2-Dichloroethane-d4	62-124					
	Toluene-d8	81-116					
	4-Bromofluorobenzene	74-126					

Notes:

1. In-house QC limits established by Mitkem. Subject to change. QC=Quality Control, % Rec.=Percent Recovery, RPD=Relative Percent Difference, MS=Matrix Spike, MSD=Matrix Spike Duplicate, RL=Reporting Limit

TABLE 4-11
AQUEOUS
ANALYTICAL LABORATORY DATA QUALITY OBJECTIVES (DQOs)
FOR PRECISION AND ACCURACY
SEMIVOLATILE ANALYSES

Matrix	*QC Compounds* [1]	*Surrogate Accuracy (% Rec.)* [1]	*Blind Field Duplicate Precision (% RPD)* [1]	*Method Blanks* [1]	*MS/MSD Accuracy (% Rec.)* [1]	*MS/MSD Precision (% RPD)*	*Lab Check Sample Accuracy (% Rec.)* [1]
Aqueous	all compounds		< 50	≤ RL			
	Acenaphthene				50-121	40	50-121
	Acenaphthylene				50-119	40	50-119
	Anthracene				52-127	40	52-127
	Benzo(a)anthracene				56-124	40	56-124
	Benzo(a)pyrene				61-121	40	61-121
	Benzo(b)fluoranthene				58-126	40	58-126
	Benzo(g,h,i)perylene				57-124	40	57-124
	Benzo(k)fluoranthene				60-124	40	60-124
	Chrysene				53-123	40	53-123
	Dibenzo(a,h)anthracene				60-122	40	60-122
	Fluoranthene				53-130	40	53-130
	Fluorene				52-125	40	52-125
	Indeno(1,2,3-cd)pyrene				23-152	40	23-152
	Naphthalene				38-117	40	38-117
	Phenanthrene				52-128	40	52-128
	Pyrene				53-131	40	53-131
	2-fluorobiphenyl	38-121					
	2-fluorophenol	48-106					
	terphenyl-d14	0-147					

Notes : In-house QC limits established by Mitkem. Subject to change. QC=Quality Control, % Rec.=Percent Recovery, RPD=Relative Percent Difference, MS=Matrix Spike, MSD=Matrix Spike Duplicate, RL=Reporting Limit

TABLE 5-1
SUMMARY OF CHEMICAL HAZARDS FOR CHEMICALS OF CONCERN
STEWART EFI SITE, YONKERS, NEW YORK

Chemical	**Published Exposure Limit [1] (8-hour TWA [2])**	**Routes of Exposure**	**Target Organs**	**Signs/Symptoms of Exposure (Acute versus Chronic Effects)**	**First Aid &Emergency Response**
Chemical Name: **Trichloroethene** CAS: 79-01-6 Vapor Pressure: 58 mmHg Ionization Potential: 9.45 eV	100 ppm (OSHA PEL)	Inhalation Skin absorption Ingestion Skin or eye contact	Eyes, skin, respiratory system, heart, liver, kidneys, and central nervous system.	Acute: Irritation eyes, skin, nose, throat, headache, visual disturbance, weakness, exhaustion, nausea, dizziness, vomiting Chronic: Cancer, liver damage	Flush skin/eyes with water Administer artificial respiration if no breathing If ingested seek medical attention
Chemical Name: **Methylene Chloride** CAS: 75-09-2 Vapor Pressure: 350 mmHg Ionization Potential: 11.32 eV	25 ppm (OSHA PEL)	Inhalation Skin absorption Ingestion Skin and/or eye contact	Eyes, skin, cardiovascular system and central nervous system.	Acute: Irritation eyes, skin, lassitude (weakness, exhaustion), drowsiness, dizziness, nausea, numbness, tingle limbs Chronic: Potential carcinogen	Eye: Irrigate Immediately Skin: Soap wash promptly Breathing: Respiratory support if no breathing Swallow: Medical attention immediately
Chemical Name: **1,1,1-trichlorethane** CAS: 71-55-6 Vapor Pressure: 100 mmHg Ionization Potential: 11.00 eV	350 ppm (OSHA PEL)	Inhalation Ingestion Skin and/or eye contact	Eyes, skin, cardiovascular system and central nervous system, liver	Acute: Irritation eyes, skin, headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium, dermatitis, cardiac arrhythmias Chronic: Liver damage	Eye: Irrigate Immediately Skin: Soap wash promptly Breathing: Respiratory support if no breathing Swallow: Medical attention immediately

TABLE 5-1
SUMMARY OF CHEMICAL HAZARDS FOR CHEMICALS OF CONCERN
STEWART EFI SITE, YONKERS, NEW YORK

Chemical	Published Exposure Limit [1] (8-hour TWA [2])	Routes of Exposure	Target Organs	Signs/Symptoms of Exposure (Acute versus Chronic Effects)	First Aid &Emergency Response
Chemical Name: **Tetrachloroethylene** CAS: 127-18-4 Vapor Pressure: 14 mmHg Ionization Potential: 9.32 eV	100 ppm (OSHA PEL)	Inhalation Skin absorption Ingestion Skin and/or eye contact	Eyes, skin, respiratory system, heart, liver, kidneys, and central nervous system.	Acute: Irritation eyes, skin, nose, throat, respiratory system, flush face and neck, incoordination, headache, drowsiness, skin redness, nausea and dizziness, Chronic: Cancer, liver damage	Eye: Irrigate Immediately Skin: Soap wash promptly Breathing: Respiratory support if no breathing Swallow: Medical attention immediately
Chemical Name: **Toluene** CAS: 108-88-3 Vapor Pressure: 21 mmHg Ionization Potential: 8.82 eV	200 ppm (OSHA PEL)	Inhalation Skin absorption Ingestion Skin and/or eye contact	Eyes, skin, respiratory system, liver, kidneys and central nervous system.	Acute: Irritation eyes, nose, lassitude, confusion, euphoria, insomnia, parasthesia, dermatitis, dizziness, headache, dilated pupils, lacrimation, anxiety and muscle fatigue Chronic: Liver, kidney damage	Eye: Irrigate Immediately Skin: Soap wash promptly Breathing: Respiratory support if no breathing Swallow: Medical attention immediately
Chemical Name: **Poly-aromatic hydrocarbons** CAS: various Vapor Pressure: NA Ionization Potential: NA	None - Carcinogen	Inhalation Skin absorption Ingestion Skin or eye contact	Eyes, Skin, Respiratory System, Liver, Kidneys, And Central Nervous System.	Acute: Irritation eyes, skin, nose, throat, dizziness, headache, nausea, breathing difficulty, liver, kidney disturbance,	Flush skin/eyes with water Administer artificial respiration if no breathing If ingested seek medical attention

TABLE 5-1
SUMMARY OF CHEMICAL HAZARDS FOR CHEMICALS OF CONCERN
STEWART EFI SITE, YONKERS, NEW YORK

Chemical	Published Exposure Limit [1] (8-hour TWA [2])	Routes of Exposure	Target Organs	Signs/Symptoms of Exposure (Acute versus Chronic Effects)	First Aid &Emergency Response
Chemical Name: **Various metals** CAS: various Vapor Pressure: NA Ionization Potential: NA	None - Carcinogen	Inhalation Skin absorption Ingestion Skin or eye contact	Eyes, Skin, Respiratory System, Liver, Kidneys, And Central Nervous System.	Acute: Irritation eyes, skin, nose, throat, dizziness, headache, nausea, breathing difficulty, liver, kidney disturbance,	Flush skin/eyes with water Administer artificial respiration if no breathing If ingested seek medical attention

NOTES:

1. The most conservative published occupational exposure limit is listed. Sources for occupational exposure limits were OSHA and ACGIH.
2. TWA = time weighted average.
3. PPM = parts contaminant per million parts air

Sources of information include published exposure limits in 29 CFR 1910.1000 or the 2002 TLV Booklet published by ACGIH, NIOSH pocket guide, Chemical/Physical Properties from Texas Risk Reduction Program, International Chemical Safety Cards, MSDSs, and the HNU listing of Photoionization Characteristics of Selected Compounds.

TABLE 5-2
SUMMARY OF CHEMICAL HAZARDS FOR CHEMICALS ROUTINELY USED BY ERM
STEWART EFI SITE, YONKERS, NEW YORK

Chemical	**Exposure Limit (1) (8-hr TWA (2))**	**Routes of Exposure**	**Target Organs**	**Signs/Symptoms of Exposure (Acute versus Chronic Effects)**	**First Aid & Emergency Response**
Chemical Name: **Portland Cement** Vapor Pressure: N/A, solid Ionization Potential: N/A, solid	10 mg/m^3 (ACGIH TLV)	Inhalation Skin contact Ingestion	Eyes, skin, respiratory system	Acute Irritation of eyes, skin and respiratory system; skin burns Chronic Contains trace amounts of crystalline silica which cause silicosis and may be carcinogenic	Flush eyes/skin with water Administer artificial respiration if not breathing Seek medical attention immediately if ingested
Chemical Name: **Bentonite** Vapor Pressure: N/A, solid Ionization Potential: N/A, solid	0.05 mg/m^3 (ACGIH TLV for crystalline silica)	Inhalation Skin contact Ingestion	Eyes, skin, respiratory system	Acute Irritation of eyes, skin and respiratory system Chronic Contains trace amounts of crystalline silica which may cause silicosis; potential carcinogenic	Flush eyes/skin with water Administer artificial respiration if not breathing Seek medical attention immediately if ingested
Chemical Name: **Silica sand** Vapor Pressure: N/A, solid Ionization Potential: N/A, solid	0.05 mg/m^3 (ACGIH TLV)	Inhalation Skin contact Ingestion	Eyes, respiratory system	Acute Irritation of eyes; coughing Chronic Silicosis; lung carcinogen	Flush eyes with water Move to fresh air Seek medical attention

TABLE 5-2
SUMMARY OF CHEMICAL HAZARDS FOR CHEMICALS ROUTINELY USED BY ERM
STEWART EFI SITE, YONKERS, NEW YORK

Chemical	**Exposure Limit (1) (8-hr TWA (2))**	**Routes of Exposure**	**Target Organs**	**Signs/Symptoms of Exposure (Acute versus Chronic Effects)**	**First Aid & Emergency Response**
Chemical Name: **Isobutylene Balance Air** CAS: N/A, mixture Vapor Pressure: N/A, gas at ambient conditions Ionization Potential: N/A, mixture	None established	Inhalation	Respiratory system	Acute: Simple asphyxiant, difficulty breathing, cyanosis, rapid pulse, impairment of senses, mental disturbances, and convulsions Chronic: None known	Move to fresh air, administer artificial respiration if not breathing See medical attention

NOTES:
1. The most conservative published occupational exposure limit is listed. Sources for occupational exposure limits were OSHA and ACGIH.
2. TWA = time weighted average
3. mg/m^3 = milligrams of contaminant per cubic meter of air
4. ACGIH TLV = American Conference of Governmental Industrial Hygienists Threshold Limit Value
5. ppm = parts of contaminant per million parts of air
6. OSHA PEL = Occupational Safety and Health Administration Permissible Exposure Limit

Sources of information include published exposure limits in 29 CFR 1910.1000 or the 2002 TLV Booklet published by ACGIH, NIOSH pocket guide, Chemical/Physical Properties from Texas Risk Reduction Program, International Chemical Safety Cards, MSDSs, and the HNU listing of Photoionization Characteristics of Selected Compounds.

TABLE 5-3
ACTION LEVELS
STEWART EFI SITE, YONKERS, NEW YORK

Contaminant	*Action Level (units)**	*Monitoring Instrument*
Organics	25 (ppmv)	Photovac PID with 11.6 eV lamp or, MiniRae 2000 with 11.6 eV lamp or, Flame ionization detector
Dust	5.0 (mg/m^3)	MIE DR 1000 Personal DataRAM Aerosol Monitor

* For upgrading from Level D to Level C personal protective equipment (PPE)

TABLE 5-4
SITE-SPECIFIC AND TASK-SPECIFIC HAZARDS AND CONTROL STRATEGIES
STEWART EFI SITE, YONKERS, NEW YORK

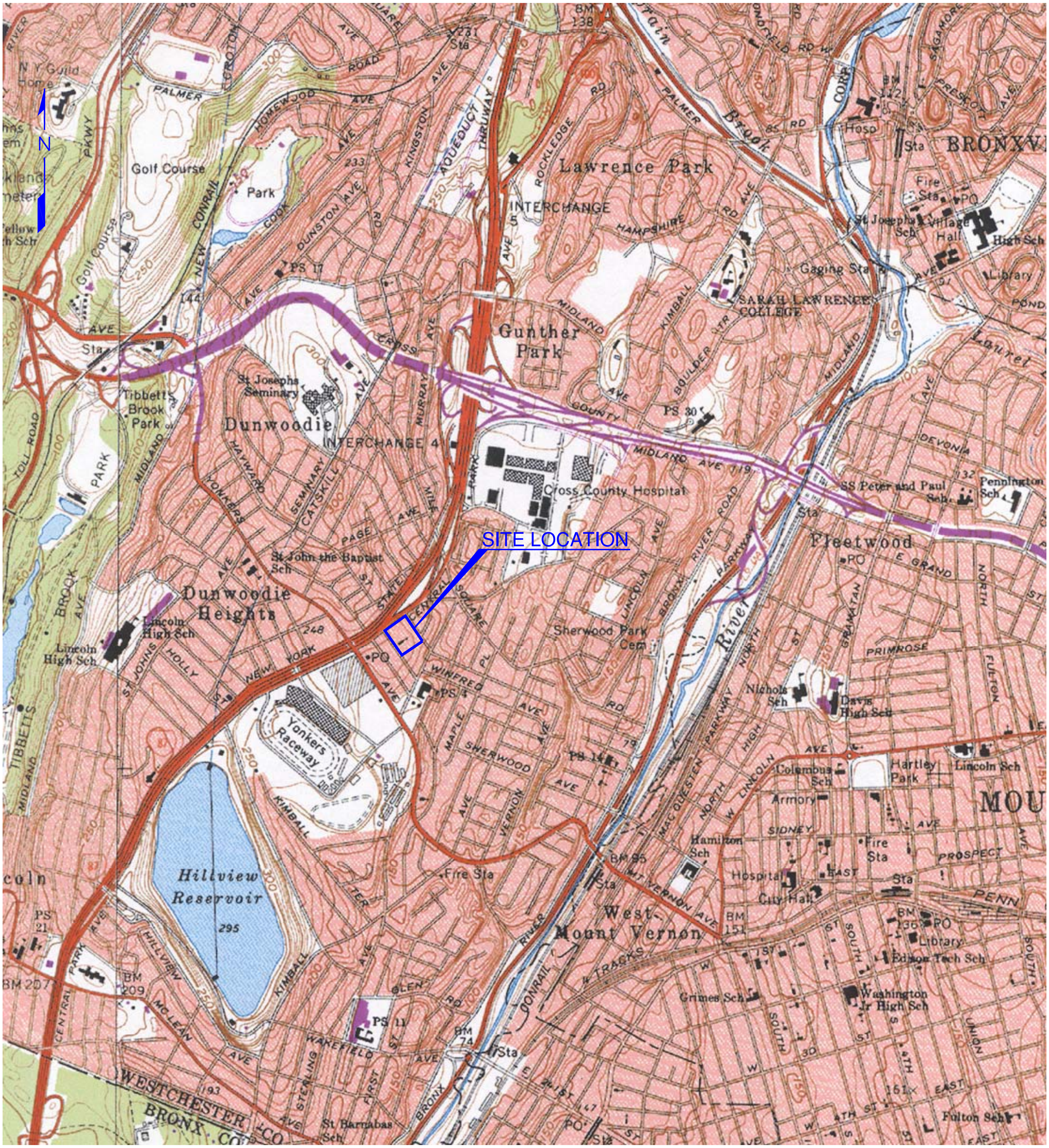
Task/Activity	*Hazards*	*Control Strategy*
All activities at site Level D PPE	Poisonous plants	• Identify suspect plants • Vegetation control at or below ankle height by having client mow/weed-eat path and work area • Appropriate protective clothing disposable Tyvek™ coveralls, thin nitrile gloves, disposal boots, tape at wrists and ankles • Barrier cream for uncovered skin • Wash exposed body parts and equipment thoroughly after work in highly-vegetated areas
	Non-stinging insects	• Insect repellant
	Stinging insects	• Survey work area for presence of nests • Eliminate nests • If drilling, cease work following first indication of thunder/lightning
	Thunder/Lightning	• Shelter in buildings or vehicles not underneath trees or near drilling equipment • Begin work after 15 minutes has elapsed from last thunder/lightning
Drilling	Heavy equipment movement	• Personnel maintain eye contact with operators when near the rig.
	Dropped equipment, slip, trip or fall.	• Hard hats, steel-toe safety shoes and safety glasses worn during equipment operation.
	Noise	• Hearing protectors with proper noise reduction rating.
Completion and development of groundwater well	Splashing of chemical in groundwater	• Safety glasses; chemical-resistant suits (as determined necessary by SSO)

TABLE 5-5
PERSONAL PROTECTION EQUIPMENT REQUIREMENTS
STEWART EFI SITE, YONKERS, NEW YORK

PPE Level	Ensemble Components	Anticipated Use
Level D Should be worn only as a work uniform and not in any area with respiratory or skin hazards. It provides minimal protection against chemical hazards.	• Long pants and shirt with sleeves • Steel-toed footwear • Safety glasses with molded side shields or goggles. • Hard hat if potential for head injury or falling debris is possible/or client requirement • General purpose work gloves if task does not involve water or wet materials • Hearing protection • High visibility traffic vest when in traffic areas	All activities unless otherwise directed by the SSO, PM, and Project Manager and Project Health and Safety Coordinator .
Modified Level D	Level D and the following: • Disposal Tyvek coveralls • Steel-toed rubber boots or disposal boot covers over shoes • Thin nitrile gloves • Green nitrile gloves over thin nitrile gloves when primary gloves may tear or puncture	Any of the above-referenced tasks in which there is moderate potential for skin contact
Level C Should be worn when the criteria for using air-purifying respirators are met, and a lesser level of skin protection is needed.	Level D or Modified Level D and the following: • Half-face air purifying respirator with combination organic vapor/high efficiency particular air (HEPA) cartridges	Any of the above-referenced tasks in which there is moderate potential for skin contact with constituents and data indicating need for respiratory protection. No upgrade to Level C without approval from Project Manager and Project Health and Safety Coordinator
Level B Should be worn when the highest level of respiratory protection is needed, but a lesser level of skin protection is needed.	Not anticipated to be required	Tasks requiring Level B PPE are not anticipated during this project. If Level B PPE is needed, as determined by the SSO and/or the Project Health and Safety Consultant, the HASP will be revised.
Level A Should be worn when the highest level of respiratory, skin, and eye protection is needed.	Not anticipated to be required	Tasks requiring Level A PPE are not anticipated during this project. If Level A PPE is needed, as determined by the SSO and/or the Project Health and Safety Consultant, the HASP will be revised

TABLE 5-6
EMERGENCY DRILL FREQUENCY
STEWART EFI SITE, YONKERS, NEW YORK

Project Duration	***Drill Frequency***
Less than 30 days	None, cover during review/sign-off of HASP
Greater than one month but less than one year	Once
Greater than one year	Annually



0 2000' 4000'

APPROX. GRAPHIC SCALE

SOURCE: U.S.G.S. QUADRANGLE MAPS, MT. VERNON, N.Y. 1966

TITLE				
SITE LOCATION MAP STEWART STAMPING FACILITY YONKERS, NY				
PREPARED FOR: STEWART EFI				
ERM Environmental Resources Management			SCALE: GRAPHIC	FIGURE: 1-1
DRAWN: Y.S./EMF	JOB NO.: 0022375	FILE NAME: 0022375-00-001	DATE: 11/21/05	

0 60' 120'

GRAPHIC SCALE

TITLE

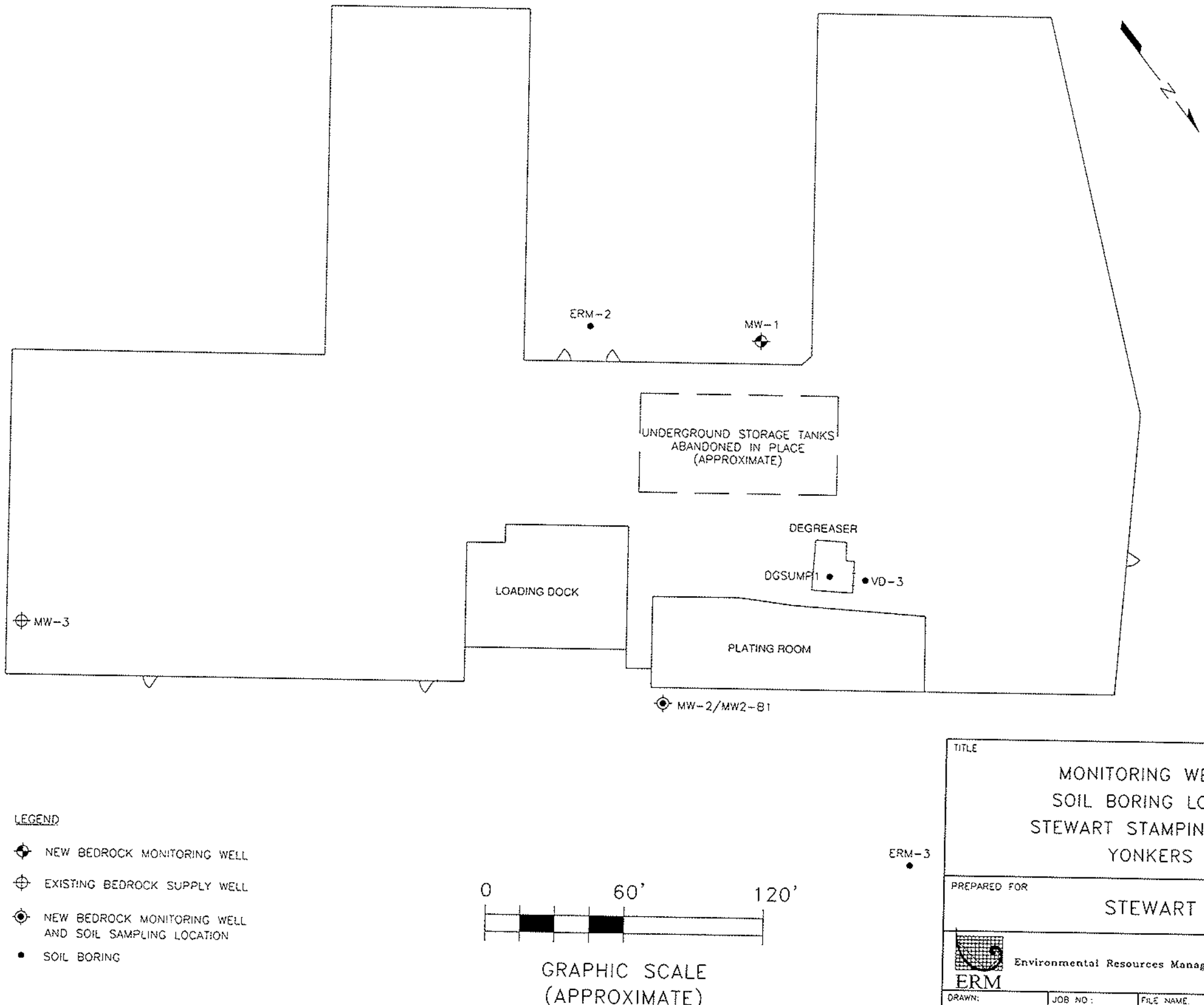
SITE PLAN (FIRST FLOOR)
STEWART STAMPING FACILITY
YONKERS, NY

PREPARED FOR

STEWART EFI

ERM Environmental Resources Management

DRAWN:	JOB NO.:	FILE NAME:	SCALE / DATE	FIGURE
Y.S./EMF	0022375	0022375-00-002	GRAPHIC / 11/21/05	1–2



TITLE

MONITORING WELL AND
SOIL BORING LOCATIONS
STEWART STAMPING FACILITY
YONKERS NY

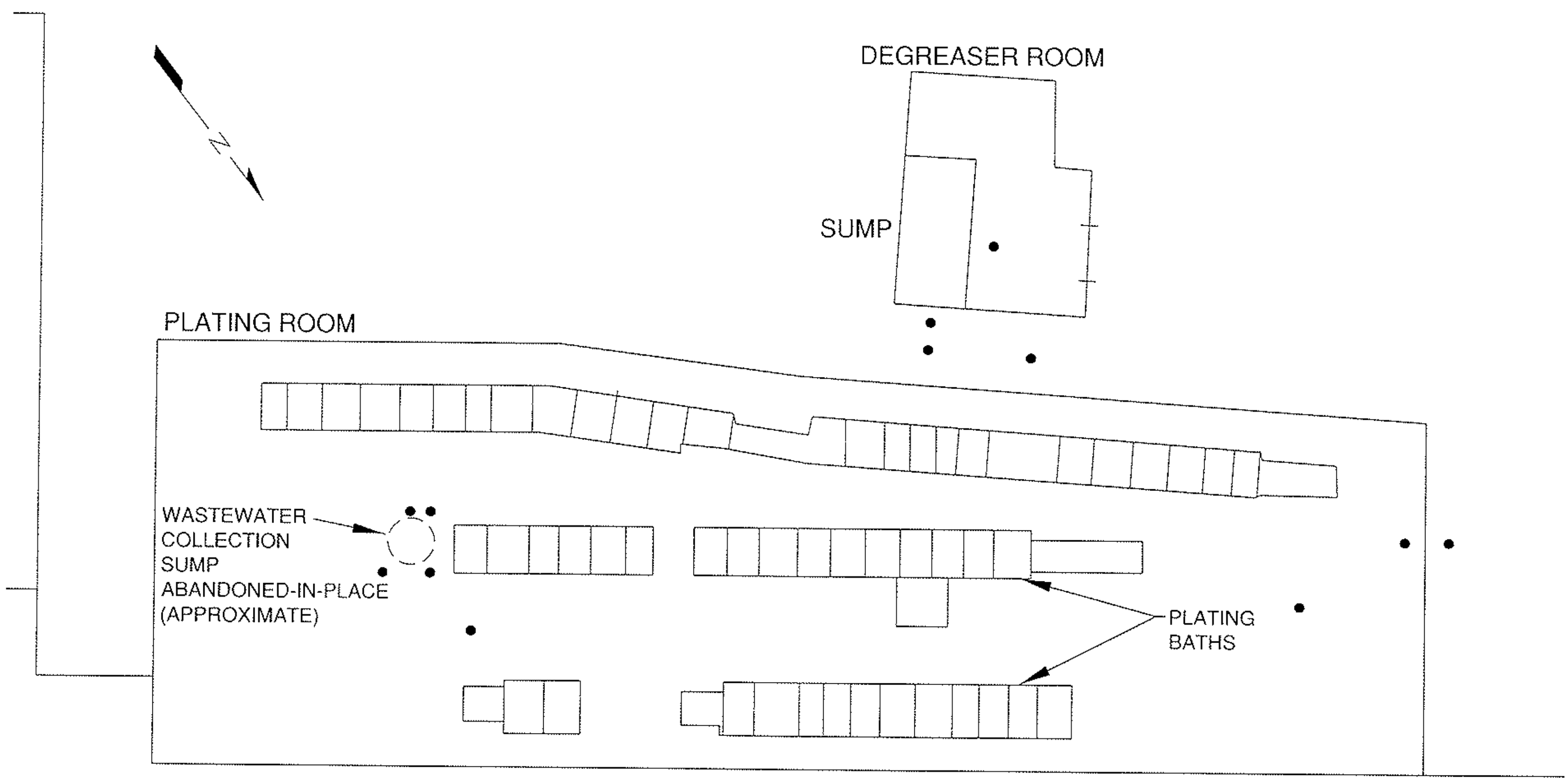
PREPARED FOR

STEWART EFI

ERM Environmental Resources Management

SCALE	FIGURE
NONE	1-3
DATE	
11/21/05	

DRAWN:	JOB NO:	FILE NAME:
Y.S./E.M.F.	0022375	0022375-00-003



LEGEND

● SOIL BORING ATTEMPTED, REFUSAL ENCOUNTERED ON SUB-FLOOR AT 2-4 FEET BELOW GRADE

0 15' 30'

GRAPHIC SCALE
(APPROXIMATE)

TITLE

UNSUCCESSFUL BORING LOCATIONS
STEWART STAMPING FACILITY
YONKERS NY

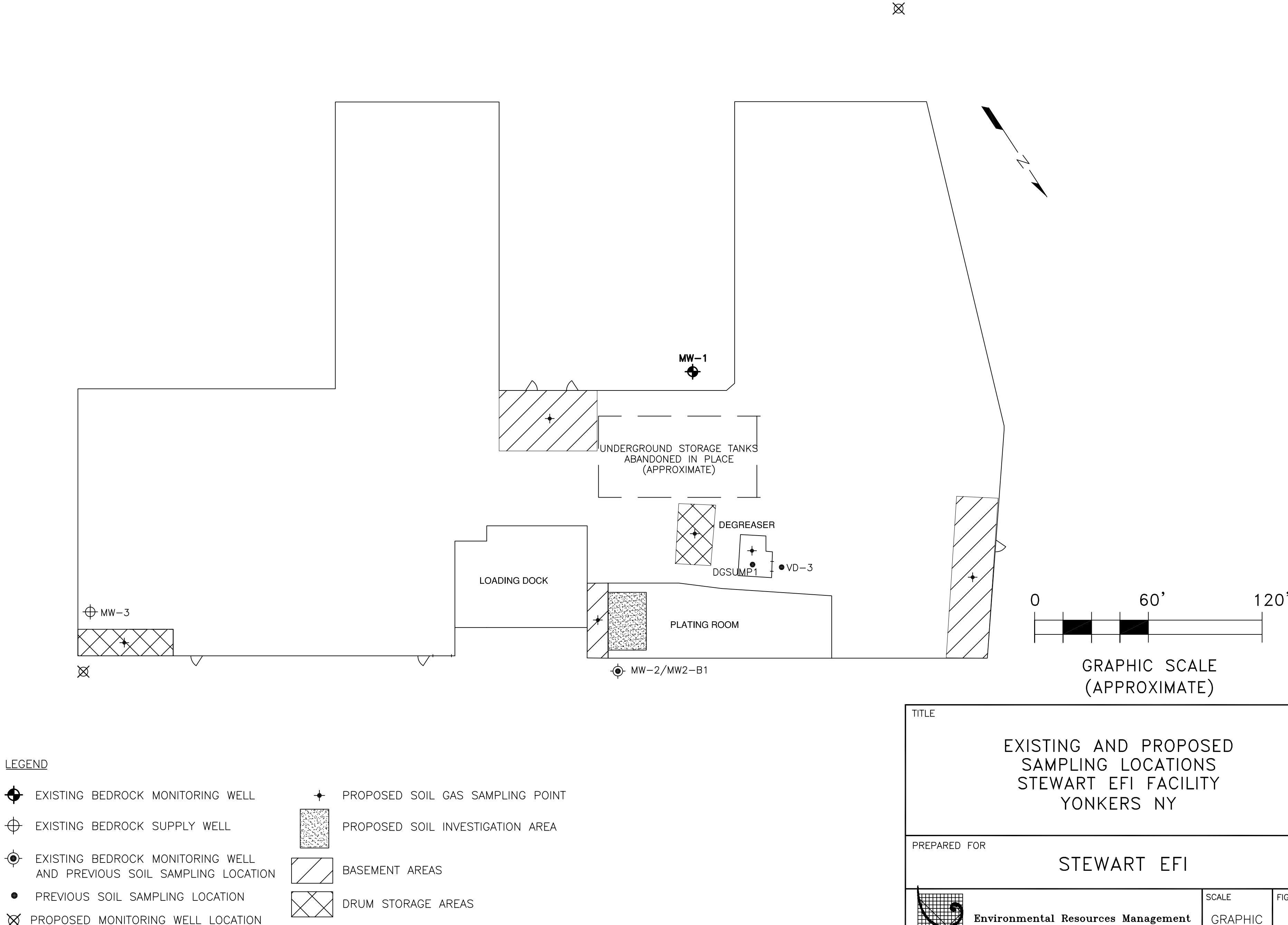
PREPARED FOR

STEWART EFI

ERM Environmental Resources Management

SCALE	FIGURE
GRAPHIC	2-1

DRAWN:	JOB NO:	FILE NAME:	DATE
Y.S./E.M.F.	0022375	0022375-00-004	11/21/05



TITLE

EXISTING AND PROPOSED
SAMPLING LOCATIONS
STEWART EFI FACILITY
YONKERS NY

PREPARED FOR

STEWART EFI

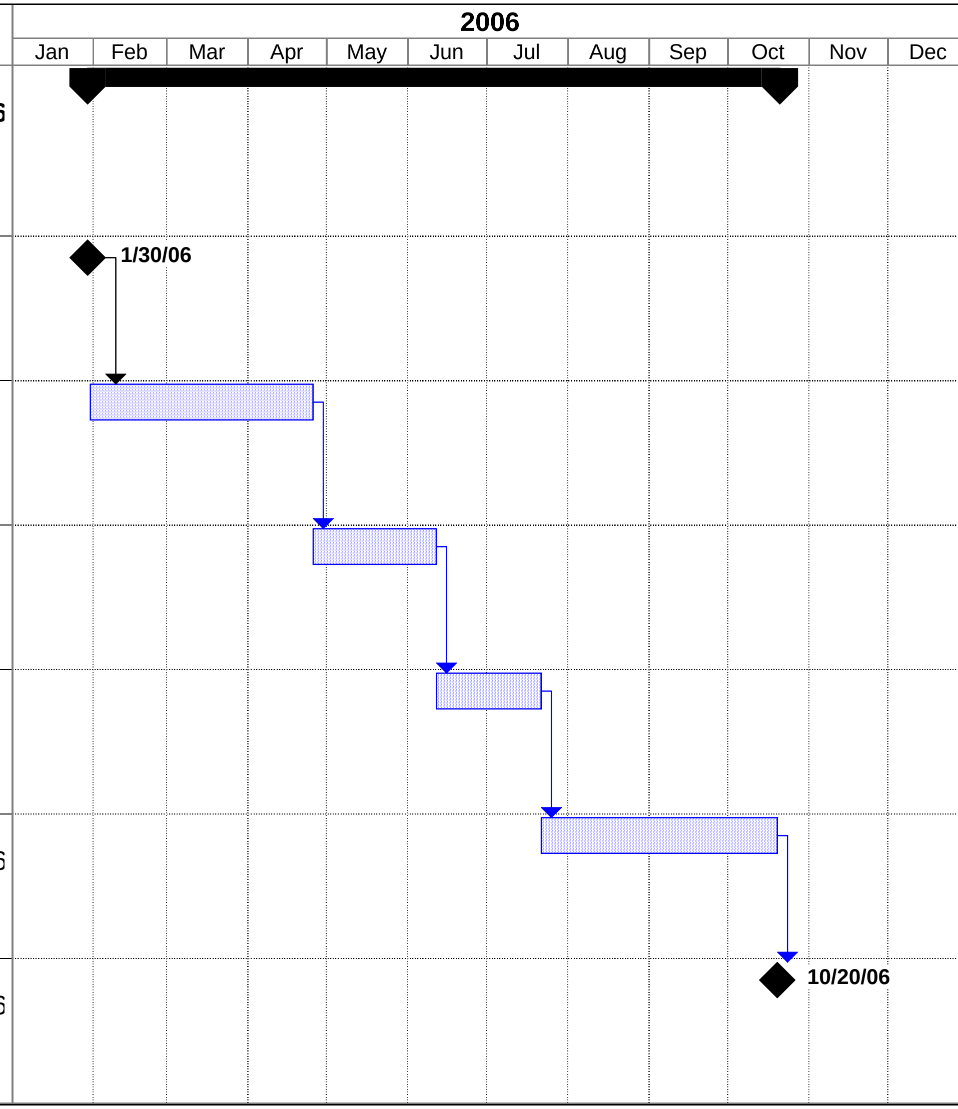
ERM Environmental Resources Management

SCALE	FIGURE
GRAPHIC	2-2

DRAWN:	JOB NO.:	FILE NAME:	DATE
Y.S./EMF	0022375	0022375-00-005	11/28/05

Figure 3-1
Project Schedule
Stewart EFI Facility, Yonkers, New York

ID	Task Name	Duration	Start	Finish
1	**Voluntary Investigation Implementation**	**264 days**	**Mon 1/30/06**	**Fri 10/20/06**
2	Submission of Voluntary Investigation Work Plan to NYSDEC	1 day	Mon 1/30/06	Mon 1/30/06
3	NYSDEC Review/Approval of Investigation Work Plan	85 days	Tue 1/31/06	Tue 4/25/06
4	Implement Field Sampling	47 days	Wed 4/26/06	Sun 6/11/06
5	Laboratory Turnaround	40 days	Mon 6/12/06	Fri 7/21/06
6	Preparation of Voluntary Investigation Report	90 days	Sat 7/22/06	Thu 10/19/06
7	Submission of Voluntary Investigation Report To NYSDEC	1 day	Fri 10/20/06	Fri 10/20/06



Date: Thu 1/12/06 | Summary | Task | Milestone

Prepared By: Environmental Resources Management
520 Broad Hollow Road, Suite 210, Melville, NY

APPENDIX A

Phase I ESA Report (September 2002)

DRAFT

Insilco Corporation

Phase I Environmental Site Assessment and Limited Compliance Review
Stewart Stamping Corporation Yonkers, New York

September 2002

M1512.01.01

Michael B. Teetsel, C.P.G.
Principal-in-Charge

Matt Gallo, CPEA
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DRAFT

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EXECUTIVE SUMMARY

Environmental Resources Management - Northeast (ERM) completed a Phase I Environmental Assessment of the Stewart Stamping Corporation facility (the facility, or Subject Property) located at 630 Central Park Avenue in Yonkers, New York.

The facility manufactures metal parts for the automotive and electronics components industries in several high speed stamping processes. There are also finishing processes including plating, polishing, and heat treatment performed at the facility. The facility is a source of regulated air emissions, wastewater discharges, and hazardous waste. Principal raw materials in use at the facility consist of coiled steel, steel alloy, and copper; plating chemistry; lubricant; and hydraulic oil.

The facility consists of approximately 350,000-square feet of building space on an approximately 4-acre property. An estimated 70 percent of the building houses manufacturing operations, with the remainder used for warehousing and offices. Stewart Stamping has operated at the Central Park Avenue location since approximately 1942. The facility was reportedly constructed in approximately 1930 as a warehouse for the Wannamaker Department Stores on previously undeveloped land.

ERM identified Recognized Environmental Conditions (RECs) at the facility, which are summarized below and are discussed in greater detail in the body of the report.

RECOGNIZED ENVIRONMENTAL CONDITIONS

Plating Chemical Spillage and Historic Operations

The plating room at the facility has been reportedly used for metal parts finishing throughout most of the facility's operational history. ERM noted areas of plating chemical spillage within concrete berms under the plating lines and in concrete sluices and sumps used to convey these chemicals to the on-site wastewater pretreatment facility. Several of these containment areas appear to have been recently lined with chemical-resistant synthetic liners, and other areas do not have such liners. The plating room floor was recently refinished, and a former wastewater collection sump was filled and covered in the process. The condition of this sump at the time of closure is unknown. Historic operations in this area present a concern for releases of plating chemistry to the environment.

Historic Chlorinated Organic Solvent Degreasing/Solvent Use

Substantial quantities (approximately 30 tons annually) of methylene chloride and trichloroethylene are used for parts cleaning at the facility. Certain metal product lines are finished in two (2) vapor degreasers at the facility. The older vapor degreaser, in operation for at least 20 years, is set in a concrete sump. The condition of this sump beneath the degreaser is unknown as it reportedly has never been inspected. Historic operations in this area present a concern for releases of solvents to the environment. Little is known regarding historic degreasing operations or practices at the facility.

Former Underground Storage Tanks

Six (6) underground tank systems were closed in place at the facility in 1996. Two (2) of these underground storage tanks (USTs) contained water storage (8,000 gallons each). The remaining four (4) USTs contained No. 4 fuel oil (two 3,000 gallon USTs, and two 5,000 gallon USTs). These tanks were tested and found to be tight. They were then filled with a concrete slurry mix and closed in place. There was no subsurface sampling conducted to verify conditions as part of the UST closure.

1.0 INTRODUCTION AND BACKGROUND

1.1 PURPOSE AND AUDITORS

Environmental Resources Management (ERM) performed a Phase I Environmental Assessment of the Stewart Stamping Corporation located at 630 Central Park Avenue in Yonkers, New York (the facility, or Subject Property). The environmental assessment was performed for Insilco Corporation in anticipation of a financial transaction involving the facility.

The site visit was performed on 28 August 2002 by ERM auditor Matt Gallo, CPEA. ERM was accompanied on the site visit by Mr. Ed Rish, Director of Quality Control. Additional information was provided in brief meetings/interviews with Phil Rejeski, Facility Manager, and Weily Tung, Plating Supervisor.

1.2 SCOPE OF WORK

This environmental assessment was conducted in conformance with ERM's proposal dated 26 August 2002 and in general with the requirements of ASTM Standard E1527-00; *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process.*

The assessment was conducted to evaluate the potential for environmental impacts on the subject property as a result of past or current activities on the property or surrounding properties. ERM's Phase I Environmental Assessment included:

- an on-site inspection of the subject property to evaluate current conditions and identify areas of potential concern;
- a review of property history through interviews and aerial photographs, and historical mapping;
- observation of adjacent properties and the local area to evaluate the potential for adverse environmental impact the subject property;
- contracting of Environmental Data Resources (EDR) to identify sites of concern as required in the regulatory records review section of the ASTM standards for a Phase I Environmental Site Assessment. The information presented in the EDR report was supplemented by

telephone interviews of regulatory personnel and file reviews, as appropriate; and

- a preliminary building asbestos assessment that included visible observations of readily accessible building areas, though no sampling.

Property environmental records or permits, reasonably obtainable at the time of the site visit, were reviewed and discussed in this report, as appropriate.

1.3 *LIMITATIONS*

This report is based upon the application of scientific principles and professional judgment to certain facts with resultant subjective interpretations. Professional judgments expressed herein are based on the facts currently available within the limits of the existing data, scope of work, budget, and schedule. We make no warranties, expressed or implied, including, without limitation, warranties as to merchantability or fitness for a particular purpose. In addition, the information provided in this report is not to be construed as legal advice.

A Phase I assessment, as defined by the ASTM Standard is not intended to be a formal survey for lead-based paint, lead in drinking water, asbestos containing materials (ACM), urea formaldehyde insulation, ozone-depleting chemicals or radon. These areas are beyond the scope of a Phase I as it is defined by ASTM Standard E 1527-2000.

ERM is not engaged in environmental auditing and reporting for the purpose of advertising, sales promotion, or endorsement of any client's interests, including raising investment capital, recommending investment decisions, or other publicity purposes. The client acknowledges that this report has been prepared for the exclusive use of the client and agrees that ERM reports or correspondence will not be used or reproduced in full or in part for such purposes, and may not be used or relied upon in any prospectus, offering circular, or similar document. Client also agrees that none of its advertising, sales promotion, or other publicity matter containing information obtained from this audit and report will mention or imply the name of ERM.

1.4 LIMITING ON-SITE CONDITIONS

Limiting conditions were encountered during the site visit. The old boiler room (currently inactive) was locked and not accessible. This room reportedly contains asbestos-containing material (ACM) and has been sealed off to prevent exposure.

A residential dwelling is present on the north side of the manufacturing facility building. This dwelling was recently acquired by Stewart Stamping Corporation, and is reportedly unoccupied at the time of the assessment. There are reportedly no industrial or commercial activities performed at this location. The interior of the structure was not accessed during the site inspection; however, the grounds surrounding the structure were inspected and no conditions of environmental concern identified.

2.0 SITE SETTING

2.1 LOCATION

The facility is at the southeast corner of Whittier Avenue and Central Park Avenue, adjacent to the east of the Thomas Dewey Thruway in Yonkers, Westchester County, New York. The general location of the property and the physiographic features of the surrounding area are shown on Figure 1, developed from the United States Geological Survey (USGS) 7.5 minute quadrangle for the site.

2.2 NEIGHBORING PROPERTIES

The abutting properties include:

- North: Whittier Avenue and residential properties;
- East: Trechard Street and residential areas;
- South: Kettel Avenue, a car dealership, and residential areas; and
- West: Central Park Avenue and the Thomas Dewey Thruway (I-87).

Based on ERM's observations, the closest residence is immediately adjacent to the east of the site. However, residences are located within one-eighth mile towards the south and north as well. No visual evidence of environmental concerns was observed on other immediately-surrounding properties.

2.3 TOPOGRAPHY AND HYDROLOGY

The topography of the Subject Property gently slopes from a topographic high of approximately 210 feet Mean Sea Level (MSL) in the western portion of the site, to approximately 200 feet MSL in the northeast corner of the site. The site is located about equidistant between the Bronx River and the Saw Mill River, however the terrain slopes southeast toward the Bronx River, therefore this is the likely ground water flow direction.

No suspected wetlands areas were observed on the subject property, which, according to the Environmental Data Resources (EDR) report (Appendix B) is outside the 100-year floodplain.

2.4 *GEOLOGY AND HYDROGEOLOGY*

Site specific geology and hydrogeology information was not available during the audit. ERM was able to obtain soil information from the US Department of Agriculture Soil Survey for Westchester County. The geology of Westchester County is comprised of Precambrian metamorphic bedrock overlain by a thin veneer of Quartenary age alluvial sedimentary deposits. The bedrock is metamorphic and generally of three (3) formations: Manhattan schist; Fordham gneiss; and Inwood marble. Manhattan schist and Fordham gneiss are generally found throughout the County in irregular bands. The Inwood marble occurs as south to north trending bands defining river channels such as the Bronx, Croton, and Saw Mill rivers.

The overlying unconsolidated deposits consist of clays, fine to coarse sands and gravels and tills. The sand and gravel deposits are generally thin and of relatively small areal extent grading vertically and horizontally into fine grained and less permeable deposits. Till, the most widespread unconsolidated deposit, ranges in thickness from a few feet or less on hilltops to more than 100 feet in some of the larger valleys. The material is poorly sorted with grain sizes ranging from clay to boulders.

The two nearby river valleys (Bronx and Saw Mill Rivers) contain some stratified sand and gravel deposits that may be moderately permeable (well yields 10 to 100 gallons per minute). However, the Subject Property is on higher ground between these valleys where there is likely only a thin veneer of glacial till overlying bedrock. The till is generally very low in permeability. Published data indicates that the water table within the till unit in the area of the Subject Property. The ground water flow direction in the underlying fractured rock cannot be predicted based on the available information.

Yonkers is serviced by the New York City public water system. The Catskill Aqueduct is about 2,000 feet east of the site and the Hillview Reservoir is about 3,000 feet southeast (both in the assumed upgradient direction).

It is important to note that groundwater flow direction can be influenced locally and regionally by the presence of local wetland features, surface topography, recharge and discharge areas, horizontal and vertical inconsistencies in the types and location of subsurface soils, and proximity to water pumping wells.

3.0 SITE AND OPERATIONS INFORMATION

3.1 GENERAL SITE DESCRIPTION

The facility consists of approximately 350,000-square feet of manufacturing, warehouse, and office space in a single building on an approximately 4-acre property. The Subject Property is owned by Insilco Corporation. An estimated 70 percent of the building houses manufacturing operations, with the remainder used for warehousing and offices. A description of the site processes and material use is provided in Section 3.3. A site plan is provided as Figure 2.

The main building at the facility houses most manufacturing operations as well as administrative offices. The building was constructed in multiple phases, with the original portion of the structure dating to approximately 1930. Offices are located on the second floor in the western portion of the building, along Central Park Avenue. The building is two stories (with limited basement areas) and is constructed of concrete block and brick with a concrete floor and metal roof.

Manufacturing operations are located on the first and second floors in the original portion of the building to the east of the office area. The second floor contains the Cap End Leads department. There is also a warehouse area, small metallurgical laboratory, and a tool room on the second floor where Cap End Lead machines are built and fitted.

The first floor contains the press rooms where metal parts are "stamped" from metal coils and rods. There are several degreasers for cleaning parts prior to packaging and shipping to customers.

Certain product lines are not degreased, but plated instead. These parts are brought to the Mass Finishing area on the first floor where they are cleaned and plated in various processes (see Section 3.3). Other operations on the first floor include tool rooms for fitting of the presses on the first floor, a compressor room with four (4) natural gas-fired compressors, shipping/receiving, raw materials storage, and maintenance.

There are limited basement areas at the facility. One area contains the former boiler room. This room reportedly contains asbestos-containing materials and has been sealed off to prevent entry and exposure. This area could not be accessed during the site inspection. Another basement area contains three (3) No. 2 fuel oil-fired boilers.

Raw material chemicals are received at the site in 55-gallon drums or smaller containers, and stored on containment pallets in the specific areas that utilize the materials. An exception is plating chemicals, which are stored in the waste treatment area. Hazardous waste is stored in waste treatment (F006 sludge) and in an area near the shipping department (F001).

3.2 UTILITIES

The facility is provided with:

- Water from the New York City Reservoir System;
- Sewer from the Westchester County Department of Environmental Facilities - Yonkers Joint Wastewater Treatment Plant (process, sanitary, and storm water);
- Electricity from Consolidated Edison; and
- Natural gas by Consolidated Edison.

The buildings on the subject property are equipped with a centralized heating, ventilation and air conditioning (HVAC) systems.

3.3 PROCESSES AND MATERIAL USE

3.3.1 Current Operations

The facility's operations consist of: stamping and cutting of metal parts in presses and other machines; cleaning/degreasing of parts; finishing (plating) of certain product lines; and wastewater treatment. Ancillary operations include: warehousing; shipping/receiving; tooling of various presses and other metal fabrication machines; maintenance; and engineering/administration functions. Primary product end use is in the automotive and electronics components (circuit breakers and in circuit board diodes and components). The facility operates under SIC Codes 3471 and 3469.

Cap end leads are the metal leads that protrude from many circuit board diodes and components. The cap ends are stamped from metal coils on presses on the first floor, silver plated in the plating operation (first floor), and fitted onto end leads (cut from a spool of wire) on Cap End Lead machines on the second floor. Chemical usage in these areas consists of lubricants and mineral spirits (Varsol).

Metal parts are "stamped" on large press machines on the first floor. These machines generally use lubricants, both in internal machine hydraulics and on the metal parts in the stamping process. Certain machines also have small reservoirs where stamped parts are "cold" degreased in trichloroethylene. Other parts are degreased in several "portable" Ultronix degreasers (110 gallon capacity) that can be moved to different product lines, as required. Large scale degreasing is conducted in two vapor degreasers: (1)a Pero closed loop vapor degreaser was installed in 1996 and uses trichloroethylene (150 gallon capacity); and (2) an older methylene chloride "open top" vapor degreaser (this unit has been fitted with a lid) has been reportedly used at the site for at least 20 years, and is installed in a concrete sump.

Shavings and cuttings from machining are collected at each machine and accumulated in drums for recycling. The machining operations use a water-soluble coolant/cutting oil that is collected in drums and recycled on-site. The recycling process consists of settling in 55-gallon drums, pumping off the oil through a filter, and storage for reuse in two (2) 500-gallon above ground storage tanks. Solids and unusable oil from this process is disposed of off-site as non-hazardous waste.

Metal parts destined for plating are processed in tumblers using a detergent and abrasive media to remove burs prior to plating. These parts are then brought to the Plating Room for final finishing. There were seven (7) discrete plating lines present during the site inspection. Each line consists of several process tanks ranging in size from 250 gallons to 500 gallons. These lines are listed below, with a brief process description:

1. <u>Barrel Silver Plating</u>: clean/rinse; acid activation; cold water rinse; copper plate; cold water rinse; silver plate; cold water rinse.

2. <u>Barrel Copper - Alkaline Tin Line Plating</u>: cyanide activation; copper plate; cold water rinse; alkaline bath; cold-water rinse.

3. <u>Barrel Copper - Bright Tin Plating</u>: cyanide activation; copper plate; cold water rinse; acid activation; acid tin plate; cold-water rinse.

4. Barrel Solder Plating: acid dip; solder plate; cold-water rinse.

5. Hot Tin Plating: flux solution; hot tin plate; acid dip; cold-water rinse.

6. Barrel Nickel Plating: clean/rinse; acid activation; cold water rinse; nickel plate; cold water rinse (this line has a nickel reclamation stage for rinse water - evaporative).

7. Barrel Zinc Plating: zinc plate; cold water rinse.

Rinse water from these tanks is reportedly discharged to drains underlying the tanks. Plating chemistry is reportedly pumped out into drums and transferred to waste treatment; however, spillage is captured in drains beneath these tanks. These drains (concrete sluices) discharge to sumps, which are pumped to the wastewater treatment plant. The condition of the concrete containment areas and collection sluices/sumps varied at the time of the inspection. Several lines and sumps appeared to be underlain by a composite liner over the concrete. Other lines did not have this composite liner over the concrete. The floor of the plating room was reportedly refinished in approximately 2001, and appeared in relatively good condition during the site inspection. A former wastewater collection sump was reportedly filled in and covered with concrete at this time (reportedly 10 feet deep, 15 feet in diameter). The condition of this sump prior to closure is unknown.

The wastewater treatment plant generally handles three (3) waste streams: oily rinse waters; general rinse waters; and cyanide rinses. The treatment process is conducted in a series of above ground process tanks generally ranging from 300 to 500 gallons in capacity. Treatment chemicals are received and stored in 55-gallon drums; although certain solutions (sodium hypochlorite, caustic soda) are diluted with water and stored in tanks in this area. The waste treatment area is contained by floor drains that discharge back to headworks.

The oily wastewater is treated with a flocculent that breaks the oil encapsulation of metallic wastes. This wastewater is then combined with the general metallic rinse waters. The cyanide wastewater is treated with sodium hypochlorite and caustic soda solutions to destroy cyanides. These general metallic and cyanide waste streams are then combined and proceed through the following treatment steps:

- pH is raised by caustic soda addition to precipitate metal hydroxides;

- the wastewater is treated again with a flocculent and a polymer agent to remove more metals from solution;
- precipitates are settled out in a clarifier tank;
- the wastewater passes through a cationic exchange system to remove more metal ions; and
- effluent is discharged to the sewer after final pH adjustment.

Metal hydroxide sludge is removed from the clarifier, dewatered in a filter press, placed in bags and disposed as hazardous waste (F006).

Information regarding production and chemical usage was obtained from the 2001 Toxic Release Inventory Report (TRI Form R) completed for the facility. The facility "Otherwise Used" approximately 27 tons of trichloroethylene and 5 tons of methylene chloride in the year 2001.

3.3.2 *Discontinued Operations*

The facility has operated at the current location since approximately 1942 and operations have evolved over time. However, plating and parts cleaning were reportedly associated with the operation since its inception. The facility reportedly historically conducted solder reflow operations utilizing lead-tin solder. It could not be determined when this operation was discontinued.

3.4 *CHEMICAL USE AND STORAGE*

Chemical use at the facility relates primarily to maintenance operations and production support. The vast majority of chemicals are stored in 55-gallon drums or smaller containers.

3.4.1 *Container Storage*

Chemical use at the facility relates primarily to maintenance operations and production support as outlined below:

- Plating chemicals are delivered and stored in 55-gallon drums or smaller containers. These chemicals are stored near their point of use in the plating room or in the wastewater treatment plant. Both of these areas are contained by drains that discharge to wastewater treatment.

- Lubricants used in the machine hydraulics and as cutting oils/coolants are generally stored in the Press Room and End Cap Leads areas on secondary containment pallets. Recycled cutting oils/coolants are also stored in two (2) 500-gallon above ground storage tanks within a concrete secondary containment dike inside the building. There were numerous drums of waste coolant waiting recycling observed in this area.

- Solvents (trichloroethylene and methylene chloride) are stored in various degreasers at the facility, and in 55-gallon drums. These materials were not provided with secondary containment.

- Hazardous waste sludge (F006) is stored in bags within the wastewater treatment plant. These bags are specially designed to contain this type of waste and are commonly used in industry for this purpose. This area is contained by drains that discharge to wastewater treatment. Hazardous waste solvents (F001) are stored in drums near a shipping area adjacent to the maintenance department. There was no waste solvent present in this area during the site inspection.

- Maintenance chemicals (e.g.,) are stored in 55-gallon drums in the maintenance area;

- Fuel oil for the boilers is stored in two (2) 5,000-gallon above ground storage tanks. These tanks are installed within a concrete containment vault.

3.4.2 *Underground Storage Tanks*

According to facility personnel, no USTs are currently in use at the Subject Property. ERM did not observe indicators of USTs such as fill or vent pipes during the site visit. However, six (6) underground tank systems were closed in place at the facility in 1996 according to a a document entitled, *Closure Report - Underground Storage Tank Systems* (Kalogeras and Grosser, February 1996). Two (2) of these underground storage tanks (USTs) contained water storage (8,000 gallons each) for process water collected from two (2) former process groundwater wells at the facility.

The remaining four (4) USTs contained No. 4 fuel oil (two 3,000 gallon USTs, and two 5,000 gallon USTs). These tanks were reportedly tested and found to be tight. They were then filled with a concrete slurry mix and closed in place. There was no subsurface sampling conducted to verify conditions as part of the UST closure. The report was reportedly submitted to the New York State Department of Environmental Conservation (NYSDEC) for review. There was no record on any response from the NYSDEC regarding this report.

3.4.3 *Above Ground Tanks*

The facility maintains two (2) 500-gallon above ground polyethylene storage tanks for storage of recycled cutting oil. These tanks are installed within a secondary containment dike inside the building. There are also two (2) steel above ground No. 4 fuel oil storage tanks installed in 1994 within a secondary containment dike at the facility for building heating purposes. These fuel oil tanks are registered with the Westchester County Department of Health (Registration 3012544). There are polyethylene storage tanks in the wastewater treatment plant ranging in size from 300 gallons to 500 gallons for polymer, flocculent, caustic soda, sulfuric acid, and bleach. These tanks are installed over a concrete floor surrounded by drains that discharge to the treatment system headworks.

There are numerous above ground process tanks at the facility. Polyethylene tanks associated with the seven (7) plating lines at the facility range from 250 gallons to 500 gallons in size, and are installed over concrete secondary containment berms with drains that discharge to the wastewater treatment system. There are approximately 14 process tanks that comprise the wastewater treatment system installed over a concrete floor surrounded by drains that discharge to the treatment system headworks.

3.5 *HAZARDOUS AND NON-HAZARDOUS WASTE MANAGEMENT*

3.5.1 *Hazardous Waste*

The facility is a large quantity generator of hazardous waste (USEPA ID No. NYD085502243). Approximately 100,000 pounds of hazardous waste were generated in 2001. The primary hazardous wastes generated at the facility are metal hydroxide sludge (F006) from treatment of plating wastewater transported off-site for metals recovery, and spent solvents (F001) sent off site for solvents recovery. Approximately 44 tons of F006 sludge, and 6 tons of F001 solvent waste were sent off site in 2001.

F006 sludge is dewatered in a filter press and stored in specially designed bags in the wastewater treatment plant for disposal. The water from dewatering is fed back to the treatment plant headworks. The sludge storage area is contained by floor drains that discharge back to the treatment plant headworks. The sludge is shipped to World Resources Corporation (PAD981038227) in Pottsville, Pennsylvania by St. Joseph Motor Lines (PAD987358587).

Waste solvent is stored in a shipping area near the maintenance department in 55-gallon drums. There was no waste stored there during the site inspection. The waste is shipped to Marisol (NJD002454544) located in Middlesex, New Jersey. Marisol also provides the trucking of this material.

The facility is generally inspected on an annual basis by the Westchester County Department of Health. According to facility personnel, the facility was inspected in approximately June 2002 jointly by the Westchester County Department of Health and United States Environmental Protection Agency (USEPA) and no violations were noted.

3.5.2 *Non-Hazardous Waste*

Non-hazardous solid waste is generated at the subject property. Solid waste and wood are stored inside the loading dock of the building in two (2) roll-off containers. A compactor is used to maximize the amount of solid waste in the container. The solid wastes are removed regularly by Waste Management. Scrap metal is accumulated in a separate roll-off container and removed for recycling by either Lonny Joe, Inc., Pascat, Inc., Glantz Recycling, or Relvan, Inc. depending on price and market conditions. Technique, Inc. recycles silver. Waste lubricants are removed by Elf Lubricants.

3.6 WATER, WASTEWATER AND STORM WATER

3.6.1 Water

The facility is connected to the public water system for potable and process water. According to facility personnel, there are no drinking water wells at facility.

No drinking water supply wells or groundwater monitoring wells were observed on the subject property. However, there were reportedly two (2) former process water wells used at the facility. One of these wells was reportedly taken off-line in approximately 1990, and the second well in approximately 1994. The casings for these wells still exist within the building, but the pumps have reportedly been removed and the casings capped. There was no other information regarding these wells available during this assessment.

3.6.2 Wastewater

The facility generates process wastewater from plating and parts tumbling (cleaning with detergent and abrasive media). The plating room and parts tumbling areas are equipped with floor drains and sluices/sumps that are pumped to the on-site wastewater treatment plant that discharges to the sanitary sewer system after treatment.

The facility maintains a wastewater discharge permit with the Westchester County Department of Environmental Facilities (permit #5449) and is authorized to treated plating wastewater. Wastewater is discharged to the Yonkers Joint Wastewater Treatment Plant and sampling of the discharge is required quarterly by the permit. According to facility personnel, the facility is in substantial compliance with permit conditions contained in the permit.

Facility personnel reported that the property has been connected to the public sewer system for its known history, and that there are no known septic systems on the property. ERM noted no obvious visual evidence of septic systems at the facility.

3.6.3 *Stormwater*

The vast majority of the site is paved or covered by the building footprint. Precipitation that falls on the Subject Property is collected in a number of storm drains or leaves the property as sheet flow and is collected by storm drains located in the surrounding streets. Yonkers is served by a combined sewer system where storm water is treated with sanitary wastewater at the Yonkers Joint Wastewater Treatment Plant. There were no significant materials stored outside exposed to storm water observed during this assessment.

3.7 *AIR EMISSIONS*

The facility is a major source of air pollutants under the Clean Air Act, and holds a Title V Operating Permit (#3-5518-00242/00019) issued by the NYSDEC. The permit is effective 23 October 2000 through 23 October 2005. The facility is a major source for volatile organic compounds and hazardous air pollutants including cyanide, trichloroethylene, and methylene chloride. In addition, the Westchester County Department of Health has issued Certificates to Operate for various emission sources at the facility including the three (3) boilers (3.2 million BTU/Hour each), two (2) vapor degreasers, a heat treat oven, the plating lines and nickel recovery unit.

The facility was reportedly most recently inspected by the Westchester County Department of Health and USEPA in 2002, and no violations were noted.

3.8 *POLYCHLORINATED BIPHENYLS (PCBS)*

ERM inspected the property for types of equipment that have been historically associated with the use of PCBs as a dielectric fluid coolant and stabilizer.

There were no transformers observed on the Subject Property, and facility personnel indicated that there are no transformers owned by the facility. It is likely that Consolidated Edison maintains transformers within vaults in the street in this area.

According to facility personnel, the facility never utilized hydraulic oil containing PCBs in any equipment. The potential for the use of PCBs in grinding and cutting oils during past site operations is low, and facility personnel were unaware of any such use.

Fluorescent lights are present in facility buildings. Based on the age of the buildings, it is possible that some of the light ballasts contain PCBs. Although disposal of fluorescent light ballasts is not regulated, best management practice would suggest that fluorescent light ballasts removed in bulk during remodeling or demolition be disposed of properly at a permitted facility.

3.9 *VISUAL INDICATIONS OF ON-SITE CONTAMINATION*

No visual indications of on-site contamination such as staining or stressed vegetation were observed by ERM in the exterior of the building.

However, flooring within several interior production areas of the building exhibited staining associated with the long industrial history of the property. These areas include:

- Plating room floor and containment areas;
- Wastewater treatment area;
- Press Room floor around the presses;
- Old vapor degreaser pit; and
- Cutting oil/coolant recycling area and secondary containment dike.

3.10 *ASBESTOS-CONTAINING MATERIALS*

A Phase I assessment, as defined by the ASTM Standard is not intended to be a formal survey for asbestos containing materials. These areas are beyond the scope of a Phase I as it is defined by ASTM Standard E 1527-2000. However, information readily available during the site inspection regarding ACM is discussed below.

Asbestos was banned in most friable building materials (sprayed applied surfacing materials and thermal system insulation) in 1978, but the Occupational Safety and Health Administration deems spray applied surfacing materials, thermal system insulation materials, and vinyl flooring materials as "presumed asbestos-containing materials" (PACMs) if they are present in pre-1980 buildings (Title 29 of the Code of Federal Regulations, Parts 1910.1001 and 1926.1101). Historical records indicate that the site building was constructed prior to 1980, and therefore the PACMs may have been used in building construction.

An informal survey (handwritten report) appears to have been conducted in 1988 by DuAll, Inc. This survey identified ACM in the facility bake oven, old boilers, and piping in the compressor room. Asbestos air monitoring in 1995 by Rapid Environmental Management found levels below applicable standards in all areas of the facility except the old boiler room. Subsequent abatements in 1995 by Environcom, Inc. reportedly removed or encapsulated all identified asbestos at the facility, except for the old boiler room in the basement. This room has been sealed off to prevent access and exposure.

A visual inspection of potential asbestos-containing materials in easily accessible areas was conducted. No samples were collected or analyzed. ERM did not observe potential friable or non-friable PACMs on the subject property.

Under OSHA regulations building and/or facility owners are required to identify the presence, location, and quantity of ACMs in structures built prior to 1981 if construction, alteration, repair, maintenance, renovation, or custodial activities are performed. Building and/or facility owners are required to communicate the presence, location, and quantity of PACMs to facility employees or subcontractors and/or building tenants.

3.11 *WETLANDS*

There are no mapped wetlands are present on the subject property. No evidence of wetland areas were noted during the site inspection.

3.12 *LEAD-CONTAINING MATERIALS*

A Phase I assessment, as defined by the ASTM Standard is not intended to be a formal survey for lead-based paint. These areas are beyond the scope of a Phase I as it is defined by ASTM Standard E 1527-2000. However, information regarding the use of lead-containing materials available during the site inspection is discussed below.

Lead-containing materials are limited to some solder used at the facility and lead contained in metal alloys. The TRI Report for 2001 indicated 191 pounds of lead manufactured or processed at the facility during 2001.

There was reportedly a wave solder operation that used lead solder employed at the facility in the past. It is unknown how long this operation was conducted or when it was discontinued.

3.13 RADIOACTIVE SOURCES AND RADON

There were no current or former radioactive sources identified at the facility during this assessment.

A radon gas survey was not conducted during this assessment. However, information supplied by Environmental Data Resources that was obtained from the U.S. Environmental Protection Agency (USEPA), indicates that the Subject Property is located in Zone 3, where the predicted average indoor radon level is typically less than 2 (pCi/L) picocuries per liter. In addition, radon information from the New York Basement Screening Results Database for Yonkers, New York indicates average radon concentrations of 2.1 pCi/L. Radon mitigation measures are recommended by the USEPA when concentrations of radon exceed 4 pCi/L. Site-specific sampling has not been performed to evaluate the concentrations of radon within the building at the Site.

Radon is a colorless, odorless gas that exists naturally in some geologic formations. Radon levels are generally highest in basements and ground-floor rooms in contact with the earth. Building products, especially cinder blocks made from material high in uranium and other alpha-emitting radionuclides, may release radon gas.

4.0 ASSESSMENT OF PAST LAND USE AND OPERATIONS

4.1 GENERAL INFORMATION

Based on interviews with site personnel and a review of historical records, the property was owned by the John Wanamaker Department Store and used as a warehouse from approximately 1930 through 1942. The subject property was vacant land until the building was constructed in 1930. The site was acquired by Stewart Stamping Corporation in approximately 1942 and current operations (or similar) were established. Stewart Stamping Corporation was owned by the Stewart, Lessing, Hornel and Sternfeld families at that time, who operated a facility located in the Bronx, New York from 1936 until the current site was acquired in 1942. Insilco Corporation reportedly acquired Stewart Stamping in 1968.

4.2 PREVIOUS ENVIRONMENTAL REPORTS

Site personnel indicated that no environmental investigation of the subject property have been completed in the past. An exception is the Underground Storage Tank System Closure Report conducted in 1996; however, no soil or groundwater investigation was conducted as part of these activities.

4.3 EVALUATION OF HISTORIC INFORMATION SOURCES

To determine past uses of the subject property and surrounding properties, ERM reviewed historical sources of information as outlined below. Copies of the Sanborn maps and aerial photographs are presented in Appendix B.

According to facility personnel, the site has been continuously operated for manufacturing metal products since 1942. Prior to 1942 the site was used as a warehouse from its development on undeveloped land in 1930. Information from Sanborn Fire Insurance Maps appears to substantiate this history. Maps from 1917 depict the Subject property as undeveloped land. Maps from 1942 depict the Subject Property as a John Wanamaker Department Store. There is a single building visible along Central Park Avenue on the corner of Whittier Avenue on this map, with a parking area extending towards the east of the structure. The area along Central

Park Avenue towards Kettel Street is undeveloped. Residences are present towards the east. Maps from 1950 depict the site as the Stewart Stamping Facility, and show essentially the same building layout as the 1942 maps. There is a store and a gasoline filling station adjacent to the south of the structure towards Kettel Street on these maps. Maps from 1956 depict the same building footprint; however, the store and filling station to the south are no longer present.

Maps from 1962 show that an area of the building towards Kettel Street has been developed as iron storage. Maps from 1971 and 1979 depict the entire area from Kettel Street north to Whittier Avenue as covered by the building footprint. The building extends east to a parking lot at the property boundary along Whittier Avenue. There are residences present east of the facility along Kettel Street. Maps from 1988 depict a parking area east of several residences along Kettel Street. Maps from 1991 depict the facility essentially as it is today, with the building extending east along Whittier Avenue to the property line, and extending east along Kettel Street to surround a single residence.

{INSERT AERIAL DISCUSSION WHEN AVAILABLE}

Other than the presence of a "filling station" at Kettel Street and Central Park Avenue in the 1950 maps, the Sanborn maps reviewed by ERM did not give any indication that underground storage tanks (USTs) or other fuel sources were present at the site.

5.0 DATABASE AND GOVERNMENT RECORDS REVIEW

5.1 ENVIRONMENTAL DATABASE SEARCH

ERM contracted EDR to conduct a database search for agency records. The report, presented in Appendix A, defines and summarizes the ASTM databases reviewed in the EDR report and notes if any sites (including the subject property) were identified in the specified radius.

Sites identified within the study radii were evaluated to determine if they are likely to have adversely impacted the subject property. The criteria used to evaluate the potential for adverse impact to the subject property include:

- distance from the subject property,
- expected depth and direction of ground water and surface water flow,
- expected storm water flow direction, and
- the presence/absence of documented contaminant releases at the identified sites that have not been remedied to the satisfaction of regulators.

The identification of a site as potentially upgradient or downgradient is based on the expected direction of ground water flow to the south-southeast.

5.2.1 *Subject Property*

The facility was identified on the RCRA Large Quantity Generator (LQG), UST, AST and Spills databases. The facility generates RCRA F001 and F006 wastes. RCRA violations were reported based on an inspection in 1988, and the enforcement action listed as "Written Informal".

Information on the UST database states that seven (7) USTs were "closed-removed". There were no dates provided. This is a discrepancy with the 1996 Underground Storage Tank System Closure Report reviewed during the assessment. The database lists an additional 3,000-gallon fuel oil UST as closed at the facility.

A spill to the sanitary sewer system was reported at the Subject Property in August 1996. An area resident reportedly observed a facility employee dump lubricating oil into a storm drain at the facility. No further information was provided.

Information on the AST database indicates that there are two (2) 5,000-gallon fuel oil storage tanks registered at the facility. This is consistent with the observations made at the facility as part of this assessment.

5.2.2 *Surrounding Properties*

No properties were identified within the specified search radii in EDR's search of the National Priorities List (NPL), Comprehensive Environmental Recovery and Compensation Liability Information System (CERCLIS), CERCLIS No Further Remedial Action Planned, and RCRA Transporter, Storage or Disposal Facilities databases. Sites identified in EDR's review of other databases are summarized in Table 1.

Table 1 - Surrounding Area Sites Identified in EDR Report

Database	Radius searched	Sites Found
Inactive Hazardous Waste Disposal Sites (SHWS) State's equivalent to CERCLIS	1 mile	1
Resource Conservation and Recovery Information System (RCRIS) Generators Facilities which are regulated based on current hazardous waste generation management activities.	0.25 mile	5
Underground Storage Tanks (USTs)/Aboveground Storage Tanks (ASTs) List of sites that have notified the Westchester Department of Health of the presence of USTs at their property	0.25 mile	7
NY Spills Spills reported to NYSDEC	0.125 Mile	2
Chemical Bulk Storage Above Ground Tanks Registered Hazardous Substance Storage Tanks	0.125 Mile	3

Database	Radius searched	Sites Found
Leaking Underground Storage Tanks (LUSTs) List of closed or unremediated reported leaking underground storage tanks.	0.250 mile	1

Based on ERMs review of the database findings for vicinity sites, an adverse impact to the subject property from the vicinity sites is not expected with one exception. The noted exception is the Getty Service Station site located at 757 Central Park Avenue, approximately 830 feet north-northeast of the Subject Property. Underground gasoline storage tanks apparently failed a tightness test in 1999, and remediation is currently underway. This site is potentially upgradient, and groundwater impacts (if any) could reasonably affect the Subject Property. No impact is expected from the remainder of the listings in the database because the identified vicinity sites are in expected down- or cross-gradient locations, the sites have been remedied to the satisfaction of regulators, or no releases to the subsurface have been reported.

DRAFT

6.0 *QUALIFICATIONS OF ENVIRONMENTAL PROFESSIONAL CONDUCTING THIS ASSESSMENT*

This assessment was conducted by Matt Gallo, CPEA of ERM's Melville, New York office. Michael B. Teetsel, C.P.G. reviewed the contents of this report. The professional qualifications for these individuals are included in Appendix C.

APPENDIX B

Phase II Site Investigation Report (January 2003)

FINAL

Insilco Corporation

Phase II Site Investigation
Stewart Stamping Corporation
Yonkers, New York

January 2003

M1513.00.01

Environmental Resources Management
520 Broad Hollow Road, Suite 210
Melville, New York 11747
(631) 756-8900
www.erm.com

FINAL

Insilco Corporation

Phase II Site Investigation
Stewart Stamping Corporation Yonkers, New York

January 2003

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Michael B. Teetsel, C.P.G.
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1.0 INTRODUCTION AND BACKGROUND

Environmental Resources Management (ERM) performed a Phase II Site Investigation of the Stewart Stamping Corporation property located at 630 Central Park Avenue in Yonkers, New York (the Site). A site location map is provided as Figure 1-1 and a site plan as Figure 1-2. This work was performed for Insilco Corporation in anticipation of a financial transaction involving the facility.

The scope of the Phase II study was based on ERM's previous Phase I Environmental Assessment (ERM, November 2002). A summary of the Phase I findings is provided below.

1.1 PREVIOUS ENVIRONMENTAL STUDIES

The Phase I Environmental Site Assessment was assessment was conducted in conformance with the requirements of ASTM Standard E1527-00; *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process*. The facility manufactures metal parts for the automotive and electronics components industries in several high speed stamping processes. There are also finishing processes including plating, polishing, and heat treatment performed at the facility. The facility is a source of regulated air emissions, wastewater discharges, and hazardous waste. Principal raw materials in use at the facility consist of coiled steel, steel alloy, and copper; plating chemistry; lubricant; and hydraulic oil.

The facility consists of approximately 350,000-square feet of building space on an approximately 4-acre property. An estimated 70 percent of the building houses manufacturing operations, with the remainder used for warehousing and offices. Stewart Stamping has operated at the Central Park Avenue location since approximately 1942. The facility was reportedly constructed in approximately 1930 as a warehouse for the Wanamaker Department Stores on previously undeveloped land.

ERM identified Recognized Environmental Conditions (RECs) at the facility, which are summarized below.

- <u>Plating Chemical Spillage and Historic Operations</u> - The plating room at the facility has been reportedly used for metal parts finishing throughout most of the facility's operational history. ERM noted areas of plating chemical spillage within concrete berms under the plating lines and in concrete sluices and sumps used to convey these chemicals to the on-site wastewater pretreatment facility. Several of these containment areas appear to have been recently lined with chemical-resistant synthetic liners, and other areas do not have such liners. The plating room floor was recently refinished, and a former wastewater collection sump was filled and covered in the process. The condition of this sump at the time of closure is unknown. Historic operations in this area present a concern for releases of plating chemistry to the environment.

- Historic Chlorinated Organic Solvent Use - Substantial quantities (approximately 30 tons annually) of methylene chloride and trichloroethylene are used for parts cleaning at the facility. Certain metal product lines are finished in two (2) vapor degreasers at the facility. The older vapor degreaser, in operation for at least 20 years, is set in a concrete sump. The condition of this sump beneath the degreaser is unknown as it reportedly has never been inspected. Historic operations in this area present a concern for releases of solvents to the environment. Little is known regarding historic degreasing operations or practices at the facility.

- Former Underground Storage Tanks - Six (6) underground tank systems were closed in place at the facility in 1996. Two (2) of these underground storage tanks (USTs) contained water storage (8,000 gallons each). The remaining four (4) USTs contained No. 4 fuel oil (two 3,000 gallon USTs, and two 5,000 gallon USTs). These tanks were tested and found to be tight. They were then filled with a concrete slurry mix and closed in place. There was no subsurface sampling conducted to verify conditions as part of the UST closure.

1.2 *PHASE II SCOPE OF WORK*

The objective of the Phase II work was to investigate the RECs identified in the Phase I for potential releases to the environment. The initial investigation scope included the installation of shallow overburden monitoring wells to assess site ground water and indoor soil borings to evaluate soil conditions in and around the RECs. However, attempts to install monitoring wells in the overburden revealed that shallow bedrock was present and no saturated soil was present at the site. In addition, efforts to install soil borings beneath the building were unsuccessful due to the ubiquitous presence of a sub-floor that prevented penetration deeper than two to three feet below the building slab. As a result of these conditions, the implemented scope of services was limited to the work elements presented below.

1.2.1 *Ground Water Investigation*

Two new bedrock monitoring wells were installed at the Site using the air rotary drilling method. Two additional wells were attempted using hollow-stem augers, but were not completed due to refusal on the bedrock surface. Each of these drilling locations is shown on Figure 1-3. Both completed wells were constructed with six-inch diameter steel casing set a minimum of five feet into competent bedrock. An open hole extended below the bottom of the casing to intersect water-bearing fractures in the rock. These two new wells were sampled along with one existing bedrock production well at the site. Prior to sampling, the depth to ground water will be measured and each well will be checked for the presence of light, non-aqueous phase liquid (LNAPL) using an optical interface probe. Each well was then sampled using low-flow sampling methodology to limit entrained solids. Other water chemistry parameters (temperature, specific conductance, pH, dissolved oxygen (DO) and oxidation-reduction potential (ORP) were monitored during the purging process. The sample was collected when three consecutive readings were within the following constraints:

- <15 NTU of turbidity;
- ± 0.2 units for pH;
- ± 5% for conductivity;
- ± 10% for DO and ORP; and
- < 1.0 feet of drawdown.

All ground water samples were analyzed for the following constituents:

- Volatile Organic Compounds (VOCs) by Method 624;
- Poly-aromatic Hydrocarbons (PAHs) by Method 625;
- Priority Pollutant Metals by Methods 200.7 and 245.1;
- Total Cyanide by Method 335.2; and
- Free (Weak Acid Dissociable) Cyanide by Method 335.2.

1.2.2 *Soils Investigation*

Three soil borings were installed and sampled as part of the soils investigation (see Figure 1-3 for locations). In addition, 12 other borings were attempted, but were not completed due to refusal on a sub-floor structure. The locations of these failed borings are shown on Figure 1-4.

One of the completed borings was installed through the base of the sump that holds the old vapor degreaser unit. A concrete core hole was drilled through the concrete sump bottom and one soil sample was collected using a hand auger from the soil immediately beneath the concrete. Upon completion, the core hole was repaired.

The other two completed borings were installed using a Geoprobe machine and extended to bedrock or refusal. Continuous Macro-core samples were collected with each being screened for VOCs using a portable photo-ionization detector (PID). Two samples from these borings were selected for laboratory analysis based on the PID screening results and field observations.

All soil sample collected for laboratory analysis were analyzed for the following constituents:

- Volatile Organic Compounds (VOCs) by Method 8260;
- Poly-aromatic Hydrocarbons (PAHs) by Method 8270;
- Priority Pollutant Metals by Methods 6010 and 7471; and
- Total Cyanide by Method 9012.

2.0 INVESTIGATION RESULTS

2.1 SITE HYDROGEOLOGY

Five geologic logs were prepared for each soil boring or monitoring well that extended deeper than two to three feet. These logs are presented in Appendix A. The unconsolidated overburden was found to consist of an unstratified mixture of silt, sand and gravel, typical of the glacial ground moraine (till) deposits that outcrop in the local area. No ground water was encountered in the overburden material. Depth to bedrock was found to vary between eight and twenty feet.

Observations made from the air rotary drill cuttings indicated that the bedrock was dark colored and micaceous. This is typical of the Yonkers Gneiss (Precambrian) that occurs in the vicinity of the site. Published data (Fisher, 1970) describe this unit as a micaceous hornblende gneiss. One significant water bearing fracture was encountered during the drilling of well MW-1 at 34 to 35 feet below grade. In well MW-2, minor fractures that produced little or no water were encountered at 21 and 26 feet below grade.

During the development of well MW-2, depth to water measurements were recorded in MW-1 and the existing production well (MW-3) in an attempt to evaluate if any hydraulic interconnection exists between the three wells. While MW-2 was being pumped, no water level changes were observed in either MW-1 or MW-3. While this suggests a lack of hydraulic interconnection, these results are considered inconclusive due to the short duration of the test (30 minutes) and the low sustainable pumping rate produced by MW-2 (1.25 gpm).

Due to lack of definitive knowledge on the hydraulic interconnection of the water bearing fractures in the shallow bedrock, it was not possible to evaluate the site specific ground water flow direction.

The basic construction data for the three site wells are provided below.

Well	Well Depth	Casing Length	Depth to Bedrock	Static Depth to Water
MW-1	47 ft	26.8 ft	23 ft	21.05 ft
MW-2	43 ft	15 ft	8 ft	20.80 ft
MW-3	>300 ft	Unknown	Unknown	31.28 ft

2.2 *SOIL INVESTIGATION RESULTS*

Soil samples were collected to evaluate potential chemical releases to the subsurface from the old vapor degreaser, which sits below floor level in a sump structure, and from the numerous baths containing electroplating solutions in the facility plating room. A total of five samples were collected, from three separate boring locations. The results from all soil samples are provided in Table 2-1. It should be noted that the scope of the soil investigation was severely limited due to accessibility issues. As previously described in Section 1.2.2, twelve additional borings were attempted inside the building, but met refusal on a subfloor structure.

2.2.1 *Degreaser Area*

Two borings were installed in the vicinity of the old degreaser (see Figure 1-3 for locations). One boring consisted simply of a coring through the concrete base of the sump containing the degreaser unit and collection of one grab sample from the uppermost soil below the slab. This sample was designated DGSump1. The second boring was designated VD-3 and was located immediately outside the entrance to the concrete block room that houses the degreaser unit. This boring was installed by Geoprobe and was the only location inside the building that did not encounter refusal on the subfloor. Two samples were collected at this location for laboratory analysis from 6.0 to 8.0 and 13.0 to 15.0 feet below grade. The 13-15 foot horizon was selected based on a positive detection on the PID; the 6-8 foot sample was selected at random as no other indications of contamination were observed. The laboratory analytical results for the three samples collected in the degreaser area are summarized below:

- None of the three samples contained any VOCs (the primary constituents of concern for this area) at levels in excess of the New York State Recommended Soil Cleanup Objective (RSCO). The only VOCs detected were *de minimus* levels of acetone, methylene chloride, trichloroethene, tetrachloroethene and toluene.

- No PAHs were detected.

- The inorganic analyses indicated the presence of zinc marginally above the RSCO value. However, zinc was present at similar levels in all soil samples collected at the site, therefore it appears likely that this is a background condition. The sample collected beneath the sump also contained chromium slightly above the RSCO. No other inorganic analytes exceeded the RSCO.

2.2.2 *Plating Room*

Only one boring (MW2-B1) could be completed in the vicinity of the plating room (see Figure 1-3 for location). None of samples collected from this boring had sensory evidence of contamination, nor did they produce a response on the PID. As a result, two random samples were selected for laboratory analysis from 1.0 to 4.0 and 6.0 to 8.0 feet below grade. The laboratory analytical results for these two samples are summarized below:

- Neither of these samples contained any VOCs at levels in excess of the New York State Recommended Soil Cleanup Objective (RSCO).
- Low levels of PAHs were detected in the shallow sample. Only one PAH compound (benzo(a)pyrene) marginally exceeded the RSCO.
- The inorganic analyses indicated the presence of zinc marginally above the RSCO value. However, as previously discussed, it appears likely that this is a background condition. No other inorganic analytes exceeded the RSCO.

2.2.3 *Abandoned Underground Storage Tanks*

The evaluation of potential releases from these structures was limited to investigation of the site ground water. See Section 2.3 for discussion of these results.

2.3 *GROUND WATER INVESTIGATION RESULTS*

Prior to sampling, each well was gauged for the presence of light, non-aqueous phase liquid (LNAPL). No LNAPL was detected in any of the three on-site wells. The wells were then sampled using low-flow methodology as previously described in Section 1.2.1. The results of the laboratory analyses are summarized in Table 2-2. The original laboratory data sheets are provided in Appendix C. The results of the water chemistry monitoring performed in the field are provided below (data recorded at the time of sample collection).

Well	Temp. (°C)	pH (std units)	Turbidity (NTUs)	ORP (mV)	Spec. Cond. (mS/cm)	DO (mg/L)
MW-1	17.9	6.08	15	118.4	0.683	0.78
MW-2	17.6	6.09	0.0	290.8	2.364	9.08
MW-3	16.1	7.19	5.0	-170.5	1.745	0.23

The water chemistry is similar in wells MW-1 and MW-2, but significantly different in MW-3. Most noteworthy are the differences in temperature, pH and ORP. This is not surprising considering the much greater depth of MW-3. This well is probably drawing water from deep fractures that are not in hydraulic communication with the shallow fractures intersected by MW-1 and MW-2.

The laboratory analytical results for the three ground water samples collected as part of this investigation are summarized below:

- No samples contained VOCs at levels in excess of the New York State Ambient Water Quality Standards.

- No PAHs were detected in any of the three wells.

- Well MW-1 did not contain any inorganic constituents above the applicable standards. Well MW-2 was found to contain relatively low levels of arsenic marginally above its standard. Zinc was also detected in MW-2 at high levels far in excess of its standard. The results from MW-3 indicated the presence of chromium at levels marginally above its standard.

3.0 CONCLUSIONS

ERM has completed a Phase II Site Investigation at the Stewart Stamping Corp. site in Yonkers, NY. The purpose of the investigation was to evaluate potential chemical releases to the environment in each of three Recognized Environmental Conditions (RECs) identified by ERM in a previous Phase I Environmental Site Assessment. Based on the data developed through this study (see Section 2.0 of this document) the following conclusions are made regarding the three RECs:

- Historic Electroplating Operations – The soil sampling data collected from boring MW2-B1 did not indicate the presence of plating chemistry. However, this is not surprising given the location of this boring outside of the room where the plating operations are performed. The ground water sampling results indicate high levels of zinc in well MW-2. Since zinc plating is performed as part of site operations, it seems likely that the presence of zinc in ground water is related to these activities. The extent of zinc-impacted ground water cannot be determined based on the available data. In addition, the detection of arsenic and chromium in ground water at levels slightly above the applicable standards may also be related to site operations, although a definitive cause-and-effect relationship does not exist as it does with the zinc findings.

- Historic Chlorinated Organic Solvent Use – The soil and ground water samples collected and analyzed for VOCs do not indicate that a significant amount of solvents have bee released to the subsurface as a result of past degreasing operations. The detected levels of VOCs were all well below applicable standards.

- Former Underground Storage Tanks (USTs) – There is no evidence that a significant amount of No. 4 fuel oil was released from these UST systems. No LNAPL was detected in the three on-site wells. In addition, no dissolved petroleum hydrocarbons were detected in the ground water samples collected as part of this investigation

4.0 SITE REMEDIATION COST ESTIMATE

This section provides an estimate of potential remedial costs based on the sampling results presented in this document. It is recognized that the site investigation work conducted to date does not represent a complete characterization of the property, as the extent of the impacted media has not been fully defined. As a result, assumptions are required in order to prepare a cost estimate. In accordance with the contract of sale for the property, this cost estimate must be based on a "Reasonable Most Likely Scenario". For the purposes of this exercise the Reasonable Most Likely Scenario shall be defined as a likely set of actions based on ERM's experience with similar projects and knowledge/understanding of regulatory requirements.

4.1 REASONABLE MOST LIKELY REMEDIATION SCENARIO

The detection of high levels of zinc in ground water indicates that releases have occurred from plating operations at the site. This remedial scenario therefore assumes that this finding will drive a regulatory requirement for soil and ground water remediation. It is assumed that no other condition exists at the site that will require further investigation or remediation. The cost estimate for this scenario is based on the following:

Soil Remediation Assumptions

- A complete soil investigation is performed to delineate the extent of impacted soil beneath the plating room.
- An area approximately 2000 ft^2 in size within the plating room contains impacted soil and requires remediation. This represents over 43% of the entire plating room.
- The average depth to bedrock within the impacted area is 9.0 feet. The subsurface material consists of 7.5 feet of soil and 1.5 feet of concrete. The in-place volume of impacted material therefore includes 556 cubic yards of soil and 111 cubic yards of concrete.
- The impacted soil will be remediated by excavation and off-site disposal. The implementation of the remedy assumes the following:
  - Plating operations are shut down and the room is cleared so that there is unfettered access to perform excavation activities.

- It is assumed that the excavation will not encounter ground water (i.e., the water table is below the soil/rock interface).

- Soil Density is 1.6 tons per cubic yard. Concrete density is 2.0 tons per cubic yard.

- The building foundation rests on bedrock therefore excavation can be performed without the need to install structural supports for the building.

- All excavated material will be disposed in a secure landfill as RCRA non-hazardous.

<u>Ground Water Remediation Assumptions</u>

- A bedrock ground water investigation will be performed to delineate the extent of all inorganic constituents above the applicable standards. The scope of this program is assumed to consist of the installation of up to five additional bedrock monitoring wells.

- Suitable off-site locations are accessible and available for well installation.

- No active remediation is required, however semi-annual ground water sampling will be conducted for ten years to monitor the natural attenuation of the plume.

The assumption of no active remediation is made based on the fact that except for zinc, all exceedences of the applicable standards are marginal. In addition, there are no receptors as ground water is not utilized for supply purposes in Yonkers. With regard to zinc, this metal is an essential nutrient, therefore its presence in ground water does not represent a significant risk.

4.2 *REASONABLE MOST LIKELY SCENARIO COST ESTIMATE*

The cost estimate for the Reasonable Most Likely Scenario presented above is provided in Table 4-1. It should be noted that the soil remediation estimate is significantly impacted by the fact that the work will be conducted within the small area encompassed by the current plating room. The cost estimate assumes that except for this room, the remainder of the plant will remain in normal operation during the excavation. This approach results in significantly higher costs to perform this work. As shown in Table 4-1, the estimated cost to implement the assumed scope of work for soil and ground water remediation at the Stewart Stamping site is:

- Soil Remedy - $1,264,930
- Ground Water Remedy - $ 296,125
- Project Total - $1,561,055

APPENDIX C

Standard Operating Procedures (SOPs)

C.0 STANDARD OPERATING PROCEDURES

C.1 SOP 1: SOIL BORINGS

Soil borings with collection of soil samples for lithologic characterization and laboratory analysis will be installed to characterize on-site soil quality.

A NYSDOH ELAP-certified laboratory will analyze the soil samples using the methods specified in the Work Plan.

Drilling Methods

All boreholes for soil sampling will be advanced by hand auger or Geoprobe.

Drilling Equipment Decontamination

All downhole drilling equipment shall be decontaminated by steam cleaning prior to performance of the first boring/well installation and between all subsequent borings/well installations. This shall include all hand tools, casing, augers, drill rods and bits, tremie pipe and other related tools and equipment. The steam cleaning equipment shall be capable of generating live steam with a minimum temperature of 212^{o} degrees Fahrenheit. The equipment shall be cleaned to the satisfaction of the ERM's Hydrogeologist.

Soil Sample Collection for Lithology

All soil sampling shall be performed using a properly decontaminated hand auger or Geoprobe Macrocore sampler. An ERM Hydrogeologist will examine and describe the lithology immediately upon collection. The sample will also be screened for VOCs using a hand-held photoionization detector (PID) total organic vapor analyzer. This information will be recorded in the project field book.

A standard "Geologic Log" will be maintained for each boring that will include all of the geological information gathered in the field, including the following:

- The structure of the soils sampled, including layering stratification features, and the dominant soil types;

- The color of soils, using Munsell Soil Color Charts;
- The moisture content of soils;
- Soil grain features, including grain sizes, degree of sorting or grading, angularity, and mineralogy. The soils will be classified using the ASTM Method D2488-84, a visual manual procedure;
- Identification of any rock fragments, organic material or other components; and
- The consistency of clay-dominated soils.

All of the soil information collected will be recorded as a designation under the USCS along with additional observations for each distinctive soil type within each sample. The ERM Hydrogeologist shall record penetration resistance, recovery and sample description for each split-barrel sample in soil boring logs.

Soil Sample Collection for Laboratory Analysis

Soil samples will be collected for laboratory analysis as specified in the Work Plan.

It is anticipated that a Geoprobe will be used with either a Macro Core (MC) sampler or a Large Bore (LB) drive point sampler. The MC samplers are an open tube design and measure approximately 2" in diameter by 46" long. The samplers will be fitted with a removable cutting shoe and clear acetate liner. Samples will be collected from the prescribed depths below land surface.

If probe hole "cave-in" is significant, it may be necessary to use the closed piston assembly that fits into the MC cutting shoe or to switch to the LB drive point sampler. The LB samplers use twenty-two inch by one inch acetate liners and can be driven closed to a desired sampling depth, then opened and driven two feet further.

Each of sampler will be fitted with a new acetate liner prior to use. The acetate liner assists in the removal of the soil sample from the tube and helps insure sample integrity.

Soil samples may also be collected using a properly decontaminated hand auger. Soil sampling conducted with a hand auger will implemented according to the following general protocol:

1. Identify the sampling location and record it.

2. Drive a clean hand auger into the soil by hand and place the soil sample into appropriate sample containers as described in the Work Plan. If a volatile fraction is to be collected, that portion of each sample will be collected and directly placed into laboratory provided glassware to minimize volatilization of any compounds contained within the sample. The remaining fractions of each sample will be placed into a properly decontaminated stainless steel mixing bowl for homogenization prior to placement in laboratory provided glassware (in accordance with specific procedures set forth in the QAPP).

Work Site Restoration

Upon completion of the work, the drilling subcontractor shall restore all work areas/drilling locations to a pre-drilling condition. The drilling subcontractor shall remove and dispose of all debris, remove all equipment and materials from the each work site promptly and leave the location in a neat and orderly fashion to the satisfaction of ERM's Hydrogeologist. The restoration shall include repair of any holes, trenches, tire ruts, damage to pavement, etc. caused by the movement or operation of the drilling subcontractor's equipment.

C.2 SOP 2: ORGANIC VAPOR SCREENING – SOIL SAMPLE HEADSPACE

Field screening for organic compounds in soil samples will be performed as one of several field screening criteria, and continuously in the breathing zone of all work areas where intrusive activities are to occur as of the part of the Health and Safety monitoring program. This will serve as an immediate indication as to volatile organic hazards at the work location and will determine if personnel health and safety protection is adequate. Screening with a hand-held PID meter will be performed during all intrusive work activities (i. e. installation of soil borings and/or groundwater monitoring wells, or collection of groundwater samples) field investigation and all sample collection activities.

(1) Calibrate the PID daily in accordance with the particular manufacturer's procedures.

(2) For health and safety monitoring during intrusive activities, the PID will be used to continuously monitor for organic vapors in the breathing zone of all work areas in accordance with the HASP.

(3) For soil samples, a container separate from any jars that may be used for laboratory analysis will be used to check for total organic vapor concentrations using the PID. Generally, the sample aliquot retained for geologic description and archive is used for headspace total organic vapor screening.

(4) Fill the sample container approximately 2/3 full with soil.

(5) Place aluminum foil over the sample jar mouth, tightly sealing the opening.

(6) Allow the jar to stand for 5 minutes in a location where the sample temperature change will be minimal.

(7) After the 5 minutes, shake to jar for 1 minute to aid the desegregation of VOCs from the soil matrix.

(8) After the 5 minutes, insert the probe of a PID through the foil seal and observe the instrument for the maximum organic vapor reading.

(9) Record the sample number and maximum headspace organic vapor concentration reading.

C.3 SOP 3: SUB-SLAB SOIL GAS SAMPLING

The soil gas samples will be collected at the locations specified in the Work Plan using SUMMA® canisters equipped with timed sample acquisition regulators. The canisters and regulators will be certified clean by the laboratory prior to on-site use. A NYSDOH ELAP-certified laboratory will analyze each sample for VOCs using USEPA Method TO-15.

Selection And Preparation Of Sample Collection Point

Observe the condition of the building floor slab for apparent penetrations such as concrete floor cracks, floor drains, or sump holes. Note the floor conditions on the sampling form and select a potential location or locations for a temporary or permanent subsurface probe. The location or locations should be away from foundation walls and apparent penetrations.

Review the proposed location or locations with the occupant/owner describing how the sampling port or ports will be installed. After receiving permission from the occupant or owner, mark the proposed location(s) and describe the location(s) on the sampling form.

Using the PID, screen indoor air in the area of floor penetrations such as concrete floor cracks, floor drains, or sump holes (note that the detection limits for the laboratory analyses to be performed on the samples collected are considerably lower than the detection limits of the PID). Record the indoor air PID readings on the sampling form.

Temporary Subsurface Probe Installation

1. Drill a 1-inch diameter hole about 1 to 2 inches into the concrete slab using an electric hammer drill.

2. Extend the hole through the remaining thickness of the slab using a 3/8-inch drill bit. Extend the hole about three inches into the sub-slab material using either the drill bit or a steel probe rod.

3. Insert a section of ¼ -inch O.D. Teflon ™ or brass tubing to the bottom of the floor slab. Seal the annular space between the 1-inch hole and ¼ -inch tubing by applying hot beeswax into the 1-inch hole.

4. Connect the ¼ -inch Teflon™ tubing (or brass tubing using a length of ¼-inch I.D. Teflon™ tubing) to a stainless steel valve using compression fittings or hose clamps. Open the in-line valve and purge the probe tubing using a polyethylene 60-cubic centimeter (cc) syringe. Close the valve, remove and cap the syringe, and connect the ¼ -inch Teflon™ tubing and in-line valve to a SUMMA® canister. DO NOT DISCHARGE THE AIR/SOIL GAS SYRINGE INTO INDOOR AIR. For duplicate sample locations connect a second canister before purging by installing a ¼ -inch stainless steel "tee" fitting between the probe discharge tubing and the stainless steel valve.

Preparation Of SUMMA® Canister And Collection Of Sample

1. Place SUMMA® canister adjacent to temporary subsurface probe.

2. Record SUMMA® canister serial number on sampling summary form and COC.

3. Assign sample identification on canister ID tag, and record on sampling summary form and COC.

4. Remove brass plug from canister fitting.

5. Install pressure gauge / metering valve on canister valve fitting and tighten. If pressure gage has additional (2nd) fitting, install brass plug from canister fitting into gage fitting and tighten.

6. Open and close canister valve.

7. Record gage pressure on sample summary form and COC. Gage pressure must read >25 psi. Replace SUMMA® canister if gage pressure reads <25 psi.

8. Remove brass plug from gauge fitting and store for later use.

9. Install particulate filter onto metering valve input fitting and tighten.

10. Connect subsurface probe to end of in-line particular filter via ¼ -inch O.D. Teflon™ tubing and Swagelok® fittings.

11. Open canister valve and in-line stainless steel valve to initiate sample collection.

12. Take digital photograph of SUMMA® canister set up and surrounding area.

13. Record date and local time of valve opening on sampling summary form and COC.

Termination Of Sample Collection

1. Revisit SUMMA® canister after 80% of sample collection time has elapsed to verify sufficient amount of vacuum pressure remains for sample collection and shipment. At end of sample collection period (e.g., 2 hours after initiation of sample collection) record gauge pressure on sampling form and COC.

2. Record date and local time of valve closing on sampling summary form and COC.

3. Close canister valve.

4. Disconnect Teflon™ tubing and remove particulate filter and pressure gage / metering valve from canister.

5. Reinstall brass plug on canister fitting and tighten.

6. Remove SUMMA® canister from sample collection area.

7. Remove temporary subsurface probe and plug the slab probe hole with solid laboratory grade rubber plug. Set plug slightly below

the finished floor level cover flush with the floor surface using quick drying hydraulic cement.

Preparation And Shipment Of Sample To Analytical Laboratory

1. Pack SUMMA® canister in shipping container, note presence of brass plug installed in tank fitting.
2. Complete COC and place requisite copies in shipping container.
3. Close shipping container and affix custody seal to container closure.

C.4 SOP 4: GROUNDWATER SAMPLING

Groundwater sampling will be performed using USEPA low-flow well purging/sample collection techniques and/or standard purge and bail methods as outlined in the Work Plan.

General Procedures

The following procedure will be used for all monitoring well groundwater sampling:

- Clean all water-level measuring equipment using appropriate decontamination procedures.
- Wear appropriate health and safety equipment as outlined in the HASP. In addition, samplers will don new sampling gloves at each individual well prior to sampling.
- Visually examine the exterior of the monitoring well for signs of damage or tampering and record in the field logbook.
- Unlock well cap.
- Take and record in field logbook PID readings.
- Measure the static water level in the well with a decontaminated steel tape or electronic water level indicator. The tape or water level indicator will be rinsed with deionized water in between individual wells to prevent cross-contamination. Synoptic round of water level measurements will all be completed on the same day.

- All wells will also be checked for the presence and thickness of Light or Dense Non Aqueous Phase Liquids (LNAPL/DNAPL).

- If LNAPL or DNAPL is encountered on the top of the water table at the time of sampling, a sample of the LNAPL or DNAPL will be collected for analysis if accumulations are sufficient. Measurement of the thickness of this layer will be taken using an interface probe. A sample of the LNAPL or DNAPL may be obtained using a dedicated bottom-loading bailer. The sample will be sent to the laboratory for analysis of its chemical composition and physical properties (e.g., specific gravity, and gas chromatograph (GC) fingerprint). Initially, no groundwater sample will be collected from wells that contain LNAPL or DNAPL.

- If LNAPL or DNAPL is not detected in the well, continue with the low-flow sampling procedures described below.

Low-Flow Sampling

The low-flow sampling procedure is intended to facilitate the collection of minimum-turbidity groundwater monitoring well samples. The low-flow groundwater purging/sampling technique employs the use of a flow-through cell equipped with probes and a meter for measuring groundwater quality parameters such as pH, temperature, specific conductivity, and dissolved oxygen. One example of this equipment is the Horiba U-22 Flow-Through Cell and the specific manufacturer's calibration and operation instructions should be followed.

Sample Equipment

- Pneumatic bladder pumps constructed of stainless steel and Teflon®.

- Tubing: Tubing used in purging and sampling each well must be dedicated to that well. Once properly located, moving the pump in the well should be avoided. Consequently, the same tubing should be used for purging and sampling. Teflon® or Teflon®-lined polyethylene tubing will be used to collect samples for the organic and inorganic analyses necessary for this project.

- Electronic water level measuring device, 0.01-foot accuracy.

- Flow measurement supplies (e.g., graduated cylinder and stop watch).

- Interface probe.

- Power or air source (generator, compressed air tank, etc.).
- In-line purge criteria parameter monitoring instruments - pH, turbidity, specific conductance, temperature, and dissolved oxygen.
- Decontamination supplies.
- Logbook and field forms.
- Sample bottles.
- Sample preservation supplies (as specified by the analytical methods).
- Sample tags or labels, chain of custody forms.
- Well construction data, location map, field data from last sampling event.

Sample Procedure

1) Lower pump, safety cable and tubing very slowly into the well to a depth corresponding to the center of the saturated screen section of the well. The pump intake must be kept at least two feet above the bottom of the well to prevent mobilization of any sediment. Lowering the pump quickly, or even at a moderate rate, will result in disturbing sediment in the well. This is one of the most important steps in low flow sampling at the Site.

2) Measure the water level again with the pump in well before starting the pump. Start pumping the well at 100 to 500 milliliters per minute. Ideally, the pump rate should cause little or no water level drawdown in the well (less than 0.3 foot and the water level should stabilize).

    - Measure and record the depth to water and pumping rate every 3 to 5 minutes (or as appropriate) during pumping. If purging continues for more than 30 minutes, readings will be recorded at approximately 10-minute intervals. However, once stabilization is indicated, a minimum of 3 consecutive readings at 3 to 5 minute intervals will be recorded prior to sample collection.

    - Care should be taken not to cause pump suction to be broken or entrainment of air in the sample. Do not allow the groundwater level to go below the pump intake.

- Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to minimize drawdown and/or to ensure stabilization of indicator parameters.

3) During purging, measure and record the field indicator parameters using the in-line meter (turbidity, temperature, specific conductance, pH, Eh, and dissolved oxygen) every 3 to 5 minutes (or as appropriate). If purging continues for more than 30 minutes, readings will be recorded at approximately 10-minute intervals. However, once stabilization is indicated, a minimum of 3 consecutive readings at 3 to 5 minute intervals will be recorded prior to sample collection.

   - The well is considered stabilized and ready for sample collection once all the field indicator parameter values remain within 10 percent for 3 consecutive readings.

   - If drawdown in the well is measured at 1 foot or more, continue to low flow purge until a minimum of the equivalent volume of 1 well casing volume is removed. Using the flow equation to calculate the volume of purge water. Then collect the groundwater sample.

4) Before sampling, either disconnect the in-line cell or use a by pass assembly to collect groundwater samples before the in-line cell. All sample containers should be filled by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.

5) Samples requiring pH adjustments will have their pH checked to ensure that the proper pH has been obtained. For VOC samples, this will necessitate the collection of a test sample to determine the amount of preservative that needs to be added to the sample container prior to sampling.

6) Label the samples using waterproof labels, or apply clear tape over the paper labels. Place all samples in a cooler as described in the QAPP with bagged ice or frozen cold packs and maintain at 4°C for delivery to the laboratory.

7) Do not use ice for packing material; melting will cause bottle contact and possible breakage.

8) Measure and record well depth. Take final water quality reading using low flow cell.

9) Secure the well.

C.5 SOP 5: MEASUREMENT OF GROUNDWATER PH AND TEMPERATURE

(1) Immerse the tip of the electrode in water overnight. If this is not possible due to field conditions, immerse the electrode tip in water for at least an hour before use.

(2) Rinse the electrode with demineralized water.

(3) Immerse the electrode in pH 7 buffer solution.

(4) Adjust the temperature compensator to the proper temperature.

(5) Adjust the pH meter to read 7.0.

(6) Remove the electrode from the buffer and rinse with demineralized water.

(7) Collect a groundwater sample using a bailer (or from the pump discharge line in the case of the vertical profile wells) and pour a small amount of this sample into an extra sample jar, which will not be used to store chemically analyzed samples.

(8) Immerse the electrode into the extra sample jar. Do not immerse the electrode into a sample that will be chemically analyzed.

(9) Read and record the pH of the solution, after adjusting the temperature compensator to the sample temperature (obtained during measurement of specific conductance or from a standard scientific thermometer).

(10) Rinse the electrodes with demineralized water.

(11) Keep the electrode immersed in demineralized water when not in use.

(12) All results are to be recorded in the Field Notebook.

C.6 SOP 6: MEASUREMENT OF GROUNDWATER SPECIFIC CONDUCTANCE

(1) Immerse the electrode in water overnight. If this is not possible due to field conditions, immerse the electrode for at least an hour before use.

(2) Collect a groundwater sample using a bailer (or from the pump discharge line in the case of the well purging activities) and pour a small amount of this sample into an extra sample jar, which will not be used to store chemically analyzed samples.

(3) Rinse the cell with one or more portions of the sample to be tested.

(4) Immerse the electrode in the sample and measure the temperature. Do not immerse the electrode into a sample, which will be chemically analyzed.

(5) Adjust the temperature setting to the sample temperature.

(6) Immerse the electrode in the sample and measure the conductivity. Do not immerse the electrode into a sample, which will be chemically analyzed.

(7) Record the results in the Field Notebook.

C.7 SOP 7: MEASUREMENT OF GROUNDWATER TURBIDITY

(1) Ensure that the sample cell (sample vials) is clean, with no dust and lint on the inside or outside surface.

(2) Ensure that instrument has been standardized recently and span control has not been changed.

(3) Range calibration of instrument is performed at the factory, but it should be checked from time to time against fresh formalin turbidity standard dilutions.

(4) Check the mechanical zero setting while instrument is off.

(5) Turn on the power and press the battery check switch and verify the battery check range. The needle should be in the battery check area. If battery was not recharged before use, switch to a charged instrument. The battery pack should be charged on a daily basis.

(6) Select the range that will exceed the expected turbidity of the sample under test and press the appropriate range switch.

(7) Place the focusing template into the cell holder and adjust the zero control for a reading of zero NTU. Remove the focusing template.

Note: If the instrument will be used in the 100 range, place the cell riser into the cell holder before inserting the test sample. When using the 1 and 10 ranges, the cell riser must not be used.

(8) Collect a groundwater sample using a bailer (or from the pump discharge line in the case of the vertical profile wells) and pour a small amount of this sample into an extra sample jar, which will not be used to store chemically analyzed samples.

(9) Fill a clean sample cell to the marked line with the sample to be measured and place it into the cell holder. Use the white dot on the sample cell to orient the cell in the same position each time. Cover the sample cell with the light shield and allow the meter to stabilize. Read the turbidity of the sample. The sample size for all turbidity measurements should be 18 ml. Use the line on the sample cell as a level indicator. Variation in sample volume can affect the accuracy of the determinations. When measuring the lower range (0 - 10 and 0 - 1 NTU), air bubbles in the sample will cause false high readings - before covering the cell with the light shield, observe the sample in its cell. A five-minute wait period can eliminate air bubbles from the sample and thereafter a valid reading can be taken.

(10) Record the results in the Field Notebook.

C.8 SOP 8: MEASUREMENT OF GROUNDWATER DISSOLVED OXYGEN

The dissolved oxygen (DO) meter will be properly calibrated prior to each sampling event.

Calibration Procedure

(1) Prepare the DO meter with a thin Teflon membrane stretched over the sensor.

(2) Perform a battery check.

(3) Set mode switch to operate and the operation switch to zero, and zero the instrument.

(4) Take a temperature measurement and determine the calibration value from the manufacturers table for the appropriate atmospheric pressure.

(5) Select the desired range and adjust the instrument to an appropriate calibration value (determined in the preceding step).

(6) Place the probe in a water sample with a known dissolved oxygen level and read mg/L-dissolved oxygen.

(7) Record temperature and dissolved oxygen calibration information on the equipment calibration and maintenance log for that instrument.

Operating Procedure

(1) Calibrate the dissolved oxygen meter.

(2) Perform the battery check.

(3) Immerse the electrode in water overnight. If this is not possible due to field conditions, immerse the electrode for at least an hour before use.

(4) Collect a groundwater sample using a bailer and pour a small amount of this sample into an extra sample jar, which will not be used to store chemically analyzed samples.

(5) Rinse the cell with one or more portions of the sample to be tested.

(6) Set mode switch to operate and the operation switch to the desired range.

(7) Immerse the probe in the water sample.

(8) Take a temperature and adjust the temperature compensator to the sample temperature (obtained during measurement of specific conductance or from a standard scientific thermometer).

(9) Switch the dissolved oxygen content measurement and allow reading to stabilize.

(10) Record the results in the Field Notebook.

(11) Repeat procedure and record a second reading. Average the results and record the average.

(12) Rinse the probe with distilled water and replace protective cover on probe with a small amount of distilled water to keep the probe membrane wet.