Site 15 Interim Remedial Action
Supplemental Remedial Investigation Work Plan

174TH Fighter Wing
New York Air National Guard
Hancock Air National Guard Base
Syracuse, New York

July 2007

Air National Guard
Andrews AFB, Maryland

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LIST OF ACRONYMS/ABBREVIATIONS

Acronym/ Abbreviation	Definition
ANG	Air National Guard
ARARs	Applicable or Relevant and Appropriate Requirements
AS	Air Sparging
ASP	Analytical Services Protocol
AOC	Area of Concern
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
bgs	Below Ground Surface
COC	Chain-of-Custody
DGI	Data Gap Investigation
DO	Dissolved Oxygen
DUSR	Data Usability Summary Report
ERM	Environmental Resources Management
eV	Electron Volt
FS	Feasibility Study
FDT	Fluorescent dye- tracing
gm	grams
gpm	gallons per minute
HASP	Health and Safety Plan
HSA	Hollow-Stem Auger
IRA	Interim Remedial Action
IRP	Installation Restoration Program
LNAPL	Light Non-Aqueous Phase Liquid
LUCs	Land Use Controls
mg/kg	milligrams per kilogram (parts per million)
mg/l	milligrams per liter (parts per million)
NTU	Nephelometric Turbidity Unit
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSGS	New York State Geological Survey
O&M	Operations and Maintenance
ORC	Oxygen Release Compound®
ORP	Oxidation-Reduction Potential
OSHA	Occupational Safety and Health Administration
PID	Photoionization Detector
POTW	Publicly Owned Treatment Works
ppb	parts per billion

LIST OF ACRONYMS/ABBREVIATIONS

Acronym/ Abbreviation	Definition
ppm	parts per million
PRT	Post-Run Tubing
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RFI	Relative Fluorescence Intensity
RI	Remedial Investigation
ROD	Record of Decision
ROI	Radius of Influence
SCG	Standards, Criteria, and Guidance
SVE	Soil Vapor Extraction
SVOC	Semi-Volatile Organic Compound
TAGM	Technical and Administrative Guidance Memorandum
TAL	Target Analyte List
TCL	Target Compound List
TMB	Trimethylbenzene
TOGS	Technical Operations Guidance Series
TPH	Total Petroleum Hydrocarbons
µg/kg	micrograms per kilogram (parts per billion)
µg/l	micrograms per liter (parts per billion)
µs/cm	micro siemens per centimeter
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
VI	Vapor Intrusion
VOC	Volatile Organic Compound

SECTION 1.0

INTRODUCTION

Environmental Resources Management (ERM) is assisting the Air National Guard (ANG) with an Interim Remedial Action (IRA) at Site 15 of the 174th Fighter Wing (FW), Hancock Air National Guard Base (Hancock ANGB) in DeWitt, New York (the Site). The ANG requested ERM to prepare a technical and cost proposal associated with their 16 February 2007 letter and Statement of Work (SOW) titled" Environmental Restoration Program Statement of Work for Supplemental Remedial Investigation at 174th Fighter Wing; Hancock ANGB; Syracuse, New York"; Project Number: HAAW20077054 dated 30 January 2007. The ANG accepted ERM's technical and cost proposal on 1 May 2007.

During the investigation associated with the January 2007 Technical Memorandum (TM), at location MW-101 (within the former pump house area at Site 15), elevated PID readings were noted in the soil above the groundwater table. The presence of a mass of residual petroleum in soil above the groundwater table could have a significant negative effect on the effectiveness of the contemplated groundwater remediation involving treatment only of the saturated zone. ERM concluded that an area of affected unsaturated zone soil is present in the former pump house area (i.e., the reported source area) of Site 15.

The results of the plume delineation indicated that BTEX-affected groundwater had been adequately delineated on the Brooklawn Golf Course (BGC) property. However, available data also suggested that relatively low concentrations of BTEX have migrated further downgradient to at least one additional property beyond the BGC property.

Review of laboratory analytical results from this plume delineation indicated that benzene, ethylbenzene, and xylenes were detected in on-site and off-site groundwater at concentrations above ambient groundwater quality standards and guidance values established by NYSDEC. Toluene and MTBE were not detected at concentrations above applicable standards, criteria, and guidance (SCGs) in any of the wells sampled during the plume delineation, suggesting that toluene and MTBE are not compounds of potential concern at Site 15 or the BGC property. Three significant areas with benzene, ethylbenzene, or xylene concentrations above applicable SCGs were noted during the completion of the plume delineation study. These three areas include:

1. The source area at Site 15 (near the former pump house and surrounding areas);
2. Area just north of Molloy Road near the base boundary; and
3. Area just south of Molloy Road on the BGC property.

ERM recommended additional delineation of affected soil be performed in the source area near the former pump house to more accurately estimate the extent and volume of affected soil in the unsaturated zone.

ERM also recommended delineation of the full extent of the BTEX plume on property that is on the east side of Fairway Drive. Collection of these additional data should allow for preparation of a more complete Focused FS Report and Record of Decision (ROD).

1.1 Project Objectives and Scope

The primary objective of this Workplan is to describe the Supplemental Remedial Investigation tasks that are proposed to complete the characterization of the extent of a soil source area still remaining in the former pump house area of Site 15 and to define the extent of benzene, toluene, ethylbenzene, and xylenes (BTEX) and MTBE in groundwater at Site 15, including both the on-Site and off-Site portions of the dissolved plume. The results of the Supplemental Remedial Investigation will be used to refine the remedial alternative recommended in the FS Report (Parsons, 2002). As discussed with NYSDEC during the Kick-Off Meeting in February 2005, it is currently anticipated that the remedy for Site 15 groundwater will be re-focused towards an enhanced natural attenuation approach. Specific tasks proposed to refine the remedial approach include the installation of six additional permanent monitoring wells, a direct-push investigation to further delineate the plume, soil vapor sampling, and hydrogeologic testing.

1.2 Previous Activities

Over the past 15 years, several soil and groundwater investigations have been conducted at Site 15. A detailed history of site investigations between June 1990 and December 2001 is provided in the FS Report (Parsons, 2002). Discussion of previous investigation activities in this Workplan is limited to those investigation activities that are relevant to groundwater.

A spill investigation was conducted in June 1990 resulting in the installation and sampling of four monitoring wells (MW-1, MW-2, MW-3, and MW-4). Groundwater analytical data indicated a maximum benzene concentration of 510 micrograms per liter (μg/l). Polychlorinated biphenyls (PCBs) were not detected in samples collected from these wells.

Six soil borings were advanced and completed as monitoring wells (MW-5 through MW-10) in November and December 1990. Groundwater samples were collected from all existing wells (MW-1 through MW-10) and analyzed for BTEX, PCBs, and total petroleum hydrocarbons (TPH). Analytical data for groundwater yielded concentrations up to 700 μg/l of benzene, 520 μg/l of ethylbenzene, 1,800 μg/l of xylenes, and 2.3 milligrams per liter (mg/l) of TPH. PCBs were not analyzed in samples collected from these wells during the November and December 1990 investigation.

Groundwater samples were collected from nine of the ten monitoring wells in June and July 1994. A sample was not collected from monitoring well MW-5 because the well was damaged to an extent that prevented collection of a representative sample. Concentrations of TPH increased in monitoring wells MW-7 and MW-2 relative to the 1990 sampling event. However, TPH was not detected in wells MW-8, MW-9, and MW-10.

A Remedial Investigation (RI) was conducted in 1995 and 1996, resulting in the installation of four additional shallow monitoring wells (MW-5R, MW-11, MW-12S, MW-13) and two deeper monitoring wells (MW-6D and MW-12D). Groundwater samples were collected from all existing monitoring wells during the RI. The estimated horizontal extent of affected groundwater was delineated based on volatile organic compound (VOC) and semi-volatile organic compound (SVOC) concentrations in groundwater. Separate-phase product resembling jet fuel was observed near the leading edge of the plume at that time. SVOCs were restricted mainly to an area on the northeast side of the pump-house (Lockheed, 1997).

A treatability study investigation was conducted at the Site in May 1998, which resulted in the installation of four additional monitoring wells (MW-14 through MW-17) and one planned recovery well (RW-1) for separate-phase product observed during the RI. Groundwater samples were collected for VOC analysis from the four newly installed wells. Separate-phase product was not observed in planned recovery well RW-1. Therefore, planned product recovery operations were not implemented. Benzene and/or ethylbenzene were detected in the groundwater samples collected from monitoring wells MW-14 and MW-15.

Thirty-eight temporary groundwater sampling points were installed using direct-push techniques in September and October 1999 to further delineate BTEX in Site groundwater. Three permanent wells were also installed (MW-18, MW-19, MW-20). The thirty-eight monitoring points were screened in the field for VOCS with a photoionization device (PID). BTEX compounds were detected in 24 of these locations. A small amount of separate-phase product resembling jet fuel was encountered in three of the temporary points and one well (MW-19).

A Data Gap Investigation (DGI) was conducted in 2000 and 2001 to provide additional data regarding the extent of BTEX-affected groundwater. The DGI included installation of temporary groundwater sample collection points on the Brooklawn Golf Course (off Site) to evaluate groundwater quality in this area. A total of 17 groundwater samples were collected and submitted for laboratory analysis. In the fall of 2001, a small amount of light non-aqueous phase liquid (LNAPL) was observed in monitoring well MW-6. Petroleum-like sheen was also observed in monitoring wells MW-21 and MW-22 installed in the fall of 2001. BTEX concentrations in groundwater exceeded the NYSDEC groundwater quality standards in 2 of the 21 direct-push locations at the Brooklawn Golf Course, indicating that BTEX has migrated off Site at concentrations above applicable or relevant and appropriate requirements (ARARs).

During the most recent investigation associated with the January 2007 Technical Memorandum (TM), at location MW-101 (within the former pump house area at Site 15), elevated PID readings were noted in the soil above the groundwater table. The presence of a mass of residual petroleum in soil above the groundwater table could have a significant negative effect on the effectiveness of the contemplated groundwater remediation involving treatment only of the saturated zone. ERM concluded that an area of affected unsaturated zone soil is present in the former pump house area (i.e., the reported source area) of Site 15 and should be further evaluated.

ERM recommended in the TM that additional delineation of the affected soil be performed in the source area near the former pump house to more accurately estimate the extent and volume of affected soil in the unsaturated zone.

1.3 General Investigation Approach

The purpose of the IRA is to mitigate potential threats to human health and the environment. Construction of an air sparge (AS)/soil vapor extraction (SVE) system was originally contemplated as part of the remedy for Site 15 as outlined in the FS Report (Parsons, 2002). However, a review was subsequently conducted which suggested that collection of updated analytical data regarding groundwater quality at the Site was appropriate and that re-visitation of the proposed remedy may be appropriate for Site 15 based on the results of the additional investigation. These and other topics were discussed with the NYSDEC, the New York State Department of Health (NYSDOH), and Mr. Guy Easter (owner of Brooklawn Golf Course) during the Kick-Off Meeting on 17 February 2005. In the Kick-Off Meeting, an investigation approach was proposed and tentatively accepted by NYSDEC and the other stakeholders. The proposed Supplemental Investigation was completed in November of 2006 and the results were presented in detail in ERM's January 2007 TM, previously referenced. This proposed Supplemental Remedial Investigation approach includes the following main components:

- Prepare a Supplemental Remedial Investigation Workplan (this document) and submit the Workplan to NYSDEC, NYSDOH, and Mr. Easter for review and approval.
- Perform a direct-push investigation (on Site and off Site) to evaluate the current extent of BTEX-affected groundwater and obtain additional hydrogeologic information potentially relevant to Site remediation.
- Measure soil vapor concentrations (optional) at selected locations to evaluate the potential for soil vapor intrusion issues for off-site buildings.

- Install three permanent monitoring wells off Site east of Fairway Drive, at locations to be determined subsequent to review of results from the direct-push investigation.
- Install two permanent monitoring wells side gradient of the Site 15 source area at locations to be determined in the field based on results the direct-push investigation.
- The new monitoring wells will be developed and all existing wells previously sampled in November 2006 and new wells will be sampled to obtain an existing baseline condition.

All work to be performed during this Supplemental Remedial Investigation will be performed according to the NYSDEC-approved Site-Specific HASP. (Parsons, 2001a; Appendix A).

1.4 Work Plan Structure

This Work Plan was written in general conformance with the guidelines presented in ANG's Environmental Restoration Program (ERP) Investigation Guidance (ANG, 2005). It provides a description of the planned activities and is organized as follows:

- Section 1 - Introduction
- Section 2 - Project Management Approach
- Section 3 - Installation Background Information
- Section 4 - Recent Groundwater Sampling and Analysis
- Section 5 - Applicable or Relevant and Appropriate Requirements
- Section 6 - Permits
- Section 7 - Investigation Approach and Procedures
- Section 8 - Sample Collection Procedures
- Section 9 – Land Surveying
- Section 10 - Decontamination Procedures
- Section 11 - Borehole Abandonment Procedure
- Section 12 - Investigation-Derived Waste Management
- Section 13 - Project Schedules and Deliverables
- Section 14 - References Cited

Figures and tables follow Section 14. This Work Plan also includes two appendices, as follows :

- Appendix A - Health and Safety Plan
- Appendix B - Quality Assurance Project Plan.

SECTION 2.0

PROJECT MANAGEMENT APPROACH/PLAN

This section provides an overview of ERM's project management plan for the Hancock ANGB Supplemental Remedial Investigation.

2.1 Project Management Organization

ERM's project team will consist of the following personnel:

Program Manager: Responsible for the overall execution of the project and for maintaining an open line of communication with the ANG ERP Branch and the Base Environmental Manager.

Project Manager: Supervises the project team, provides technical direction and interface with the ANG Project Manager and the Base Environmental Manager, coordinates subcontractor support, and manages project schedule and budget.

Site Manager: Directly supervises the on-site field investigation activities and project team, and provides technical direction and interface with the Project Manager.

Quality Assurance/Quality Control (QA/QC) Manager: Responsible for establishing standardized quality assurance procedures for the project and ensuring that effective procedures and controls are implemented to achieve project quality goals and adherence to contract requirements.

Site Safety and Health Officer: Responsible for ensuring that physical and chemical hazards are appropriately mitigated through effective execution of the Site Health and Safety Plan (Appendix B).

Project Scientists, Engineers, and Technicians: Includes qualified geologists, chemists, engineers, and field technicians.

2.2 Project Procedures

An open line of communication will be maintained between the Project Manager and the project team to ensure that the project objectives are met. Sampling and other field activities will be carried out in accordance with this Workplan. The Supplemental Remedial Investigation will be executed according to the project schedule included in Section 12.0.

2.3 Quality Management

The QA/QC Manager will be responsible for ensuring that established QA/QC procedures are followed. Corrective action will be taken at any time deemed necessary. The QA/QC procedures will be directed in accordance with the Hancock ANGB Quality Assurance Project Plan (QAPP) contained in Appendix C.

2.4 Subcontractor Management

ERM is responsible for performance of the work under this contract delivery order, including the work of subcontractors. ERM will hire subcontractors for drilling and analytical testing services. The Project Manager will oversee the subcontractor's work with respect to technical performance, quality, and adherence to cost and schedule. In addition, ERM will ensure that subcontractor activities comply with the QAPP.

2.5 Project Staffing

ERM will use an experienced team of professionals who have performed similar work at the Hancock ANGB or other investigation sites. The project team will be selected by the ERM Program Manager and Project Manager.

SECTION 3.0

INSTALLATION BACKGROUND INFORMATION

This section summarizes background information pertinent to the proposed Supplemental Investigation at the Hancock ANGB. Detailed descriptions of the Base operations and history, environmental setting, previous investigations, and other background information are provided in the FS Report (Parsons, 2002).

3.1 Installation Description

The 174th Fighter Wing of the New York Air National Guard is based at Hancock Field; a former Air Force Base located two miles north-northeast of the City of Syracuse in Onondaga County in central New York. The 174th Fighter Wing supplies air reconnaissance for the eastern portion of the United States. A Site Location Map is presented as Figure 1.

The Air National Guard facility is currently operating within the southern portion of the former Hancock Air Force Base located south of the Syracuse airport. Facilities on the base include hangers, support building office and maintenance buildings. The Air National Guard Readiness Center at Andrews AFB in Maryland manages Installation Restoration Program-related efforts for Air National Guard installations. Hancock ANGB is bordered by Syracuse International Airport to the north, the Town of Dewitt to the east and south, and the Town of Salina to the west. The Town of Cicero lies to the north of the Base and Syracuse Airport.

3.2 Site 15 Description

Site 15 was formerly used as a pump house. It is approximately 2.5 acres in area, and consists of brush and wooded vegetation, a large concrete pad, a bermed area where a 215,000-gallon aboveground tank was formerly located, and two drainage swales. One drainage swale borders the Site along the north-northeast side, and a second drainage swale borders the west side of the Site. The drainage swales contain water only intermittently following storm events. Water within the drainage swales does not appear to be hydraulically connected to underlying groundwater (Parsons, 2004).

Site 15 has sustained PCB, JP-4, and JP-8 spills over the years. Several Site structures were removed in 2003 as part of a removal action for PCB-impacted soils. Structures removed include a transformer pad, the foundation of the former pump house, and associated underground structures consisting of six underground tanks, three drainage sumps, and an oil-water separator (Parsons, 2004).

Impacted soil and groundwater remains to be addressed. The soil contamination consists mostly of BTEX and is located around the Former Pump House area. The groundwater contamination consists mostly of BTEX and to a lesser extent MTBE. The dissolved BTEX plume has advanced to the south of Molloy Road and east of Fairway Drive. A Site Map is presented as Figure 2.

SECTION 4.0

OCTOBER AND NOVEMBER 2006 SUPPLEMENTAL INVESTIGATION

ERM performed soil and groundwater sampling at Site 15 in October and November 2006. This section summarizes the October to November 2006 Supplementary Investigation.

4.1 Summary of Field Work

ERM initiated the work outlined in the NYSDEC-approved Workplan in October 2006. The Conceptual Site Model (CSM), direct-push investigation, monitoring well installation and repairs, and soil vapor survey described in the Workplan are presented in detail in this section. Groundwater samples were collected from each of the monitoring wells on Site 15 and the BGC utilizing low flow purging and sampling methodology. Fluorescent dye tracing (FDT) was also implemented as approved by ANG and the NYSDEC.

4.1.1 Conceptual Site Model

Based on site data presented in previous reports and current groundwater analytical data collected by ERM in 2005, ERM developed a Conceptual Site Model (CSM) to evaluate where data gaps existed and further investigation may be required. ERM used C Tech Development Corporation's (C-Tech) Environmental Visualization System Pro (EVS-PRO) as the Site 15 CSM. C Tech's EVS-PRO is a United States Environmental Protection Agency (USEPA).

Based upon these results, the drilling program for the on-site portion of the project as proposed in the Workplan was developed. ERM also obtained groundwater samples from the direct push investigation described below on a 24-hour turnaround to apply USEPA's TRIAD approach in field planning and investigation and to apply this approach to the off-site portion of the project. Laboratory results were reviewed and field decisions made based on detection of BTEX compounds to apply the TRIAD approach to facilitate enhanced and cost-effective plume delineation.

4.1.2 Direct-Push Investigation

ERM's proposed scope included a minimum of eight soil borings and groundwater samples that would be collected during the direct-push investigation (DPI). All work conducted on Site (within the Base) and off-site (the BGC property) was based on procedures described in the NYSDEC-approved Workplan dated September 2006.

ERM initiated the DPI during the week of 16 October 2006. Soil borings were installed and groundwater samples were collected to estimate the current extent of petroleum-affected groundwater in the off-site portion of the plume.

Direct-push technology was utilized to collect continuous soil cores. Each soil boring was advanced into the sand unit where BTEX-affected groundwater had been encountered during previous investigations. Groundwater sample collection depths were determined by evaluating soil in the field and field screening of saturated soil with a calibrated PID. One groundwater sample was collected from each soil boring at the interval with the highest recorded PID reading. In the case where no elevated PID readings were measured, the groundwater sample was collected from the approximate center of the sand unit.

Groundwater samples were collected using a Hydro-punch™ or SP-16-type sampler. The sampler sleeve was pulled back to expose the temporary well screen within the sampler. A peristaltic pump and dedicated polyethylene tubing was utilized to purge groundwater from the temporary sampling point. ERM purged approximately one gallon from each of the temporary points prior to collection of representative groundwater samples into laboratory-supplied sample containers.

The groundwater samples collected during the DPI were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) and methyl tert-butyl ether (MTBE) by USEPA Method 8260. BTEX and MTBE analytical results were obtained on an expedited turnaround to facilitate direction of the investigation. As outlined in the Workplan, groundwater samples were also analyzed.

The Workplan originally proposed installation of eight soil borings and collection of eight groundwater samples during the DPI. Based on field observations, PID field screening data, and laboratory analytical data, a significant number of additional soil borings were required to further delineate the extent of BTEX-affected groundwater at the Site. The DPI was expanded outward at approximately 50-foot intervals from the original soil boring locations where field observations, field-screening data, and/or expedited laboratory analytical data suggested evidence of residual petroleum hydrocarbons. This "inside-out" investigation process was repeated until field and analytical data provided evidence suggesting that sample locations were in an area outside of the groundwater plume.

ERM collected four groundwater samples from temporary well points along the boundary of BGC property and Fairway Drive. Field and laboratory data from two of these samples suggest that BTEX-affected groundwater extends east or southeast of the BGC property.

4.1.3 Monitoring Well Installation and Repairs

Two new replacement monitoring wells were installed at Site 15. These new wells replaced two previously existing on-site wells (previously designated MW-13 and MW-21) that were destroyed by construction or remediation activities. The replacement wells were designated as MW-101 and MW-102, respectively. Due to affected media encountered during the installation of MW-101, ERM performed additional investigation in the former source area through installation of four additional soil borings.

Five new off-site wells (MW-103 through MW-107) were installed on the BGC property. Two proposed side-gradient wells were located and installed based on the results of the DPI. ERM also evaluated DPI data and installed monitoring well MW-105 within an area of BTEX-affected groundwater. ERM proposed to install another monitoring well down-gradient of the plume as described in the Workplan. Investigative results obtained during the DPI indicated the plume has migrated farther than originally reported towards the southeast near Fairway Drive. Based on the DPI, ERM installed two additional monitoring wells along the property boundary of BGC and Fairway Drive. Monitoring well MW-106 is located cross-gradient to the plume and MW-107 is located within the plume.

Two monitoring wells (MW-2 and MW-22) located within the base boundary at Site 15 were repaired to bring the wells flush with the new surface grade. The location and elevation of the wells were surveyed by a New York-licensed surveyor.

4.1.4 Quarterly Groundwater Sampling

A quarterly groundwater sampling event was conducted by ERM during this Supplemental Investigation. Depth to groundwater was measured to the nearest 0.01-foot using an electronic water level indicator or an interface probe. ERM utilized a peristaltic pump, dedicated polyethylene tubing, and a Horiba U-22 water quality parameter meter with a flow-through cell to accomplish low-flow purging/sampling of each monitoring and recovery well. Groundwater samples were analyzed for BTEX and MTBE by USEPA Method 8260.

4.1.5 Soil Vapor Survey

ERM conducted a soil vapor survey utilizing five soil vapor sampling points to evaluate the potential for vapor intrusion in contemplated mission-critical buildings which may be constructed at Site 15. Each of the soil vapor sampling points was set at a depth of 5.5 ft bgs (consistent with a typical commercial building footer) in proposed locations of potential future buildings. It should be noted that discussions with Hancock ANGB personnel suggest that any planned construction at or near Site 15 would likely be "slab-on–grade" (i.e., no basements). The soil vapor investigation was performed in general conformance with the NYSDOH document entitled *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (Public Comment Draft, February 2005).

4.1.6 Fluorescent Dye Tracing

Hydrogeologic testing consisted predominantly of fluorescent dye tracing (FDT) tests. FDT testing utilizes low concentrations of food-grade organic dyes to assess groundwater migration pathways (including preferential flow paths) and advective flow velocities. The organic dyes fluoresces at specific wavelengths and can be detected in Site 15 groundwater under the supervision of a trained, expert hydrogeologist with a spectrofluorometer at very low concentrations (as low as 50 parts per trillion (ppt). In addition, the selected fluorescent dyes are conservative (i.e., non-reactive) and are not significantly adsorbed by most soil matrices.

4.2 Summary of Results

ERM collected 22 GP and WP groundwater samples, 23 MW groundwater samples, 24 QA/QC samples and 6 soil vapor samples in the TM investigation between 16 October 2006 and 9 November 2006. All samples were collected in accordance with ERM's approved QAPP and were analyzed by a New York State ELAP certified laboratory. A summary of groundwater elevation data is presented in Table 1. A static groundwater contour map based on November 2006 field data is presented on Figure 3. All analytical data is summarized in Tables 2 and 3.

Soils encountered during the DPI generally consisted of three distinct soil units. The upper unit, generally from the surface to an average of approximately 12 feet below ground surface (bgs) consisted of a medium brown to reddish brown silty clay. The second unit, generally from 12 feet bgs to an average of approximately 29 feet bgs, consisted of a medium brown to reddish brown to gray, fine to medium grained silty sand. The third unit, generally at depths greater than 29 feet bgs, consisted of medium brown silty, clayey, fine to coarse sand with sub-rounded gravels (glacial till).

During the installation of MW-101, elevated PID readings were noted in the soil above the groundwater table. Depth to groundwater in monitoring well MW-101 during the 2006 November groundwater sampling event was approximately 9.5-feet bg or at elevation of 392.08 feet. ERM compared existing groundwater elevation data from MW-101 and nearby MW-22 with historical data (including data from former monitoring wells MW-21, MW-6S and MW-6D) in the same general area of Site 15. Review of these groundwater level data, which were collected over all seasons of the year, suggests that groundwater elevations in this portion of Site 15 typically range from approximately 390 to 392 feet.

The presence of a mass of residual petroleum in soil above the groundwater table could have a negative effect on the effectiveness of the contemplated groundwater remediation involving treatment only of the saturated zone. In order to evaluate the lateral extent of this apparent source zone above the groundwater table in a manner consistent with USEPA's Triad approach, four additional soil borings were installed by ERM during the plume delineation outward at approximately 100-foot intervals. Soil from these borings was examined by an ERM geologist and screened in the field using a calibrated PID. PID readings in three of the four borings in the unsaturated zone ranged from 44.2 ppm to 199 ppm. In addition to elevated PID readings, these soils possessed visual and olfactory evidence of residual petroleum as determined in the field by ERM's geologist. ERM concluded that an area of grossly-affected unsaturated zone soil is present in the former pump house area (i.e., the reported source area) of Site 15. A Summary of BTEX Data at Site 15 is presented on Figure 4.

Groundwater analyses from soils borings installed during the DPI indicated BTEX and MTBE concentrations below laboratory method reporting limits in 13 of the 20 sampling locations. Benzene concentrations in the other seven sampling locations ranged from 6.1 to 330 µg/l. The highest concentrations of benzene were found in the source area (Site 15) and immediately south of and parallel to Molloy Road on the BGC.

Ethylbenzene concentrations in the seven sampling locations ranged from 2.2 to 770 µg/l. The highest concentrations of ethylbenzene were found in the source area (Site 15) and immediately south of and parallel to Molloy Road on the BGC.

Xylene concentrations in the seven sampling locations ranged from 0.49 to 1,500 µg/l. The highest concentrations of xylenes were found in the source area (Site 15) and immediately south of and parallel to Molloy Road on the BGC.

Toluene and MTBE were not detected at concentrations above applicable standards, criteria, and guidance (SCGs) in any of the borings sampled during the plume delineation, suggesting that toluene and MTBE are not compounds of potential concern at Site 15 or the BGC property.

Groundwater analysis in 11 of the 23 monitoring wells indicated BTEX and MTBE concentrations below laboratory method reporting limits. Benzene concentrations in the other twelve wells ranged from ND to 110 µg/L. Figure 5 shows the lateral extent of benzene in groundwater in Fall of 2006 using all sampling locations and relative to the NYSDEC ambient groundwater quality standard of 1 µg/L (NYSDEC, 1998). The highest concentrations of benzene were found in the source area and immediately north and south of and parallel to Molloy Road on Site 15 and on the BGC.

Figure 6 illustrates the distribution of dissolved ethylbenzene in the Fall of 2006 using all sampling locations and relative to the NYSDEC ambient groundwater quality standard of 5 µg/l. Ethylbenzene concentrations were highest in the source area and in the vicinity of wells MW-19 and

MW-105 adjacent to Molloy Road on the north and south sides, respectively. .

Figure 7 shows the distribution of dissolved xylene in the Fall of 2006 using all sampling locations and relative to the NYSDEC ambient groundwater quality standard of 5 µg/l. Xylene concentrations above the NYSDEC standard are limited to the source area and in the vicinity of wells MW-19 and MW-105 adjacent to Molloy Road on the north and south sides, respectively.

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The primary chemical-specific ARARs for the Site 15 IRA are the NYSDEC Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. These criteria are contained in the NYSDEC Division of Water *Technical and Operational Guidance Series Memorandum Number 1.1.1* (TOGS 1.1.1; NYSDEC, 1998).

The NYSDEC criteria for the compounds present in groundwater at Site 15 are listed below. The values shown for BTEX are ambient water quality standards. There is no NYSDEC water quality standard for MTBE; therefore, the NYSDEC guidance value is shown.

- Benzene: 1 µg/l
- Toluene: 5 µg/l
- Ethylbenzene: 5 µg/l
- Xylene: 5 µg/l
- MTBE: 10 µg/l

SECTION 6.0

PERMITS

The Supplemental Remedial Investigation activities described in this Workplan are subject to regulation under the New York State Inactive Hazardous Waste Site Program (State Superfund). No NYSDEC permits are required for on-Site activities.

The drilling subcontractor will file a request through Dig Safely New York for subsurface utility clearance of member companies. The ANG will be responsible for identifying, locating, and marking subsurface utilities in the work areas on the Base. ERM will conduct a site walk with a representative from the Base Engineering Office to verify utility clearance for each of the proposed well locations. The assistance of property owners east of Fairway Drive will be solicited in identifying, locating, and marking privately-owned subsurface utilities in the work areas. If necessary, a private utility location service will be contracted to assist in the identification, location, and marking of privately-owned subsurface utilities.

SECTION 7.0

INVESTIGATION APPROACH AND PROCEDURES

This section describes the investigation approach and procedures for the Hancock ANGB Supplemental Investigation.

7.1 Work Plan Objectives

The purpose of this Workplan is to describe the Supplemental Remedial Investigation tasks proposed to complete the delineation of BTEX-affected soil in the former source area and dissolved BTEX in groundwater at Site 15, including both on-Site and off-Site portions of the plume. The results of the Supplemental Remedial Investigation will be presented in Technical Memorandum (Tasks 5E/5F) as shown on the project schedule in Section 12.

7.2 Direct-Push Investigation

As previously mentioned, the drilling subcontractor will file a request through Dig Safely New York for subsurface utility clearance of member companies. The assistance of Hancock ANG and the property owners east of Fairway Drive will be solicited in identifying, locating, and marking privately-owned subsurface utilities in the work areas at Site 15 and work areas east of Fairway Drive. If necessary, a private utility location service will be contracted to assist in the identification, location, and marking of privately-owned subsurface utilities. In addition, access agreements with the property owners east of Fairway Drive will have to be obtained by the ANG prior to performance of any work on their property.

ERM will initiate a Triad boring program approach around boring Nos. MW-101, WP-203, 204, and 205 as referenced in Figure 8, ERM will expand "outward" from each of these locations on a northern, southern, eastern and western axis at approximate 50-foot spacing from the above referenced soil boring locations. This step-out process will be repeated until it appears that "clean" (i.e. VOC-unaffected) soil conditions have been encountered.

Direct-push technology such as a Geoprobe™ sampler will be used to collect continuous soil cores during drilling operations. An ERM geologist will inspect the soil cores and record soil color, grain size, moisture content, field-screening results, percent recovery, and other pertinent observations on borehole logs. A calibrated photoionization detector (PID) will be used to conduct headspace VOC screening of the soil cores. "Clean" soils as referenced in the paragraph above will be determined based upon field screening of soil with a PID reading less than 20 ppm followed by laboratory analysis of this sample indicating that VOCs were not detected above regulatory soil guidance levels. Preliminary laboratory results of these samples will be supplied within 24 hours of submittal to the laboratory. If PID screening indicates no VOCs are detected, soils encountered will be determined to be "clean".

Each soil boring will be advanced to saturated conditions (approximately 9-feet below ground surface [bgs]), the geologic unit where BTEX-affected groundwater has been encountered during previous investigations.

Soil sample collection depth will be evaluated in the field based on PID readings from saturated soils. One soil sample will be collected from each soil boring at the interval with the highest-recorded PID reading. In the case where PID readings are at background levels, a soil sample will not be collected. It is anticipated that approximately thirty borings will be installed in this area and approximately ten soil samples with the highest PID readings will be submitted for laboratory analyses.

The soil samples collected during the direct-push investigation will be analyzed for BTEX and MTBE by USEPA Method 8260. Select soil samples will be analyzed for diesel range organics for assisting in remedial design criteria. In addition, geotechnical parameters sieve analyses, porosity, moisture content, bulk density and Total Organic Carbon (TOC) will be performed on pertinent samples. All environmental samples will be analyzed by a New York State Environmental Laboratory Approved Program (ELAP) certified laboratory. Associated QA/QC samples will be collected in accordance with the project QAPP (See Appendix B).

Four of the soil borings will be extended into the groundwater table and groundwater samples will be collected using a Hydropunch-like sampler. These samples are proposed to define the extent of ground water contamination and will therefore, be located in "clean" conditions at the northern, eastern, western and southern extents of the supplemental investigation area. The sampler sleeve will be pulled back to expose the screen within the sampler. A peristaltic pump and dedicated polyethylene tubing will be used to purge groundwater from the temporary sampling point. Purging will continue until approximately 1 gallon is purged or a turbidity reading of 50 nephelometric turbidity units (NTUs) or less is reached, whichever occurs first. Groundwater samples will be collected in laboratory-supplied sample containers and prepared under chain of custody for transport to the project laboratory. It is anticipated that approximately fifteen borings will be installed in this area and approximately five groundwater samples will be submitted for laboratory analyses. In addition, one of these four boring (northeastern portion of the area) an additional monitoring well (MW-108) will be installed as discussed under Additional Plume Delineation below.

The groundwater samples collected during the direct-push investigation will be analyzed for BTEX and MTBE by USEPA Method 8260. All samples will be analyzed by a New York State Environmental Laboratory Approved Program (ELAP) certified laboratory. Associated QA/QC samples will be collected in accordance with the project QAPP.

An ERM geologist will map the soil boring locations in the field using a measuring tape and will record relevant information in a field notebook. Soil boring locations will be marked with temporary field markers until their location and elevation can be surveyed by a New York-licensed surveyor. Surveying will occur as quickly as possible after sampling activities are completed in order to minimize Site disruptions. The planned horizontal and vertical accuracy of the land survey is ± 0.1 feet and ± 0.01 feet, respectively.

7.3 Additional Plume Delineation

ERM will also delineate the extent of the BTEX plume on property that is on the east side of Fairway Drive. Collection of these additional data should allow for preparation of a more complete Focused Feasibility Study (FFS) Report and Record of Decision (ROD). PID data, field observations and laboratory analyses of groundwater samples will be used to delineate the extent of the BTEX plume on property that is on the east side of Fairway Drive. ERM will initiate a Triad boring program approach east of boring MW-107 as presented on Figure 8. ERM will advance borings along a northern to southern axis with 30-foot spacing along the east side of Fairway Drive. ERM will expand the investigation using 50-foot spacing eastward from each of the boring locations. This step-out process will be repeated until it appears that "clean" (i.e. BETX-unaffected) groundwater conditions have been encountered. In the case where PID readings are at background levels, a soil sample will not be collected. It is anticipated that approximately fifteen borings will be installed in this area and approximately ten soil samples with the highest PID readings will be submitted for laboratory analyses. As previously stated, access agreements with the property owners east of Fairway Drive will have to be obtained by the ANG prior to performance of any work on their property.

Direct-push technology such as a Geoprobe™ sampler will be used during drilling operations. An ERM geologist will inspect the soil cores and record soil color, grain size, moisture content, field-screening results, percent recovery, and other pertinent observations on borehole logs. A calibrated photoionization detector (PID) will be used to conduct headspace VOC screening of the soil cores. Each soil boring will be advanced to the base of the sand unit (approximately 20 to 25 feet below ground surface [bgs]), the geologic unit where BTEX-affected groundwater has been encountered during previous investigations.

Groundwater samples will be collected using a Hydropunch-like sampler. The sampler sleeve will be pulled back to expose the screen within the sampler. A peristaltic pump and dedicated polyethylene tubing will be used to purge groundwater from the temporary sampling point. Purging will continue until approximately 1 gallon is purged or a turbidity reading of 50 nephelometric turbidity units (NTUs) or less is reached, whichever occurs first. Groundwater samples will be collected in laboratory-supplied sample containers and prepared under chain of custody for transport to the project laboratory. It is anticipated that approximately fifteen borings will be installed in this area and approximately five groundwater samples will be submitted for laboratory analyses.

The groundwater samples collected during the direct-push investigation will be analyzed for BTEX and MTBE by USEPA Method 8260. All samples will be analyzed by a New York State Environmental Laboratory Approved Program (ELAP) certified laboratory. Associated QA/QC samples will be collected in accordance with the project QAPP.

An ERM geologist will map the soil boring locations in the field using a measuring tape and will record relevant information in a field notebook.

Soil boring locations will be marked with temporary field markers until their location and elevation can be surveyed by a New York-licensed surveyor. Surveying will occur as quickly as possible after sampling activities are completed in order to minimize disruption to the facilities where the field work is occurring. The planned horizontal and vertical accuracy of the land survey is ± 0.1 feet and ± 0.01 feet, respectively.

7.4 Monitoring Well Installation

The drilling subcontractor will file a request through Dig Safely New York for subsurface utility clearance of member companies. The ANG will be responsible for identifying, locating, and marking subsurface utilities in the work areas on the Base. ERM will conduct a site walk with a representative from the Base Engineering Office to verify utility clearance for each of the proposed well locations. The assistance of property owners east of Fairway Drive will be solicited in identifying, locating, and marking privately-owned subsurface utilities in the work areas. If necessary, a private utility location service will be contracted to assist in the identification, location, and marking of privately-owned subsurface utilities. In addition, access agreements with the property owners east of Fairway Drive will have to be obtained by the ANG prior to performance of any work on their property.

One to four new groundwater monitoring wells (MW-109, 110, 111 and 112) will be installed down-gradient of all BTEX-affected groundwater as shown on Figure 8. The new well(s) will be installed using hollow-stem auger drilling methods. An ERM geologist will oversee the installation of each new monitoring well.

The top of the screened interval of the new monitoring wells will be located approximately 1 foot above the top of the sand unit. The wells will be constructed with 2-inch diameter, threaded flush joint, Schedule 40 PVC casing and 0.010-inch factory slotted screens. Morie #0 sand or equivalent will be used to install a sand filter pack around the screened interval. The filter pack will be installed to a height of 1 foot above the top of each well screen. During installation of the filter pack, the augers will be slowly removed and the sand will be tamped down using a weighted tape measure to minimize the potential for bridging. The well casing will be raised no more than 0.5 feet to allow sand to fill the borehole beneath the well screen. A 2-foot thick seal of pre-hydrated bentonite chips or bentonite slurry will be installed above each sand filter pack. Once the bentonite seal is in place, the remaining annular space will be backfilled with cement-bentonite grout. Grout will be added as required so the top of the grout will settle at an elevation approximately 1 foot bgs.

A permanent reference mark will be installed at the top of each well casing to provide a datum for surveying and water level measurements. Each additional well will be fitted with a flush-mounted steel protective casing cemented in place. A locking expansion well cap similar to those previously provided for this project will also be provided.

Each new monitoring well will be incorporated into the quarterly sampling routine. Each new monitoring well will be developed approximately five days after installation and each well and the existing wells sampled during the TM will be re-sampled based on previously documented protocols described in the TM to obtain a baseline condition.

ERM's geologist will measure the new well location in the field using a measuring tape and will record relevant information in the field notebook. The location and elevation of the wells will be surveyed by a New York-licensed surveyor. The planned horizontal and vertical accuracy of the land survey is ± 0.1 feet and ± 0.01 feet, respectively.

7.5 Well Development

The newly installed monitoring wells will be developed by purging and bailing or pumping to facilitate the removal of fine-grained material from the well, restoration of the hydraulic properties of the surrounding geologic formation, and collection of representative groundwater samples. Any disposable equipment used during well development (e.g., disposable bailers, tubing) will be dedicated to each respective well. If submersible pumps or non-disposable surge blocks or bailers are used, they will be thoroughly cleaned between wells.

The field parameters pH, conductivity, turbidity, and temperature will be measured during well development. ERM will attempt to develop each well to the point that the turbidity of the recovered groundwater is less than 50 NTUs. Development will cease when the turbidity has dropped below 50 NTUs and/or field parameters have stabilized as follows for three consecutive readings:

- ±0.1 for pH
- ±0.1 degree C for temperature; and
- ±10% for specific conductance (conductivity).

Stabilization of pH, temperature, and conductivity will be used to determine an end-point for well development if turbidity does not decrease to below 50 NTUs.

7.6 Soil Vapor Investigation

A soil vapor survey will be performed at four locations, two at exterior locations adjacent to each of the two facilities located in the down gradient area east of Fairway Drive. Soil vapor samples will be collected at a depth consistent with a typical commercial building footer (approximately 3 to 4 feet bgs). The samples will be used to evaluate the potential for vapor intrusion risks at the future building site. The proposed locations of soil vapor sampling points are presented in Figure 8. The soil vapor investigation will be performed in accordance with the NYSDOH *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (*October 2006). If results of this sampling of soil vapor indicate additional sampling is required, ERM will collect up to two additional samples within the "affected building(s)".

The drilling subcontractor will file a request through Dig Safely New York for subsurface utility clearance of member companies. The property owners east of Fairway Drive will be responsible for identifying, locating, and marking subsurface utilities in the work areas on their property. ERM will conduct a site walk with appropriate representatives from each property to verify utility clearance for each of the soil vapor sampling locations.

Soil vapor samples will be installed and collected as per Section 2.7.1 of the *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (*October 2006). Soil vapor samples will be collected through temporary soil vapor probes installed using direct-push technology. The soil will be continuously sampled and logged as the direct-push soil boring is advanced. An ERM geologist will log soil color, grain size, moisture content, and other pertinent observations. A calibrated PID will be used to conduct headspace VOC screening of the soil core.

Stainless steel rods equipped with a detachable stainless steel drive point will be driven to the desired sampling depth. At the desired depth, a 6-inch soil vapor probe (sampling screen) attached to dedicated Teflon or polyethylene tubing will be lowered through the rods to the bottom of the borehole. The drive rods will then be retracted and the borehole will be backfilled with clean quartz sand to a minimum of 6 inches above the soil vapor probe. Bentonite will then be placed above the sand pack to the ground surface, and immediately hydrated. Before the samples are collected, a minimum of 24 hours will be allowed for bentonite hydration.

Prior to collection of each soil vapor sample, the temporary soil vapor probe and tubing will be purged in accordance with NYSDOH final guidance (NYSDOH 2006). One to three implant volumes will be purged at a rate not exceeding 0.2 liters per minute. In addition, ERM will provide an enclosed container creating a seal over the vapor point that will be filled with a helium tracer gas. The vapor point will then be monitored with a helium detector to determine if ambient air is being drawn into the sampling zone. An ambient outdoor air sample will be collected upwind during soil vapor sampling activities.

Prior to sampling, a calibrated PID will be used to conduct headspace VOC screening of the screened soil area. Soil vapor samples will be collected in laboratory-certified clean 6-liter Summa® canisters with 2-hour calibrated flow controllers. The Summa® canisters will be connected to the dedicated sample tubing with a Swagelok®-type fitting. After the samples are collected, the sample tubing will be pulled from the boreholes. If necessary, the boreholes will be backfilled to the ground surface with bentonite.

Soil vapor samples will be containerized and shipped according to laboratory approved protocols. Soil vapor samples will be analyzed by a New York State ELAP certified laboratory for BTEX and MTBE using USEPA Method TO-15. Associated QA/QC samples will be collected in accordance with the QAPP (Appendix B). Reporting limits for the analyses will be as follows:

- Benzene: 0.5 ppb/vol. or 1.6 $ug.m^3$
- Toluene: 0.5 ppb/vol. or 1.9 $ug.m^3$
- Ethylbenzene: 0.5 ppb/vol. or 2.2 $ug.m^3$
- Xylene: 0.5 ppb/vol. or 2.2 $ug.m^3$
- MTBE: 0.5 ppb/vol. or 1.8 $ug.m^3$

7.7 Hydrogeologic Testing (Fluorescent Dye Tracing)

Hydrogeologic testing will be continued to obtain hydraulic conductivity estimates for the sand unit and to evaluate groundwater migration pathways and flow velocities in the study area. These data will be useful for the design and implementation of the NYSDEC-approved remedial alternative subsequent to completion of the Supplemental Investigation and submission of the Addendum to the FS Report.

The hydrogeologic testing will consist of fluorescent dye tracing (FDT) tests. FDT tests use low concentrations of food-grade organic dyes to assess groundwater migration pathways (including preferential flow paths) and advective flow velocities. The organic dyes fluoresce at specific wavelengths, and can easily be detected with a spectrofluorometer at very low (part per trillion) concentrations. In addition, the dyes are conservative (i.e., non-reactive) and are not significantly adsorbed by soil matrices.

Three specific dyes (uranine, eosine, and sodium napthtionate) will be used in three different monitoring wells at the Site. Material Safety Data Sheets for these compounds will accompany field personnel during sampling events. One dye will be added to each monitoring well. Uranine (100 grams) will be added to well MW-2, eosine (100 grams) will be added to well MW-3, and sodium naphtionate (500 grams) will be added to well MW-22. Groundwater grab samples will be collected daily for the first week after injection and on a reduced time frame for the next four weeks based on prior sample results from all downgradient monitoring wells and analyzed for fluorescence concentrations. A Shimadzu RF-5301PC and a Perkin Elmer LS-5B spectrofluorometer will be used for the fluorescence analyses. Duplicate analyses will be performed at a frequency of one duplicate for every five samples collected, along with suitable blank analyses for QA/QC purposes. Groundwater migration pathways, flow (seepage) velocities, and hydraulic conductivity will be evaluated based on the observed spatial and temporal distribution of dye concentrations measured in the downgradient monitoring wells.

SECTION 8.0

SAMPLE COLLECTION PROCEDURES

This section describes sample collection procedures for the Supplemental Remedial Investigation.

8.1 Soil Vapor

Soil vapor samples will be collected in general accordance with NYSDOH draft guidance (NYSDOH 2005). Activities known to involve the use of materials containing VOCs will not be permitted in the immediate area during soil vapor sampling activities. The area will be inspected prior to sampling and any petroleum or other hydrocarbons will be removed.

Laboratory-certified batch cleaned Summa® canisters and certified clean flow controllers will be used for each sampling location. Prior to collection of each soil vapor sample, the temporary soil vapor probe and tubing will be purged. One to three implant volumes will be purged at a rate not exceeding 0.2 liters per minute. Helium tracer gas will be used to determine if ambient air is being drawn into the sampling zone. If necessary, the bentonite surface seal will be improved to ensure the sampling zone is isolated prior to sample collection.

Soil vapor samples will be collected using laboratory-certified clean 6-liter Summa® canisters with 2-hour calibrated regulators. The Summa® canisters will be connected to the dedicated sample tubing with a Swagelok®-type fitting. Associated QA/QC samples will be collected in accordance with the QAPP (Appendix B). After the soil vapor and QA/QC samples are collected, the sample tubing will be pulled from the boreholes. If necessary, the boreholes will be backfilled to the ground surface with bentonite.

The soil vapor samples will be logged and transported under chain of custody to an ELAP-certified laboratory. The samples will be analyzed for BTEX and MTBE by USEPA Method TO-15. A minimum reporting limit of 1 microgram per cubic meter will be achieved for all analytes, unless sample dilution is required.

8.2 Groundwater and Soil

As previously discussed in Section 7.2, the proposed soil boring locations are shown in Figure 8. Direct-push technology such as a Geoprobe™ sampler will be used to collect continuous soil cores during drilling. Each soil boring will be advanced to the base of the sand unit (approximately 20 feet below ground surface [bgs]), the geologic unit where BTEX-affected groundwater has been encountered during previous investigations.

Groundwater sample collection depth will be evaluated in the field based on PID readings. One groundwater sample will be collected from each soil boring at the interval with the highest-recorded PID reading. In the case where PID readings are at background levels, the groundwater sample will be collected from the approximate center of the sand unit.

Groundwater samples will be collected using a Hydropunch-like sampler. The sampler sleeve will be pulled back to expose the screen within the sampler. A peristaltic pump and dedicated polyethylene tubing will be used to purge groundwater from the temporary sampling point. Purging will continue until approximately 1 gallon is purged or a turbidity reading of 50 nephelometric turbidity units (NTUs) or less is reached, whichever occurs first. Groundwater samples will be collected in laboratory-supplied sample containers and prepared under chain of custody for transport to the project laboratory.

The newly installed monitoring wells and the existing wells sampled in November 2006 will be sampled in general conformance with USEPA low-flow (minimal drawdown) well purging and sample collection techniques (USEPA, 1996). The low-flow groundwater purging/sampling technique employs the use of a flow-through cell equipped with probes connected to an electronic water quality meter for measuring parameters such as pH, temperature, conductivity, DO, and ORP. Examples of water quality meters that may be used include the Horiba U-22 and the YSI 600XL.

The following general procedure will be used for quarterly groundwater sampling:

- Monitoring wells and the recovery wells shall be located in the field and opened to allow access for sampling activities. The exterior of each well shall be visually inspected for signs of damage or tampering and relevant information will be recorded in the field notebook or on an appropriate form.

- Field personnel shall wear appropriate health and safety equipment as outlined in the NYSDEC-approved Site-Specific HASP. (Parsons, 2001a; Appendix A). Samplers shall don new sampling gloves at each individual well location prior to sampling.

- The locking well cap shall be unlocked and a calibrated photoionization detector (PID) with a minimum 10.2 eV lamp shall be used to measure the concentration of VOCs at the top of the well riser.

- Depth to water and the depth to the bottom of the well will be measured to the nearest 0.01-foot using an electronic water level indicator or an interface probe. The volume of water in the well will be calculated. The water level indicator or the interface probe will be cleaned between wells using decontamination procedure described in Section 10.0.

- If light non-aqueous phase liquid (LNAPL) is encountered on the top of the groundwater table, a measurement of the thickness of LNAPL will be taken using an interface probe. Groundwater samples will not be collected from wells that contain LNAPL.

- Adjustable-rate, positive displacement pumps (e.g., centrifugal pumps or bladder pumps constructed of stainless-steel or Teflon™) or peristaltic pumps will be utilized for purging/sampling of each well. The pump and dedicated tubing will be slowly lowered into the well to a depth corresponding to the saturated portion of the screened interval. The pump intake shall be kept at least six inches above the bottom of the well to prevent mobilization of any sediment.

- The water level will be measured again before starting the pump. Wells will initially be pumped at a rate of 50 to 600 milliliters (ml) per minute. Ideally, the pumping rate should cause minimal (less than 0.3 foot) water level drawdown in the well and the water level should stabilize.

- Depth to water and pumping rate shall be measured and recorded approximately every five minutes (or as appropriate) during pumping. If purging continues for more than 30 minutes, readings will be recorded at approximately 10-minute intervals.

- During purging, the field indicator parameters turbidity, temperature, specific conductance, pH, ORP, and DO shall be measured and recorded every five minutes or as appropriate based on field conditions. If purging continues for more than 30 minutes, readings will be recorded at approximately 10-minute intervals.

- Pumping rates will be adjusted to minimize drawdown and/or to facilitate stabilization of field parameters as required.

- Purging will cease when the turbidity has dropped below 50 NTUs and/or field parameters have stabilized as follows for three consecutive readings:
- ±0.1 for pH;
- Temperature ±0.1 degree C; and
- ±10% for specific conductance (conductivity).

- If drawdown in the well is measured at one foot or more continue low-flow purging until a minimum of one well casing volume is removed using the flow equation to calculate the volume of groundwater purged from the well.

- Before sampling, the flow-through cell will be disconnected or a bypass assembly will be used to collect groundwater samples before the flow-through cell. Each of the sample containers will be filled by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence and agitation.

- Sample bottles will be labeled using waterproof pens. All samples will be placed into a pre-chilled cooler for subsequent delivery to a New York State ELAP certified laboratory for analyses.

As described above, groundwater samples will be analyzed for BTEX and MTBE by USEPA Method 8260. In addition, the following selected parameters useful for evaluation of natural attenuation processes:

- alkalinity;
- ammonia;
- methane;
- nitrate;
- sulfate;
- total hardness; and
- ferrous iron.

All parameters listed above performed for the evaluation of natural attenuation processes at the Site will be performed at an approved environmental laboratory using USEAP-approved or standard methods, with the exception of ferrous iron which will be performed in the field using a Hach Model IR-18C ferrous iron test kit (1,10-phenanthroline iron reagent method). The results of ferrous iron analyses in the field will be recorded in the field notebook and/or on appropriate sampling forms.

In addition, selected soil samples will be obtained for geotechnical parameters such as sieve analyses, porosity, moisture content, bulk density and Total Organic Carbon (TOC).

8.3 Field Quality Assurance/Quality Control

Sampling will be conducted in conformance with the Site-Specific QAPP (Appendix B). Field QC/QC samples to be collected and analyzed during the Supplemental Investigation include:

- Matrix Spike (MS);
- Matrix Spike Duplicate (MSD);
- Field Blank ;
- Trip Blank; and
- Duplicate.

8.4 Field Documentation Procedures

Field activities will be sequentially recorded in a bound field notebook. Quantitative measurements and relevant observations will be recorded in the field notebook or on sample collection data sheets, well development forms, or other forms as appropriate.

Each sample submitted for laboratory analysis will be assigned a unique designation that is recorded on a Chain of Custody (COC) form. The following information will be included on COC forms:

- project identification, number, and location;
- unique sample designation;
- date and time;
- sample type and matrix;
- sample container and preservative;
- requested analyses;
- requested turn-around time;
- any special instructions or additional information; and
- appropriate signatures, dates, and times.

8.5 Sample Handling Procedures

After samples are logged in the field, they will be stored in a cooler containing ice pending delivery to the analytical laboratory. Sample coolers will generally be hand-delivered to the project laboratory. However, in cases where the samples will be shipped to the laboratory via overnight courier, the shipping container (i.e., cooler) will be secured using a signed custody seal to document that the cooler was not accessed by unauthorized personnel during transit.

SECTION 9.0

LAND SURVEYING

A New York-licensed surveyor will survey the location and elevation of the new monitoring wells and the direct-push groundwater and soil vapor sampling points. The planned accuracy of the survey is ±0.01 foot vertically and ±0.1 foot horizontally. Permanent reference marks installed on the top of each well casing during monitoring well construction will be used for the survey of well locations. The local datum used for the elevation survey will be referenced to mean sea level.

SECTION 10.0

DECONTAMINATION PROCEDURES

Heavy equipment (e.g., drilling rig, augers) 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.

Extraneous contamination and cross-contamination will be controlled by wrapping the sampling equipment with aluminum foil or otherwise isolating the equipment when not in use. Field personnel will wear Nitrile or Latex gloves when collecting samples, and will change and dispose of sampling gloves between sample locations. Decontamination of sampling equipment will be kept to a minimum in the field, and wherever possible, dedicated sampling equipment or new disposable sampling equipment will be used and disposed of after use at a sampling location. Personnel directly involved in equipment decontamination will wear appropriate personal protective equipment (PPE).

10.1 Heavy Equipment

Drilling equipment and the back of the drilling rig will be decontaminated by steam cleaning or hot-water pressure washing prior to installation of the first boring/well and between each subsequent boring/well installation. This will include hand tools, casing, augers, drill rods and bits, tremie pipe, and other related tools and equipment. Water used for heavy equipment decontamination will be from a potable source.

10.2 Sampling And Field Equipment

Dedicated, disposable sampling equipment (e.g., Teflon or polyethylene tubing and/or bailers), will be used whenever feasible. If reusable bailers or other reusable sampling equipment is used (not including submersible pumps), it will be decontaminated as follows:

- Laboratory-grade glassware detergent and tap water scrub to remove visual contamination;
- Tap water rinse;

- Distilled/de-ionized water rinse;
- 10% nitric acid rinse, followed by a distilled and de-ionized water rinse (metals only), or
- Methanol (pesticide-grade) rinse (volatiles only);
- Air dry; and
- Distilled and de-ionized water rinse.

Submersible sampling pumps used for low-flow purging and sampling will be decontaminated as follows:

- Laboratory-grade detergent and tap water scrub;
- Tap water rinse;
- Distilled/de-ionized water rinse; and
- Pumping approximately 5 gallons of potable water through the pump.

Meters and probes used in the field (other than those used solely for air monitoring or field screening purposes, such as PIDs) will be decontaminated as necessary between uses as follows:

- Laboratory-grade detergent and tap water scrub;
- Tap water rinse; and
- Distilled/de-ionized water rinse.

SECTION 11.0

BOREHOLE ABANDONMENT PROCEDURES

Boreholes will be abandoned by backfilling with cement/bentonite grout, consisting of 5 pounds of high-grade bentonite for each 94 pounds of Type I or Type II Portland cement, mixed with 8.3 gallons of water for a target density of 13.9 pounds/gallon with an acceptable range of 13.4 to 14.5 pounds/gallon. Precautions such as placement of plywood will be implemented to minimize damage to landscaped and paved areas. Re-seeding at the landscaped areas east of Fairway Drive will be performed on an as needed basis.

SECTION 12.0

INVESTIGATION-DERIVED WASTE MANAGEMENT

Section 4.5 of USEPA (1991) Management of Investigation-Derived Wastes during Site Inspections states that non-hazardous soil and liquid IDW should be left on-site within the area of concern (AOC) unless other circumstances, such as the 2 March 2005 ANG Policy letter on Remediation Derived Waste (RDW) and Investigation Derived Waste (IDW), a State ARAR or a high probability of community concerns, require off-site disposal. USEPA (1991) does not prohibit the disposal of non-hazardous groundwater and/or decontamination fluids in the AOC if they have been containerized and sampled. The following options for non-hazardous IDW management are cited from Section 4.5 of USEPA (1991):

- *soil cuttings*: spread around well, put back into boring, or put in a pit within the AOC;
- *groundwater*: pour onto ground next to well and allow infiltration;
- *decontamination fluids*: pour onto ground from containers to allow infiltration; and
- *decontaminated PPE and disposable sampling equipment*: double bag and deposit at the Facility, in a USEPA dumpster, or at a municipal landfill.

Non-hazardous IDW generated during the Supplemental Investigation will be managed in a manner consistent with the options listed above. Used PPE and disposable sampling equipment will be bagged after use and placed in a Base dumpster for subsequent disposal at a NYSDEC-permitted solid waste disposal facility.

The presence of any separate-phase product or sheen in any IDW will be interpreted to preclude classification as a non-hazardous IDW regardless of dissolved-phase concentrations. Anticipated hazardous soil or liquid IDW will be contained in 55-gallon drums for subsequent characterization analyses and management based on the results of characterization analyses. Soil or liquid IDW determined to be a hazardous waste by knowledge of the process generating the waste, existing laboratory analytical data, and/or additional waste characterization analyses will be properly transported and disposed of off site at a RCRA-permitted disposal facility. The subject IDW drums will be marked with the accumulation start date and a "hazardous waste" sticker, and RCRA waste characterization (sampling and analysis) will be performed as required by the off-site disposal facility. All hazardous waste disposals will comply with ANG policy.

PROJECT SCHEDULE AND DELIVERABLES

The current comprehensive project schedule is presented as Figure 9. The results of the Supplemental Remedial Investigation will be compiled, summarized, and presented in a Supplemental Remedial Investigation Technical Memorandum. The technical memorandum will document the estimated vertical and lateral extent of affected soil source at Site 15 and groundwater east of Fairway Drive, and will provide the basis for determining the area requiring remediation. The technical memorandum will be submitted to ANG, NYSDEC, NYSDOH, and other interested parties for review and comment.

Task 4.1 of the schedule corresponds to the Supplemental Remedial Investigation described in this work plan. Additional details relating to Task 4.1 are presented below.

Workplan Preparation and Governmental Reviews	5/2/07 to 7/20/07
Preparation and Mobe	7/23/07 to 8/3/07
Remediation Investigation – Field Work	8/6/07 to 8/31/07
Draft Technical Memorandum	9/3/07 to 10/5/07
Final Technical Memorandum	10/8/07 to 11/9/07

SECTION 14.0

REFERENCES CITED

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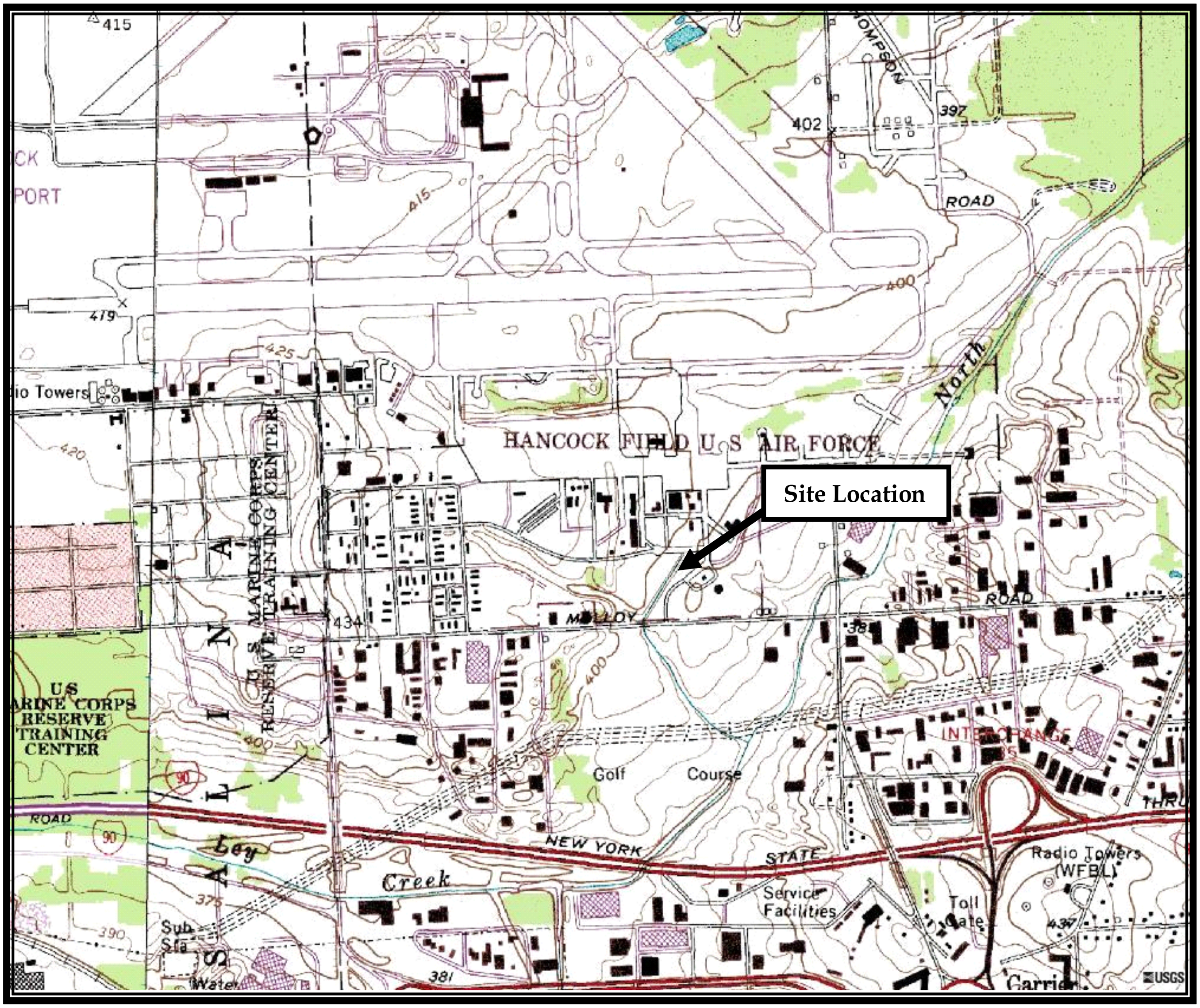
USEPA, 1996. Low-flow (minimal drawdown) groundwater sampling procedures. United States Environmental Protection Agency Groundwater Issue, Office of Research and Development and Office of Solid Waste and Emergency Response, EPA/540/S-95/504, 12 pp.

FIGURES



Syracuse West Quadrangle
New York
7.5 Minute Series

SCALE 1 : 24,000

1 .5 0 1 MILE

CONTOUR INTERVAL 20 FEET

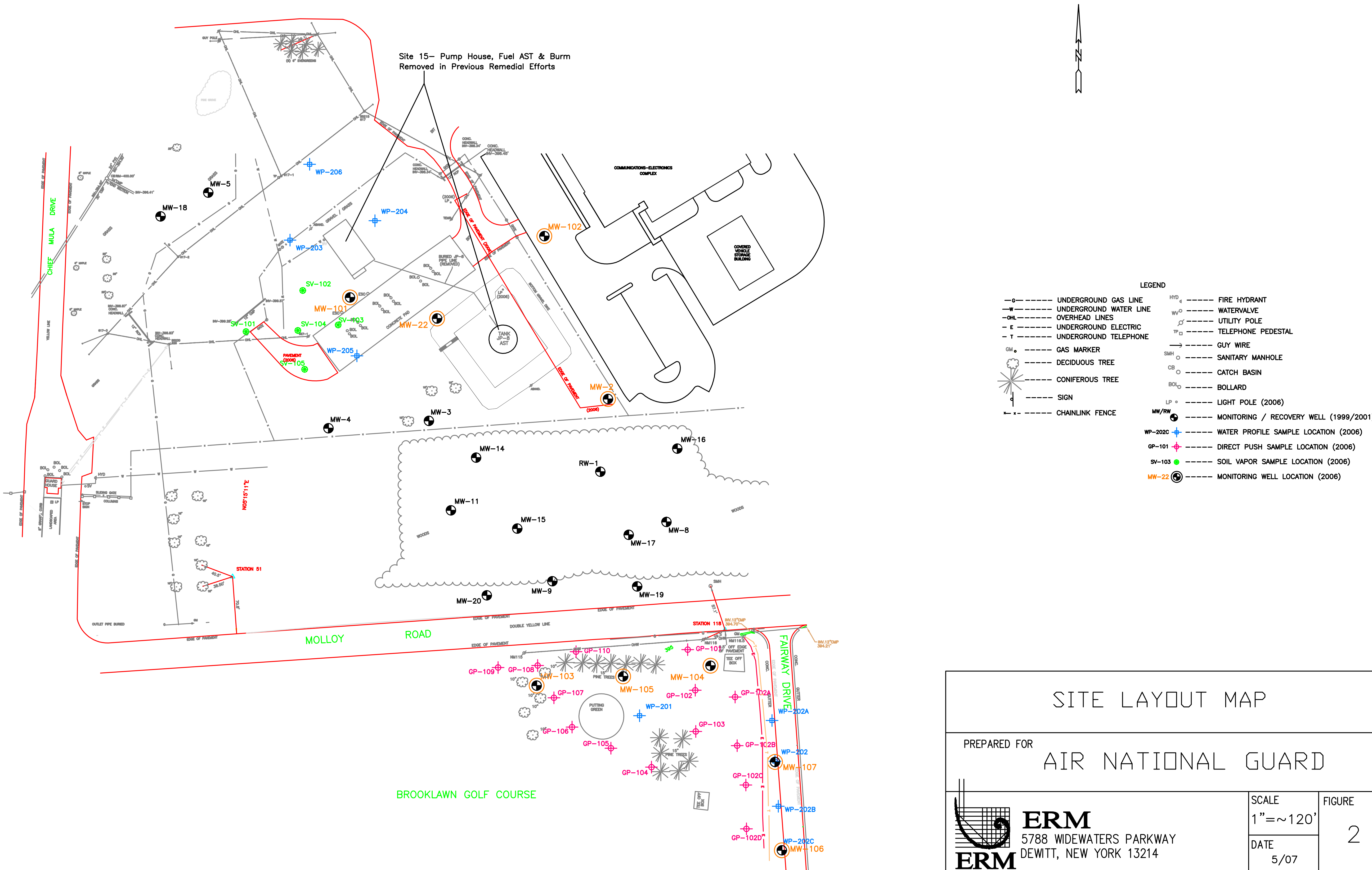
Site Location Map
174th Fighter Wing of the ANG
Syracuse, NY

PREPARED FOR
Air National Guard

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
NTS	1
DATE 5/07	

0066227



SITE LAYOUT MAP

PREPARED FOR

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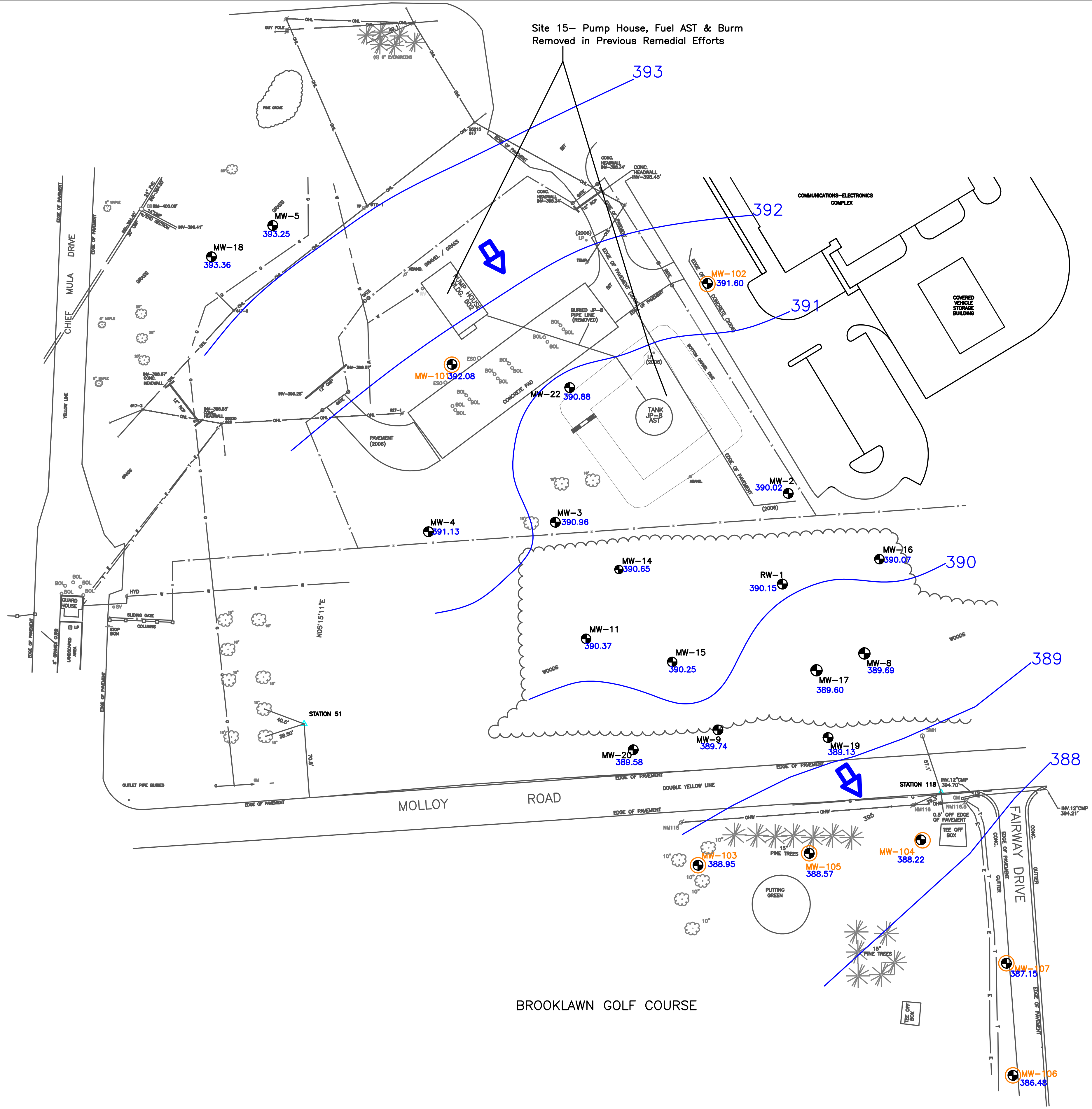
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
1"=~120'	2
DATE 5/07	

PROJECT #0066227



LEGEND

—G— UNDERGROUND GAS LINE	HYD FIRE HYDRANT
—W— UNDERGROUND WATER LINE	WV WATERVALVE
—OHL— OVERHEAD LINES	UTILITY POLE
— E — UNDERGROUND ELECTRIC	TP TELEPHONE PEDESTAL
— T — UNDERGROUND TELEPHONE	GUY WIRE
GM GAS MARKER	SMH SANITARY MANHOLE
DECIDUOUS TREE	CB CATCH BASIN
CONIFEROUS TREE	BOL BOLLARD
SIGN	LP LIGHT POLE (2006)
CHAINLINK FENCE	MW/RW MONITORING / RECOVERY WELL (1999/2001)
	WP–202C WATER PROFILE SAMPLE LOCATION (2006)
	GP–101 DIRECT PUSH SAMPLE LOCATION (2006)
	SV–103 SOIL VAPOR SAMPLE LOCATION (2006)
	MW–22 MONITORING WELL LOCATION (2006)
	389 GROUNDWATER CONTOUR (FEET
	GROUND WATER FLOW DIRECTION

STATIC GROUNDWATER CONTOUR MAP– NOV06

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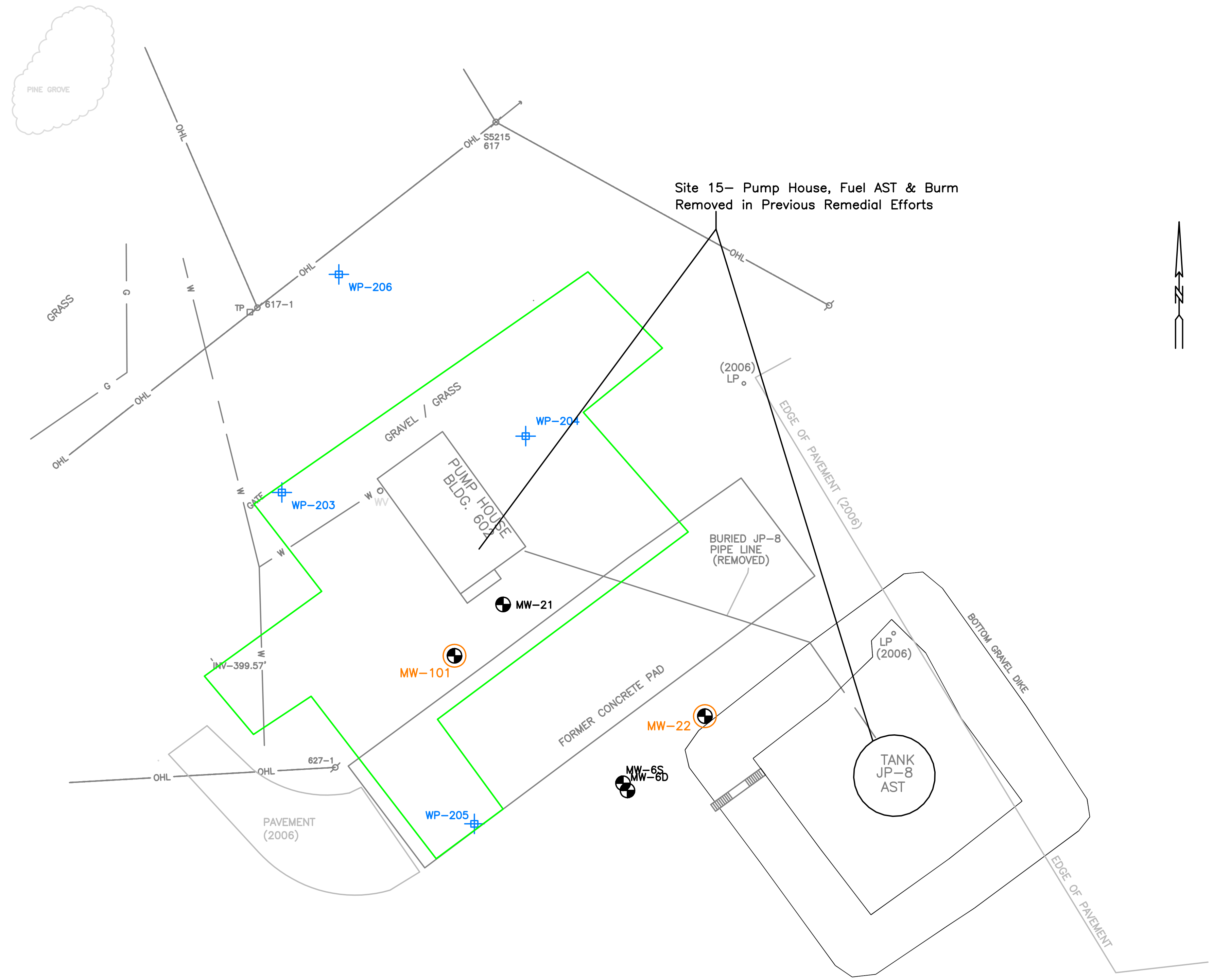
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE 1"=~120'
DATE 6/07
FIGURE 3

PROJECT #0066227



SUMMARY OF PERTINENT FIELD DATA PROXIMAL TO MW-101 IN SITE 15 AREA				
BoringLocation/ ID	WP-203	WP-204	WP-205	MW-101
Ground Elevation	401.31	401.76	402.05	401.58
Elevation of Elevated VOC Detected in Vadous	392.23	395.76	396.55	396.58
Range VOC Detected in Vadous Zone (ppm)	0.4-44.2	44.7-198	32.6-199	4.8-295
Elevation of Saturated Zone	391.23	392.76	392.55	392.08
Zone of VOC Detected above Vadous (Ft)	1	3	4	4.5

HISTORICAL GROUND WATER ELEVATIONS PROXIMAL TO MW-101 IN SITE 15 AREA					
Monitoring Well ID	MW-22	MW-21	MW-101	MW-6S	MW-6D
Top of Casing	401.11	402.17	401.58	400.62	400.28
Date					
23-Jan-01	391.41	391.86	NM	391.14	390.88
11-Apr-2005	392.58	NM	NM	NM	NM
28-Sep-2005	389.26	NM	NM	NM	NM
6-Nov-2006	390.88	NM	392.08	NM	NM

LEGEND

- WV ----- WATERVALVE
- ----- UTILITY POLE
- LP ----- LIGHT POLE (2006)
- MW/RW ----- MONITORING WELL(1999/2001)
- WP–202C ----- WATER PROFILE SAMPLE (2006)
- MW–22 ----- MONITORING WELL (2006)
- ----- ESTIMATED EXTENT OF BTEX AFFECTED SOIL
- G ----- UNDERGROUND GAS LINE
- W ----- UNDERGROUND WATER LINE
- OHL ----- OVERHEAD LINES
- x ----- CHAINLINK FENCE

SUMMARY OF BTEX DATA AT SITE 15

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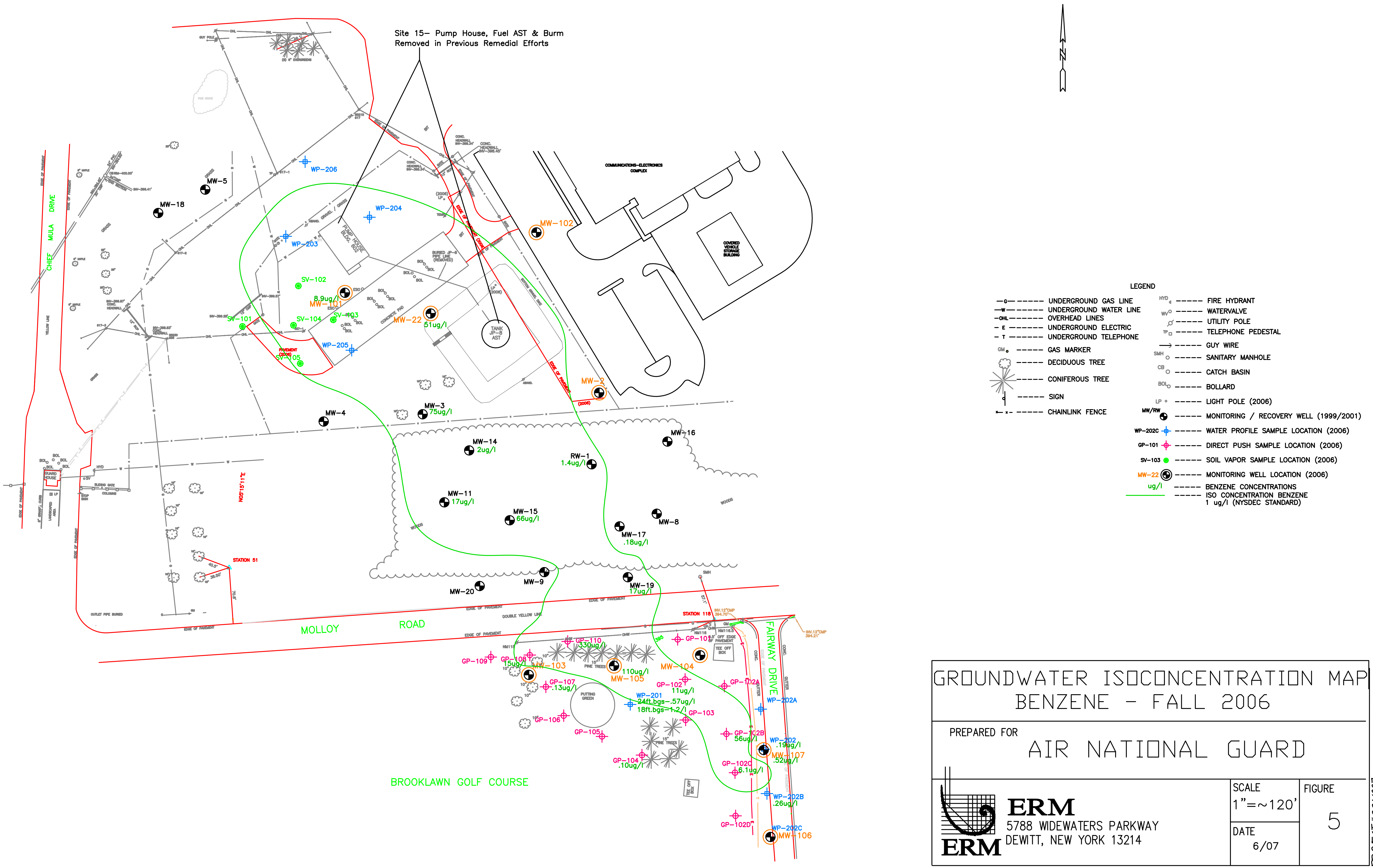
ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE 1"=~58'

DATE 6/07

FIGURE 4

PROJECT #0066227



GROUNDWATER ISOCONCENTRATION MAP
BENZENE – FALL 2006

PREPARED FOR
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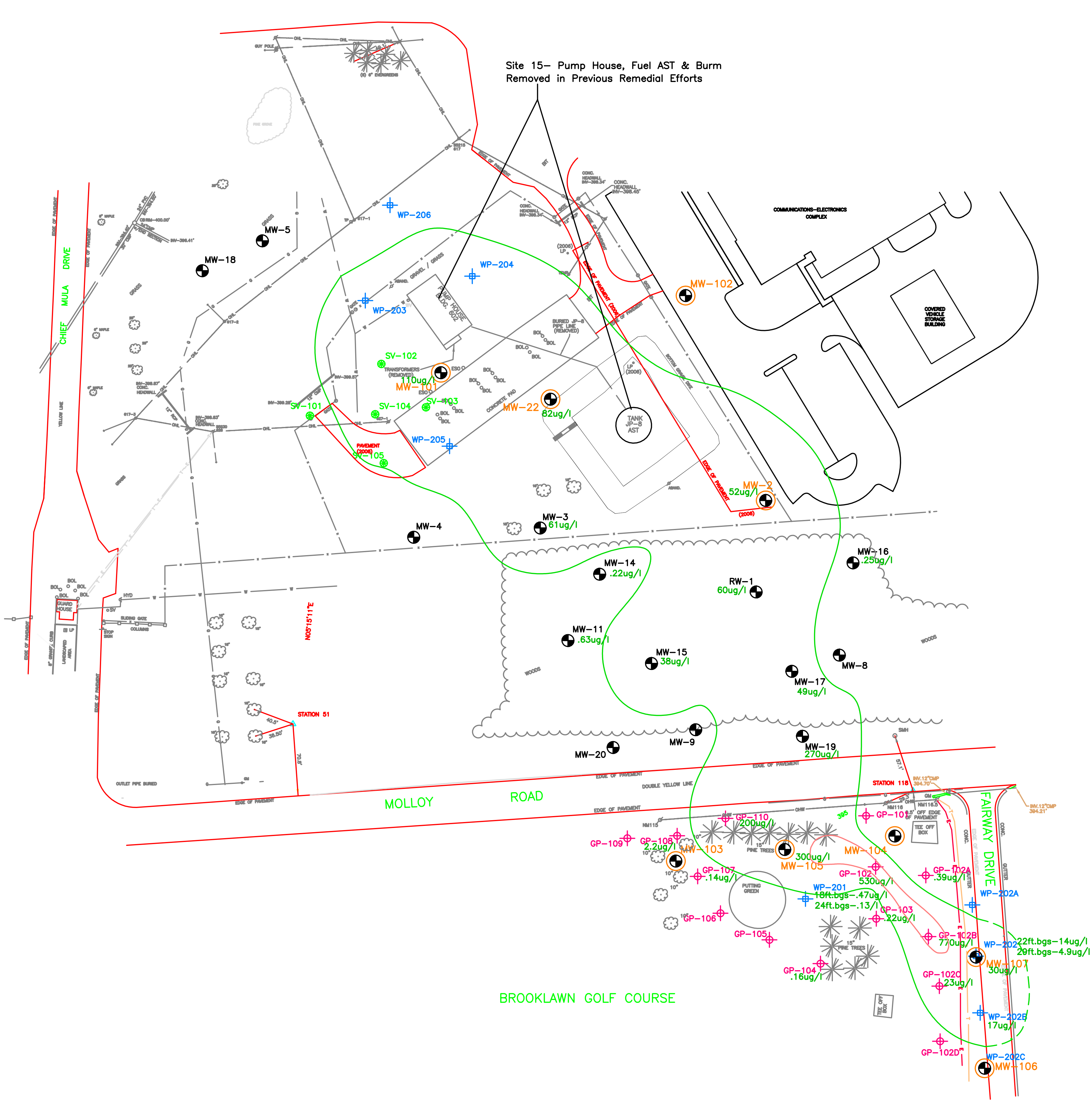
ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE 1"=~120'
DATE 6/07
FIGURE 5

PROJECT #0066227



LEGEND

- UNDERGROUND GAS LINE
- UNDERGROUND WATER LINE
- OVERHEAD LINES
- UNDERGROUND ELECTRIC
- UNDERGROUND TELEPHONE
- GAS MARKER
- DECIDUOUS TREE
- CONIFEROUS TREE
- SIGN
- CHAINLINK FENCE
- FIRE HYDRANT
- WATERVALVE
- UTILITY POLE
- TELEPHONE PEDESTAL
- GUY WIRE
- SANITARY MANHOLE
- CATCH BASIN
- BOLLARD
- LIGHT POLE (2006)
- MW/RW — MONITORING / RECOVERY WELL (1999/2001)
- WP–202C — WATER PROFILE SAMPLE LOCATION (2006)
- GP–101 — DIRECT PUSH SAMPLE LOCATION (2006)
- SV–103 — SOIL VAPOR SAMPLE LOCATION (2006)
- MW–22 — MONITORING WELL LOCATION (2006)
- ug/l — ETHYL BENZENE CONCENTRATIONS
- ISOCONCENTRATION ETHYLBENZENE 5ug/l (NYSDEC STANDARD)
- INFERRED ISOCONCENTRATION OF BROOKLAWN GOLF COURSE PROPERTY
- ISOCONCENTRATION XYLENE 500 ug/l

GROUNDWATER ISOCONCENTRATION MAP
ETHYL BENZENE – FALL 2006

PREPARED FOR

AIR NATIONAL GUARD

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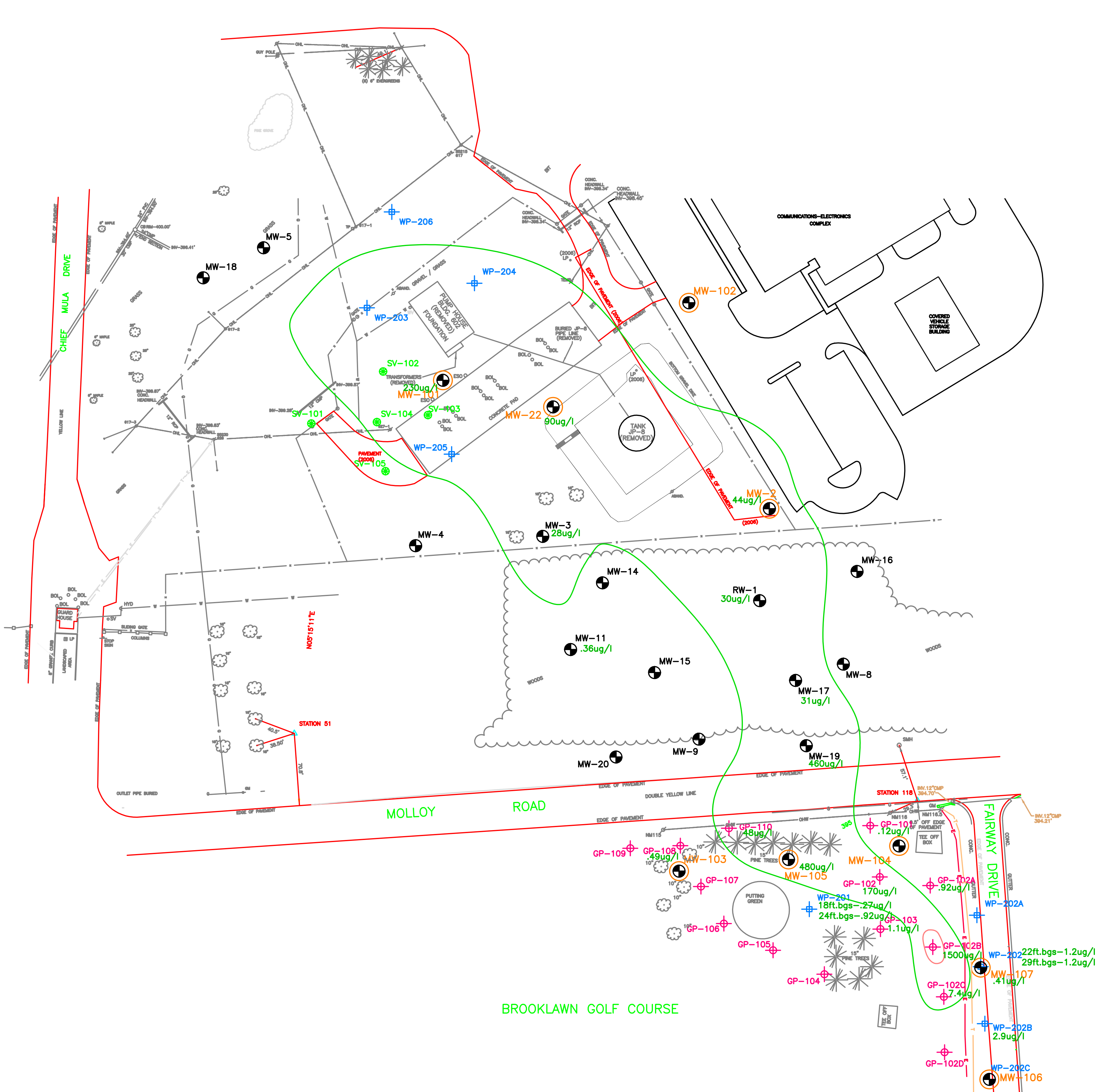
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
1"=~120'	6
DATE 6/07	

PROJECT #0066227



LEGEND

—G—	UNDERGROUND GAS LINE	HYD	FIRE HYDRANT
—W—	UNDERGROUND WATER LINE	WV	WATERVALVE
—OHL—	OVERHEAD LINES		UTILITY POLE
— E	UNDERGROUND ELECTRIC	TP	TELEPHONE PEDESTAL
— T	UNDERGROUND TELEPHONE		GUY WIRE
GM	GAS MARKER	SMH	SANITARY MANHOLE
	DECIDUOUS TREE	CB	CATCH BASIN
	CONIFEROUS TREE	BOL	BOLLARD
	SIGN	LP	LIGHT POLE (2006)
—x—x—	CHAINLINK FENCE	MW/RW	MONITORING / RECOVERY WELL (1999/2001)
		WP-202C	WATER PROFILE SAMPLE LOCATION (2006)
		GP-101	DIRECT PUSH SAMPLE LOCATION (2006)
		SV-103	SOIL VAPOR SAMPLE LOCATION (2006)
		MW-22	MONITORING WELL LOCATION (2006)
		ug/l	XYLENE CONCENTRATIONS
			ISOCONCENTRATION XYLENE 5ug/l (NYSDEC STANDARD)
			ISOCONCENTRATION XYLENE 1,000ug/l

GROUNDWATER ISOCONCENTRATION MAP XYLENE– FALL 2006

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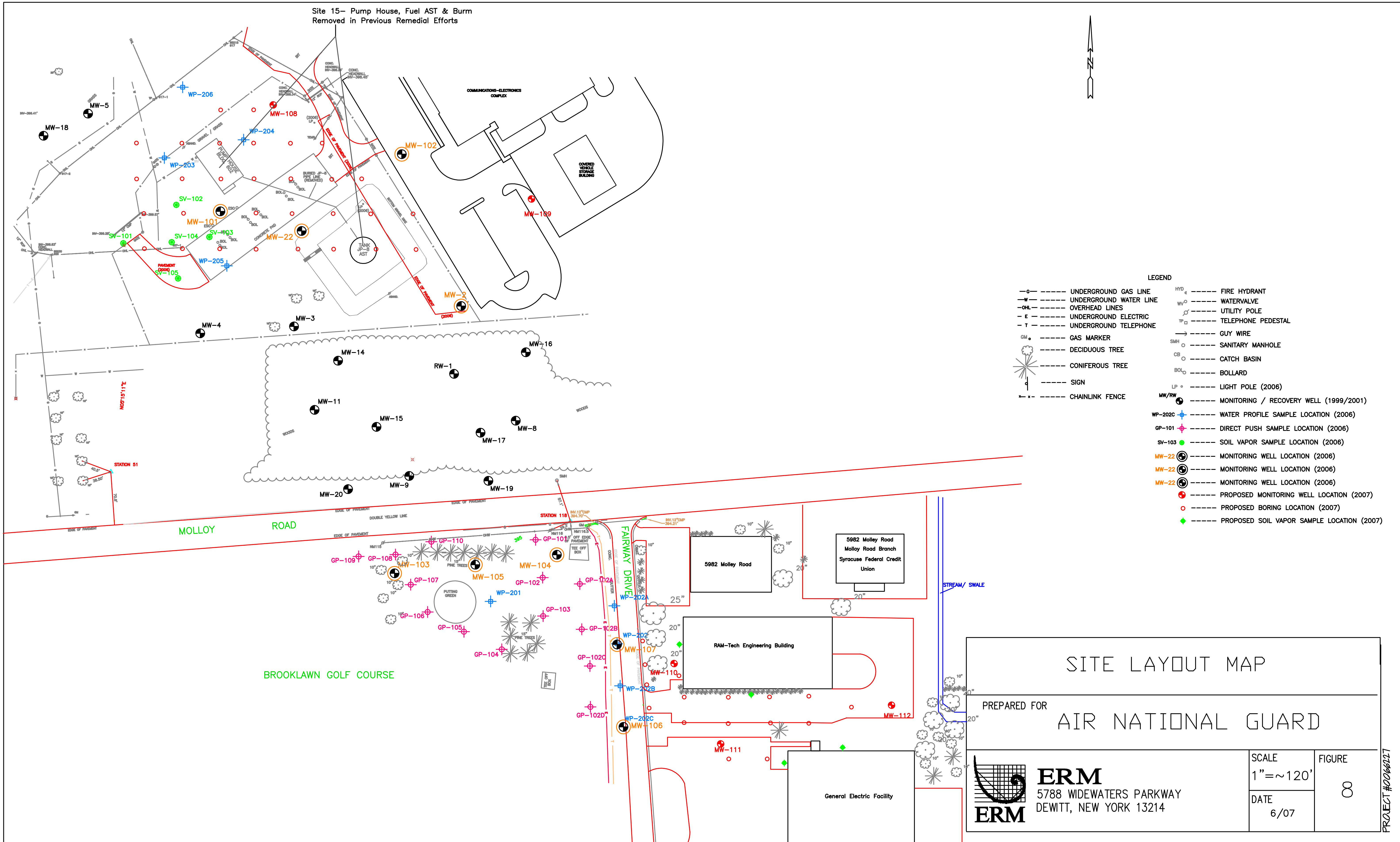
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
1"=~120'	7
DATE 6/07	

PROJECT #0066227


Site 15– Pump House, Fuel AST & Burm
Removed in Previous Remedial Efforts
N
COMMUNICATIONS–ELECTRONICS COMPLEX
COVERED VEHICLE STORAGE BUILDING
TANK JP–8 AST
MW–5
MW–18
WP–206
MW–108
WP–204
WP–203
MW–102
SV–102
MW–101
SV–101
SV–104
SV–103
MW–22
WP–205
SV–105
MW–109
MW–2
MW–4
MW–3
MW–14
RW–1
MW–16
MW–11
MW–15
MW–8
MW–17
MW–20
MW–9
MW–19
STATION 51
STATION 118
MOLLOY ROAD
FAIRWAY DRIVE
GP–109
GP–108
MW–103
GP–110
GP–101
MW–104
MW–105
GP–107
GP–102
GP–102A
WP–201
WP–202A
GP–106
GP–105
GP–103
GP–102B
WP–202
MW–107
GP–104
GP–102C
MW–110
WP–202B
GP–102D
WP–202C
MW–106
MW–111
MW–112
BROOKLAWN GOLF COURSE
5982 Molley Road
5982 Molley Road
Molley Road Branch
Syracuse Federal Credit Union
RAM–Tech Engineering Building
General Electric Facility
STREAM/ SWALE
LEGEND
UNDERGROUND GAS LINE
UNDERGROUND WATER LINE
OVERHEAD LINES
UNDERGROUND ELECTRIC
UNDERGROUND TELEPHONE
GAS MARKER
DECIDUOUS TREE
CONIFEROUS TREE
SIGN
CHAINLINK FENCE
FIRE HYDRANT
WATERVALVE
UTILITY POLE
TELEPHONE PEDESTAL
GUY WIRE
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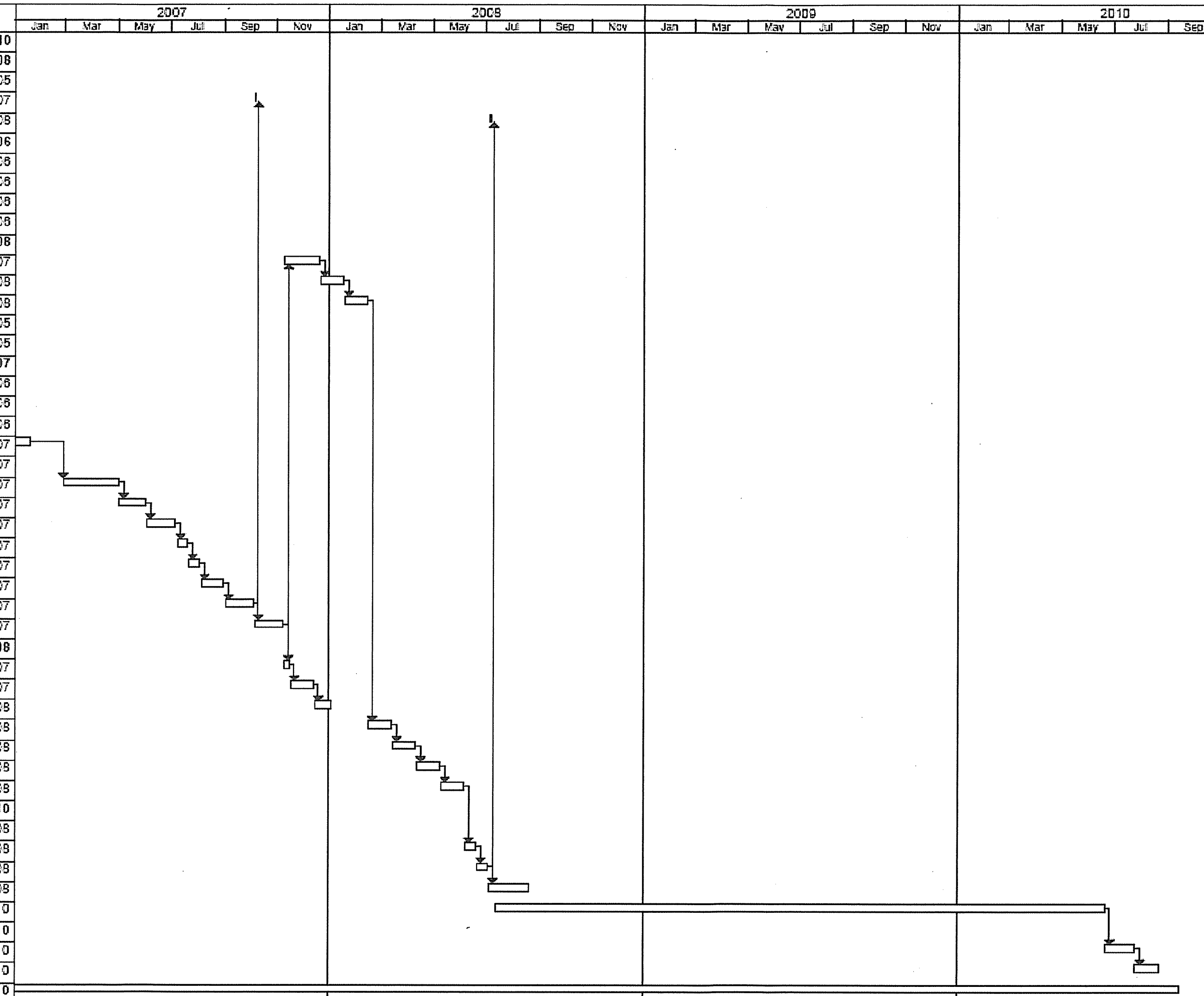
CATCH BASIN
BOLLARD
LIGHT POLE (2006)
MONITORING / RECOVERY WELL (1999/2001)
WATER PROFILE SAMPLE LOCATION (2006)
DIRECT PUSH SAMPLE LOCATION (2006)
SOIL VAPOR SAMPLE LOCATION (2006)
MONITORING WELL LOCATION (2006)
MONITORING WELL LOCATION (2006)
MONITORING WELL LOCATION (2006)
PROPOSED MONITORING WELL LOCATION (2007)
PROPOSED BORING LOCATION (2007)
PROPOSED SOIL VAPOR SAMPLE LOCATION (2007)
SITE LAYOUT MAP
PREPARED FOR
AIR NATIONAL GUARD
ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214
SCALE
1"=~120'
DATE
6/07
FIGURE
8
PROJECT #0066227

Air National Guard
Hancock ANG Base
Site 15 Interim Remedial Action
Syracuse, NY

ID	Task Name	Duration	Start	Finish
1	**Air National Guard - Interim Remedial Action**	**1456 days**	**Wed 2/16/05**	**Wed 9/15/10**
2	**Task 1- Meetings**	**884 days**	**Wed 2/16/05**	**Mon 7/7/08**
3	*Task 1A - Initial Kickoff Meeting*	2 days	Wed 2/16/05	Thu 2/17/05
4	Task 1B - Plume Delineation Summary Meeting	1 day	Mon 10/8/07	Mon 10/8/07
5	Task 1C - Site Inspection Meeting	1 day	Mon 7/7/08	Mon 7/7/08
6	**Task 2 - Workplan**	**412 days**	**Thu 3/10/05**	**Fri 10/6/06**
7	Contract Modifications	297 days	Thu 3/10/05	Fri 4/28/06
8	Task 2A - Draft Workplan and ANG Review	114 days	Mon 2/13/06	Thu 7/20/06
9	Task 2B - Draft Final Workplan and ANG/NYSDEC Review	40 days	Fri 7/21/06	Thu 9/14/06
10	Task 2C - Final Workplan and NYSDEC Approval	16 days	Fri 9/15/06	Fri 10/6/06
11	**Task 3 - Design of Remedial Action**	**745 days**	**Mon 4/11/05**	**Fri 2/15/08**
12	Task 3A - 35% Design	30 days	Mon 11/12/07	Fri 12/21/07
13	Task 3A - 85% Design	20 days	Mon 12/24/07	Fri 1/18/08
14	Task 3A - Final Design	20 days	Mon 1/21/08	Fri 2/15/08
15	*Task 3B - April 2005 GW Sampling and Analysis*	20 days	Mon 4/11/05	Fri 5/6/05
16	*Task 3B - September 2005 GW Sampling and Analysis*	20 days	Wed 9/28/05	Tue 10/25/05
17	**Task 4 - Plume Delineation and Technical Memorandum**	**74 days**	**Mon 10/9/06**	**Thu 1/18/07**
18	*Preparations/Mobilization*	5 days	Mon 10/9/06	Fri 10/13/06
19	*Task 4A - Plume Delineation*	20 days	Mon 10/16/06	Fri 11/10/06
20	*Task 4B - Draft Technical Memorandum*	15 days	Mon 11/13/06	Fri 12/1/06
21	*Task 4C - Final Technical Memorandum*	34 days	Mon 12/4/06	Thu 1/18/07
22	**Task 4.1 - Supplemental Remedial Investigation**	184 days	Tue 2/27/07	Fri 11/9/07
23	Obtain New Delivery Order	46 days	Tue 2/27/07	Tue 5/1/07
24	Task 4.1A - Draft Workplan and ANG Review	23 days	Wed 5/2/07	Fri 6/1/07
25	Task 4.1B - Draft Final Workplan and ANG/NYSDEC Review	25 days	Mon 6/4/07	Fri 7/6/07
26	Task 4.1C - Final Workplan and NYSDEC Approval	10 days	Mon 7/9/07	Fri 7/20/07
27	Preparations/Mobilization	10 days	Mon 7/23/07	Fri 8/3/07
28	Task4.1D - Supplemental RI Field Work	20 days	Mon 8/6/07	Fri 8/31/07
29	Task 4.1E - Draft Technical Memorandum	25 days	Mon 9/3/07	Fri 10/5/07
30	Task 4.1F - Final Technical Memorandum	25 days	Mon 10/8/07	Fri 11/9/07
31	**Task 5 - Focused Feasibility Study, Proposed Plan and ROD**	**150 days**	**Mon 11/12/07**	**Fri 6/6/08**
32	Preparations	5 days	Mon 11/12/07	Fri 11/16/07
33	Task 5A - Draft Focused Feasibility Study (FFS)	20 days	Mon 11/19/07	Fri 12/14/07
34	Task 5B - Final FFS	15 days	Mon 12/17/07	Fri 1/4/08
35	Task 5C - Draft Proposed Plan (PP)	20 days	Mon 2/18/08	Fri 3/14/08
36	Task 5D - Final PP	20 days	Mon 3/17/08	Fri 4/11/08
37	Task 5E - Draft Record of Decision (ROD)	20 days	Mon 4/14/08	Fri 5/9/08
38	Task 5F - Final ROD	20 days	Mon 5/12/08	Fri 6/6/08
39	**Task 6 - Remedial Action-Construction (RA-C) Implementation**	**531 days**	**Mon 6/9/08**	**Mon 6/21/10**
40	Task 6A - RA-C Implementation	55 days	Mon 6/9/08	Fri 8/22/08
41	In-Situ Remediation at Leading Edge of Plume	10 days	Mon 6/9/08	Fri 6/20/08
42	In-Situ Biodegradation at the Base Property Boundary	10 days	Mon 6/23/08	Fri 7/4/08
43	Soil - Source Area Control	35 days	Mon 7/7/08	Fri 8/22/08
44	Task 6B - Quarterly Monitoring and Reporting	506 days	Mon 7/14/08	Mon 6/21/10
45	**Task 7 - RA-C Completion Report (CR)**	**45 days**	**Tue 6/22/10**	**Mon 8/23/10**
46	Task 7A - Draft RA-C CR	25 days	Tue 6/22/10	Mon 7/26/10
47	Task 7B - Final RA-C CR	20 days	Tue 7/27/10	Mon 8/23/10
48	**Task 8 - Monthly Progress Reports**	**1456 days**	**Wed 2/16/05**	**Wed 9/15/10**



Date: Thu 5/10/07 — Task — Task Progress — Baseline — Progress Report/Meeting ◆

ENVIRONMENTAL RESOURCES MANAGEMENT

0020534/ANG Project Schedule [May-07].mpp

Project Schedule
Site 15 Interim Remedial Action
Syracuse, NY

PREPARED FOR Air National Guard

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE XX

DATE 5/07

FIGURE 9

TABLES

TABLE 1`
SUMMARY OF GROUNDWATER ELEVATION DATA
SITE 15- 174th FIGHTER WING AIR NATIONAL GUARD
HANCOCK FIELD, SYRACUSE, NY
NYSDEC SITE NUMBER 734054
ERM PROJECT NUMBER 0066227

Well ID	MW-2	MW-3	MW-4	MW-5	MW-8	MW-9	MW-11	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	MW-22	RW-1
Top of Casing	399.45	399.91	399.80	400.34	398.00	396.15	399.69	402.92	402.17	402.18	400.33	400.10	396.35	397.81	401.11	400.11
Date																
11-Apr-2005	391.17	391.72	391.99	394.76	389.28	390.97	390.14	391.45	390.95	390.71	390.24	394.32	389.66	390.22	392.58	390.87
28-Sep-2005	388.33	388.44	388.67	390.52	387.63	386.99	388.05	388.20	388.00	388.05	387.49	391.12	387.10	387.47	389.26	387.92
6-Nov-2006	390.02	390.96	391.13	393.25	389.69	389.74	390.37	390.65	390.25	390.07	389.60	393.36	389.13	389.58	390.88	390.15

Well ID	MW-101	MW-102	MW-103	MW-104	MW-105	MW-106	MW-107
Top of Casing	401.58	400.70	397.74	394.43	396.38	388.54	391.85
Date							
11-Apr-2005	NM	NM	NM	NM	NM	NM	NM
28-Sep-2005	NM	NM	NM	NM	NM	NM	NM
6-Nov-2006	392.08	391.60	388.95	388.22	388.57	386.48	387.15

NOTES:
- Top of casing provided by others.
- Measurements reported in feet.

NM - Not measured.
NA - Not Applicable.

TABLE 2
SUMMARY OF GROUNDWATER ANALYTICAL DATA- DPI FALL 2006
SITE 15- 174th FIGHTER WING AIR NATIONAL GUARD
HANCOCK FIELD, SYRACUSE, NY
NYSDEC SITE NUMBER 734054
ERM PROJECT NUMBER 0066227

WELL ID	GP-101	GP-102	GP-102A	GP-102B	GP-102C	GP-102D	GP-103	GP-104	GP-105	GP-106	GP-107	GP-108	GP-109	GP-110	NYSDEC STANDARDS
Depth Bgs (ft)	15	18	18	19	19	20	17	18	18.5	18.5	17.5	21	28	18	NA
Screen Interval	11-15	14-18	14-18	15-19	15-19	19.5-20	13-17	14-18	14.5-18.5	14.5-18.5	13.5-17.5	17-21	24-28	14-18	NA
Ground Elevation	394.27	393.5	294.3	391.85	392.59	392.67	393.37	396.23	397.02	397.6	397.74	397.72	397.49	397.26	NA
Sample Elevation	379.27	375.5	276.3	372.85	373.59	372.67	376.37	378.23	378.52	379.1	380.24	376.72	369.49	379.26	NA
Sample Date/ Time	10/16/06 11:25	10/16/06 13:15	10/19/06 11:45	10/19/06 10:20	10/19/06 13:10	10/30/06 11:00	10/16/06 14:45	10/17/06 8:45	10/17/06 10:25	10/17/06 11:55	10/17/06 13:25	10/18/06 11:15	10/18/06 13:15	10/18/06 14:45	NA
VOCs (ug/l)															
BENZENE	----	**11**	----	**56**	**6.1**	----	----	0.10 J	----	----	0.13 J	**15**	----	**330**	1
ETHYL BENZENE	----	**530 J**	0.39 J	**770**	**23**	----	0.22 J	0.16 J	----	----	0.14 J	2.2	----	**200**	5
TOLUENE	----	0.66 J	0.54 J	---	0.36 J	----	----	0.11 J	----	0.15 J	0.15 J	0.25 J	0.18 J	----	5
XYLENE	0.12 J	**170 J**	0.92 J	**1500**	**7.4**	----	1.1	----	----	----	----	0.49 J	----	**48**	5
MTBE	----	----	----	----	0.29 J	0.28 J	----	----	----	----	----	----	----	----	10

WELL ID	WP-201	WP-201	WP-202	WP-202	WP-202A	WP-202B	WP-202C	WP-206	NYSDEC STANDARDS
Depth Bgs (ft)	24	18	22	29	20	18	18	19	NA
Screen Interval	20-24	14-18	18-22	25-29	19.5-20	17.5-18	17.5-18	18.5-19	NA
Ground Elevation	396.26	396.26	392.24	392.24	393.42	390.42	388.9	401.23	NA
Sample Elevation	372.26	378.26	370.24	363.24	373.42	372.42	370.9	382.23	NA
Sample Date/ Time	10/19/06 8:15	10/19/06 8:40	10/19/06 14:40	10/19/06 14:15	10/30/06 12:55	10/30/06 14:25	10/1/06 8:45	11/7/06 11:25	NA
VOCs (ug/l)									
BENZENE	0.57 J	1.2	0.19 J	----	----	0.26 J	----	----	1
ETHYL BENZENE	0.13 J	0.47 J	**14**	4.9	----	**17**	----	----	5
TOLUENE	0.13 J	0.28 J	0.36 J	0.37 J	----	----	----	----	5
XYLENE	0.27 J	0.92 J	1.2	1.2	----	2.9	----	----	5
MTBE	0.35 J	0.25 J	----	----	----	----	0.37 J	----	10

NOTES:

ug/L = Micrograms per liter

NYSDEC Standards - NYS Division of Water Technical and Operational Guidance Series (1.1.1) 1998

The MTBE ground water stardard is from NYSDEC's TAGM 8086

VOCs - volatile organic compounds determined by USEPA Method 8260

---- = the compound was not detected at a concentration above the laboratory reporting limit

NA - not applicable

- Bold white type with black background indicates exceedance of the NYSDEC Standards or Guidance Value

WP- Water Profile Grab Sample

GP- Geoprobe Hydropunch or SP-16 Grab Sample

WP- 203, WP-204 & WP-205 were advanced to further delineate Site 15, ground water samples were not collected due to sheen on soil, elevated PID reading during screen and strong "petroleum like" odor

TABLE 3
SUMMARY OF GROUNDWATER ANALYTICAL DATA - FALL 2006
SITE 15- 174th FIGHTER WING AIR NATIONAL GUARD
HANCOCK FIELD, SYRACUSE, NY
NYSDEC SITE NUMBER 734054
ERM PROJECT NUMBER 0066227

WELL ID	MW-2	MW-3	MW-4	MW-5	MW-8	MW-9	MW-11	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	MW-22	RW-1	NYSDEC STANDARDS
VOCs (ug/l)																	
BENZENE	----	**75**	----	----	----	----	**17**	**2**	**66**	----	0.18J	----	**17J**	----	**51**	**1.4J**	1
ETHYL BENZENE	**52**	**61**	----	----	----	----	0.63J	0.22J	**38**	0.25J	**49**	----	**270**	----	**82**	**60**	5
TOLUENE	----	0.34J	----	----	----	----	0.11J	----	----	0.38J	----	----	----	----	0.34J	0.4J	5
XYLENE	**44**	**28**	----	----	----	----	0.36J	----	----	----	**31**	----	**460**	----	**90**	**30**	5
MTBE	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	10
NATURAL ATTENUATION PARAMETERS (mg/l)																	
NITRATE	0.17	----	----	0.28	----	0.1	----	----	----	0.11	----	0.83	----	----	0.3	----	NA
SULFATE	37	4	8.9	11	42	20	22	45	27	99	41	13	11	240	41	170	NA
ALKALINITY	380	300	240	340	250	270	260	370	290	520	320	320	240	370	370	310	NA
TOTAL HARDNESS	350	230	180	270	370	83	370	380	380	480	370	300	330	300	340	380	NA
AMMONIA	----	0.065	----	----	----	0.12	0.042	0.2	0.11	5.1	0.13	----	0.75	0.03	0.1	1.1	NA
METHANE	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	NA
PARAMETERS MEASURED IN THE FIELD																	
FERROUS IRON	0.9	2.2	0	0	1	1.05	1.6	NM	2.95	NM	3.2	0	2.2	1.2	NM	NM	NA
pH	8.26	6.77	8.26	6.68	4.58	6.41	4.51	7.33	7.2	7.15	7.01	7.13	4.66	4.69	5.19	6.8	NA
DISSOLVED OXYGEN	0.29	2.79	0	0.77	10.9	0	11.36	0	0	0	0	0	10.95	11.17	9.55	0	NA
OXIDATION REDUCTION POTENTIAL	-76	-8	-46	121	271	0.43	270	-121	-153	-19	-98	185	267	261	226	-200	NA
CONDUCTIVITY	1.4	0.76	0.391	0.577	0	0.83	0	0.91	0.99	3.06	0.9	0.986	0	0	0	12.1	NA
FIELD OBSERVATIONS	----	Odor	----	----	----	----	----	Odor	Odor	----	----	----	----	----	----	Odor	----

NOTES:

ug/L = Micrograms per liter
mg/L= Milligrams per liter
VOCs - volatile organic compounds determined by USEPA Method 8260
NYSDEC Standards - NYS Division of Water Technical and Operational Guidance Series (1.1.1) 1998
The MTBE ground water stardard is from NYSDEC's TAGM 8086
- Bold white type with black background indicates exceedance of the NYSDEC Standards or Guidance Value
---- = the compound was not detected at a concentration above the laboratory reporting limit
Natural Attenuation Parameters are used to characterize the physical, chemical and biological response of a hydrologic system to contamination.
Dissolved Oxygen, Oxidation Reduction Potential, pH and conductivity were measured in the field using a Horiba U-22 and flow through cell just prior to collecting samples.
Ferrous Iron concentration were measured using a HACH Test Kit
Ferrous Iron and DO are reported in mg/L
pH is reported in standard units
Oxidation Reduction Potential is reported in mV
Conductivity is reported in ms/cm
Odor = "Petroleum-like" odor
Sheen= Sheen on purge water and/or sample

TABLE 3 (Continued)
SUMMARY OF GROUNDWATER ANALYTICAL DATA - FALL 2006
SITE 15- 174th FIGHTER WING AIR NATIONAL GUARD
HANCOCK FIELD, SYRACUSE, NY
NYSDEC SITE NUMBER 734054
ERM PROJECT NUMBER 0066227

WELL ID	MW-101	MW-102	MW-103	MW-104	MW-105	MW-106	MW-107	NYSDEC STANDARDS
VOCs (ug/l)								
BENZENE	**8.9**	----	----	----	**110**	----	0.52J	1
ETHYL BENZENE	**110**	----	----	----	**300**	----	**30**	5
TOLUENE	----	----	----	----	----	----	----	5
XYLENE	**230**	----	----	----	**480**	----	0.41J	5
MTBE	----	----	----	----	----	0.34J	----	10
NATURAL ATTENUATION PARAMETERS (mg/l)								
NITRATE	0.72	0.13	0.34	0.38	0.11	----	1.1	NA
SULFATE	44	50	27	39	6.3	28	17	NA
ALKALINITY	380	430	250	330	270	420	290	NA
TOTAL HARDNESS	430	550	310	440	370	430	360	NA
AMMONIA	0.12	----	----	0.13	0.054	----	0.099	NA
METHANE	----	----	----	----	----	----	----	NA
PARAMETERS MEASURED IN THE FIELD								
FERROUS IRON	2.8	0.6	1.2	0.2	2.2	0	1.6	NA
pH	5.15	4.89	4.65	7.27	4.64	7.32	5	NA
DISSOLVED OXYGEN	9.84	9.9	10.92	0	11.09	0	10.45	NA
OXIDATION REDUCTION POTENTIAL	238	267	275	-51	272	-20	255	NA
CONDUCTIVITY	0	0	0	1.49	0	1.66	0	NA
FIELD OBSERVATIONS	Odor/sheen	----	----	----	Odor/sheen	----	----	----

NOTES:

ug/L = Micrograms per liter
mg/L= Milligrams per liter
VOCs - volatile organic compounds determined by USEPA Method 8260
NYSDEC Standards - NYS Division of Water Technical and Operational Guidance Series (1.1.1) 1998
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Odor = "Petroleum-like" odor
Sheen= Sheen on purge water and/or sample

APPENDIX A

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN FOR THE SUPPLEMENTAL INVESTIGATION WORK PLAN

*Adapted from Parsons Engineering Science's ***Health and Safety Plan for Site 15 at Hancock Field Syracuse, NY*** dated December 2000.

Site 15 Interim Remedial Action
174th Fighter Wing of the Air National Guard
Hancock Air National Guard Base
Town of Dewitt
Onondaga County, New York

New York State Department of Environmental Conservation
Site Number 734054

July 2007

ERM Project Number 0066227

Prepared by:

Environmental Resources Management
5788 Widewaters Parkway
Dewitt, NY 13214

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FIGURES

LIST OF ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
AMSL	Above Mean Sea Level
ANG	Air National Guard
CFR	Code of Federal Regulations
CRC	Contamination Reduction Corridor
CRZ	Contamination Reduction Zone
EPA	Environmental Protection Agency
FID	Flame Ionization Detector
HSP	Health and Safety Plan
IDLH	Immediately Dangerous to Life or Health
IRP	Installation Restoration Plan
KV	Kilovolts
LEL	Lower Explosive Limit
MSDS	Material Safety Data Sheets
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbon
PEL	Permissible Exposure Limit
PID	Photoionization Detector
PPE	Personal Protective Equipment
SCBA	Self-Contained Breathing Apparatus
SIC	Standard Industrial Classification
SVOC	Semivolatile Organic Compound
TLV	Threshold Limit Value
TPH	Total Petroleum Hydrocarbons
UV	Ultraviolet
VOC	Volatile Organic Compound
WBGT	Wet Bulb Globe Temperature

SECTION 1

INTRODUCTION

1.1 PURPOSE AND SCOPE

This document is a site-specific Health and Safety Plan (HSP) for a supplemental investigation as part of an Interim Remedial Action (IRA) at Site 15 at Hancock Field in Syracuse, New York (Figure 1 of Work Plan). This plan describes rules and procedures that ERM (contractor) personnel will follow to perform their duties safely, competently, and in compliance with all applicable federal, state, and local statutes and regulations. Nothing in this plan operates to relieve the contractor or its subcontractors of its responsibilities for the safety and health of its workers and compliance with this plan. Subcontractors are required to provide their own HSP, which must meet the requirements outlined in this HSP at a minimum.

This plan provides the health and safety guidance for protecting workers during operations governed by the Occupational Safety and Health Administration (OSHA) contained in the 29 Code of Federal Regulations (CFR) Section 1910.120. Managerial, professional, and technical personnel should use this plan as a guide to proper health and safety procedures while working at this Air National Guard base.

1.2 HEALTH AND SAFETY PLAN OVERVIEW

This Health and Safety Plan has the following objectives:

- Promote a safe and healthful work environment.
- Minimize the risk of human, environmental, and economic losses resulting from accidents.
- Comply with safety and health laws, regulations, and policies.
- Perform health and safety tasks efficiently.
- Satisfy ANG program needs.

Successful implementation of this plan requires cooperation between contractor personnel and ANG staff. All contractor personnel are expected to accept the responsibility to use all materials and equipment properly, to follow work procedures and rules, and to aid field supervisors in identifying and correcting unsafe conditions.

All ERM personnel are required to read and abide by this project specific HSP and sign a plan acceptance form (Figure 1.1). This form will be kept in the project files.

1.3 HAZARD IDENTIFICATION

Unsafe and unhealthy conditions at Site 15 will be identified through one or more of the following:

- Investigating and observing work areas and work practices and looking for present or potential health and safety problems
- Investigating work-related injuries and illness (or near-misses) to identify problems that need correction
- Evaluating worker suggestions or complaints

This site-specific HSP includes the following sections:

- A description of the site and tasks to be performed
- A description of the site or work area history
- A route to the hospital
- A site-specific or task-specific hazard assessment that includes identification and characterization of potential physical and chemical hazards
- Monitoring requirements and establishment of exposure limits for specific chemical parameters
- Personal protective equipment for each task
- Work site safety requirements
- Site control guidelines
- Exposure precautions
- Site entry guidelines
- Decontamination guidelines
- Waste handling and disposal guidelines

- Contingency plans
- Specific task guidelines (such as confined space entry)
- An approval statement
- HSP acceptance forms
- Attachments

This site-specific HSP is subject to review and approval by the site manager.

1.4 PROJECT WORK SCOPE OVERVIEW

ERM will conduct a supplemental investigation as part of an IRA to addresses tasks necessary to accomplish the characterization and delineation of the extent of BTEX-affected ground water at Site 15, including both on-Site and off-Site portions of the affected area. Results derived from additional investigation at the Site will be presented to NYSDEC and other interested parties in an Addendum to the FS Report. The resulting data will be used to expand on the remedial alternative(s), besides soil removal, selected in the Final Feasibility Study Report for the 174th Fighter Wing, Hancock Air National Guard Base (ANGB), Syracuse New York, February 2002, and monitor or enhance natural attenuation of contaminants in the groundwater. The scope of the groundwater monitoring and investigation program includes quarterly groundwater level measurements and sampling from the 22 existing monitoring wells, the installation of 5 or 6 permanent monitoring wells, a direct push delineation, a soil vapor investigation (otional), and hydrogeologic testing. Quality assurance/quality control (QA/QC) samples will be collected (refer to Work Plan and QAPP). Ground water samples shall be submitted for laboratory analysis at EPA QA Level III. Laboratory analysis shall include standard turn-around time. Supplemental investigation locations are indicated in Figure 8 of the Work Plan.

1.5 SITE DESCRIPTION

The below site description information was obtained from the *Proposed Remedial Action Plan for Hancock Air National Guard Site 15* (Parsons, 2004).

Site 15 is part of land used by the 174th Fighter Wing of the New York Air National Guard. The entire site located within the Air National Guard Base at Hancock Field directly adjacent to the Syracuse Hancock Airport. The Air National Guard facility at Hancock Field is bordered by the Town of Dewitt to the east and south, the Town of Salina to the west, and the Town of Cicero to the north. Syracuse International Airport is located directly to the north of the Air National Guard facility (Parsons, 2004).

Site 15 is approximately 2.5 acres in area consisting of brush vegetation, wooded vegetation in the southern portion adjacent to Molloy Road, a large concrete pad, a bermed area where a 215,000-gallon aboveground tank was formerly located, and two drainage swales. One drainage swale borders the site on its north-northeast side, and a second drainage swale is located along the west side of the site. The drainage swales contain water only intermittently following storm events. Water within the drainage swales does not appear to be hydraulically connected to underlying groundwater (Parsons, 2004).

Several site structures were removed as part of a removal action for PCB-impacted soils. The foundation of the former pump house and associated underground structures, consisting of six underground tanks, three drainage sumps, and an oil-water separator were recently removed. Additionally, a transformer pad adjacent to the southeast side of the former pump house was removed (Parsons, 2004).

1.6 SITE HISTORY

The POL area at Site 15 was constructed in 1951 and used until 1999 when it was decommissioned and a new POL area was constructed. When the area was actively used, it was the site of the Jet Fuel Transfer Pump house (Building 602), a 215,000-gallon AST, six 25,000 USTs, and equipment for transferring JP-4 to the tanks. In 1999, the pump house was demolished, the AST was cleaned and removed, and the USTs were cleaned and filled in place.

Three spills have reportedly occurred at the site:

- In the 1980s, PCBs were released, possibly from the transformers located in front of the pump house (Radian, 1994).
- In April 1990, 3,850 gallons of JP-4 were released inside the pump house. Some of the fuel reportedly flowed out of the building (Radian, 1994, and M&E, 1995).
- In June 1994, 150 gallons of JP-8 overflowed onto the ground from USTs under the northeast side of the building. The spill was reportedly contained with absorbent pads before it was able to exit through the drainage ditch on the east side of the site (M&E, 1995, and Aneptek, 1999).

Following the April 1990 release, contaminated surface soil was removed and the excavation area was backfilled with crushed stone. During cleanup, an oil-water separator and three area drainage sumps with PCB-contaminated sediment were discovered. The oil-water separator was installed in the 1950s, but was never connected to a holding tank. Product emptied into a drywell and eventually drained into the underlying soil. Spilled fuel had entered the sumps and mixed with the PCB-contaminated sediment, which is believed to have accumulated in the sumps before 1971 (Radian, 1994).

During ERM's investigation associated with the January 2007 Technical Memorandum (TM), elevated PID readings were noted in the soil above the groundwater table at location MW-101 (within the former pump house area at Site 15),. The presence of a mass of residual petroleum in soil above the groundwater table could have a significant negative effect on the effectiveness of the contemplated groundwater remediation involving treatment of only the saturated zone. ERM concluded that an area of affected unsaturated zone soil is present in the former pump house area (i.e., the reported source area) of Site 15.

The results of the plume delineation indicated that BTEX-affected groundwater had been adequately delineated on the Brooklawn Golf Course (BGC) property. However, available data also suggested that relatively low concentrations of BTEX have migrated further downgradient to at least one additional property beyond the BGC property.

Review of laboratory analytical results from this plume delineation indicated that benzene, ethylbenzene, and xylenes were detected in on-site and off-site groundwater at concentrations above ambient groundwater quality standards and guidance values established by NYSDEC. Toluene and MTBE were not detected at concentrations above applicable standards, criteria, and guidance (SCGs) in any of the wells sampled during the plume delineation, suggesting that toluene and MTBE are not compounds of potential concern at Site 15 or the BGC property. Three significant areas with benzene, ethylbenzene, or xylene concentrations above applicable SCGs were noted during the completion of the plume delineation study. These three areas include:

1. The source area at Site 15 (near the former pump house and surrounding areas);
2. Area just north of Molloy Road near the base boundary; and
3. Area just south of Molloy Road on the BGC property.

ERM recommended additional delineation of affected soil be performed in the source area near the former pump house to more accurately estimate the extent and volume of affected soil in the unsaturated zone.

ERM also recommended delineation of the full extent of the BTEX plume on property that is on the east side of Fairway Drive. Collection of these additional data should allow for preparation of a more complete Focused FS Report and Record of Decision (ROD).

Figure 1.1
Plan Acceptance Form
Project Health and Safety Plan

(For ERM and subcontractor employees only)

I have read and agree to abide by the contents of the Work Plan and Health and Safety Plan for the following project:

__________________________ ____________________________

(Project Title) (Project Number)

Furthermore, I have read and am familiar with the work plan or proposal which describes the field work to be conducted and the procedures to be utilized in the conduct of this work.

Name (print)	Signature	Date

Place in project Health and Safety File as soon as possible.

SECTION 2

PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 ORGANIZATION

This section describes the responsibilities of all onsite personnel associated with the New York Air National Guard (ANG) at Hancock Field. Principal Contractor personnel associated with this project are listed in Table 2.1.

2.2 RESPONSIBILITIES

The Program Manager designates a Health and Safety Program Manager to establish and implement a Health and Safety Plan (HSP). The Program Manager and ANG shall review and approve this site-specific HSP. The Program Manager shall ensure that the Health and Safety Program Manager updates the plan annually, at a minimum. The Program Manager and the ANG must approve any revisions to this plan.

2.2.2 Project Manager

The Project Manager reports to the Program Manager, has authority to direct response operations, and assumes total control over project activities.

The Project Manager is responsible for the following:

- Obtaining permission for site access and coordinating activities with appropriate officials
- Briefing the field teams on their specific assignments
- Using the Program Health and Safety Manager and the Site Health and Safety Coordinator to ensure that safety and health requirements are met
- Serving as the liaison with public officials
- Ensuring that the project budget is adequate for the necessary health and safety procedures and equipment
- Ensuring that the plan satisfies all federal, state, and local statutes, regulations, and ordinances concerning health and safety

- Developing training materials
- Setting up and conducting necessary training programs
- Conducting audits to ensure compliance with the health and safety program
- Updating the health and safety plan and program to meet new requirements and technologies
- Maintaining program records
- Reviewing and approving project health and safety plans for certain hazardous operations (e.g., Levels A and B activities, drum opening operations, etc)
- Reviewing subcontractor HSPs

2.2.3 Site Health and Safety Coordinator

The Site Health and Safety Coordinator reports to the Program Health and Safety Manager and advises the Field Manager and Program Health and Safety Manager of all unusual aspects of health and safety on site. The Site Health and Safety Coordinator is authorized to stop work if any operation threatens worker and/or public health or safety. The Site Health and Safety Coordinator is also responsible for the following:

- Inspecting protective clothing and equipment periodically
- Ensuring that protective clothing and equipment are properly stored and maintained
- Controlling entry and exit at the access points
- Coordinating safety and health program activities with the Program Health and Safety Manager
- Monitoring the work parties for signs of stress such as cold exposure and heat stress
- Implementing the site safety plan
- Conducting periodic inspections to determine if the site safety plan is being followed
- Knowing emergency procedures and evacuation routes;
- Posting telephone numbers of emergency medical help, local hospitals, the poison control center, the fire department, and the police department
- Notifying, when necessary, local public emergency officials
- Coordinating emergency medical care

- Setting up decontamination solutions appropriate for the type of chemical contamination onsite
- Controlling the decontamination of all equipment, personnel, and samples
- Assuring the proper disposal of contaminated clothing and materials
- Ensuring that all required equipment is available
- Advising medical personnel of potential exposures and consequences
- Notifying emergency response personnel by telephone or radio in the event of an emergency

2.2.4 Field Team

All work parties must consist of a minimum of two people. All field team members must comply with the Program HSP as well as this site-specific HSP. Field team members are to report any suspected unsafe conditions to the site health and safety coordinator and stop working if emergency conditions arise.

2.2.5 Subcontractors

Subcontractors must be trained in accordance with 29 CFR Section 1910.120 prior to their admittance to the site and must comply with the training requirements specified in Section 6 of this HSP to the extent they will be performing work under the contractor's direction. **As with all subcontractors, the responsibility for protecting the health and safety of subcontractor employees rests with the subcontractor; therefore, the subcontractor must submit an HSP to the Health and Safety Manager that identifies safety procedures for the field activities to be performed. Before beginning any field activity, the subcontractor must provide to the site health and safety coordinator documentation of necessary training and proof of participation in a medical monitoring program.** This documentation will be kept in the project file.

TABLE 2.1

CONTRACTOR IRP PERSONNEL

Client Sponsor	Jody Murata (301) 836-8120
Project Manager	David W. Myers (518) 461-8936
Program Health and Safety Manager	Ernest Sweet (315) 445-2554
Field Manager	Robert Sents (315) 445-2554
Site Health and Safety Coordinator	Robert Sents (315) 445-2554

SECTION 3
EMERGENCY RESPONSE PLAN

3.1 PERSONNEL ROLES AND LINES OF AUTHORITY

The Site Health and Safety Coordinator or Program Health and Safety Manager supervises the field team to ensure they are meeting health and safety requirements. If deficiencies are noted, work is stopped and corrective action is taken (e.g., purchase of additional safety equipment). Reports of health and safety deficiencies and the corrective action taken is forwarded to the Project Manager and Program Health and Safety Manager.

All contractor personnel receive site-specific health and safety training before starting any site activities. On a day-to-day basis, workers should watch for indicators of potentially hazardous situations and for signs and symptoms in themselves and others that warn of hazardous conditions and exposures. Emergencies can be averted by rapid recognition of dangerous situations. Before assigning daily tasks, tailgate safety meetings will be held by the Site Health and Safety Coordinator. Discussion should include:

- Tasks to be performed
- Time constraints (e.g., work period duration and rest breaks)
- Hazards that may be encountered, including their effects, how to recognize symptoms or monitor them, and danger signals
- Emergency procedures
- Communication

3.2 EMERGENCY CONTACTS

In the event of any situation or unplanned occurrence requiring assistance, the appropriate contact(s) should be made from the list below. For emergency situations, contact should first be made with the site coordinator who will notify emergency personnel who will then contact the appropriate response teams. This emergency contacts list must be in an easily accessible location at the site.

Contingency Contacts	Phone Number
Nearest phone located onsite	(315) 454-6111 (Tim Sager)
Fire Department	911
Sheriff	911
Ambulance Service	911

Poison Control Center (Syracuse, PA)	(315) 476-4766 (800) 252-5655
Pollution Toxic Chemical Oil Spills	(800) 424-8802

Medical Emergency

Hospital Name	SUNY Upstate Medical University Hospital
Hospital Phone Number	(315) 464-5611, Emergency (adult)
Hospital Address	750 East Adams Street Syracuse, NY 13210
Travel Time from Site	16 minutes
Map to Hospital	Figure 3.1

3.3 HOSPITAL EMERGENCY ROUTE

Directions to the hospital are shown on Figure 3.1 and are as follows:

- Turn LEFT out of ANG base onto MOLLOY ROAD, heading EAST
- Turn RIGHT onto THOMPSON ROAD
- Bear LEFT onto SR 298 (THOMPSON ROAD)
- Bear RIGHT onto COURT STREET ROAD
- Turn LEFT onto NORTH MIDLER AVENUE
- Turn RIGHT onto SR 290 (JAMES STREET)
- Turn LEFT onto TEAL AVENUE
- Turn RIGHT onto RAMP TO I-690
- Bear RIGHT onto I-690
- Turn LEFT onto RAMP TO US 11 (NORTH STATE STREET)
- Turn LEFT onto US 11 (NORTH STATE STREET)
- Turn LEFT onto EAST ADAMS STREET

ERM ES Contacts

Project Manager: David W. Myers	(518) 461-8936
Health & Safety Officer: Ernest Sweet	(315) 445-2554

Figure 3.1 Route to Hospital

3.4 EMERGENCY PROCEDURES

3.4.1 Introduction

If an emergency develops on site, the procedures delineated in this site-specific HSP are to be immediately followed. This site-specific HSP adheres to procedures established in the program health and safety plan. Emergency conditions exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure
- A condition occurs that is more hazardous than anticipated
- Fires, explosions, structural collapses/failures, and/or unusual weather conditions (thunderstorms, lightning, high winds, etc.) occur.

If an emergency occurs, direct voice communication is used to sound the alarm. If personnel are out of range of direct voice communication, an emergency warning signal will be sounded. General emergency procedures and specific procedures for personal injury are described within this section. A list of emergency contacts are provided above and must be posted conspicuously on site.

3.4.2 General Emergency Procedures

The emergency procedures are as follows:

- Notify the contact identified in the emergency contact table of this HSP when an emergency occurs. This list is should be posted prominently at the site.
- Use the "buddy" system (pairs).
- Maintain visual contact between "pairs." Each team member should remain close to the other to assist in case of emergencies.
- If any member of the field crew experiences any adverse effects or symptoms of exposure, the entire field crew will immediately halt work and act according to the instructions provided by the Site Health and Safety Coordinator.
- Any condition that suggests a situation more hazardous than anticipated will result in evacuating the field team and re-evaluating the hazard and the level of protection required.
- If an accident occurs, the Site Health and Safety Coordinator is to complete an Accident Report Form (See Figure 3.2). Follow-up action will be taken to correct the situation that caused the accident.

3.4.3 Injuries and Illnesses

In case of personal injury at the site, follow the procedures listed below:

- Field team members or onsite emergency medical technicians trained in first aid will administer treatment to an injured worker if appropriate.
- The victim will be transported to the nearest hospital or medical center if necessary. An ambulance will be called to transport the victim if needed.
- The Site Health and Safety Coordinator is responsible for the completion of an Accident Report Form.

3.4.4 Fire or Explosion

Health and Safety Coordinator shall:

- Notify the paramedics and/or fire department, as necessary.
- Signal the evacuation procedure outlined in this HSP and implement the entire procedure.
- Isolate the area.
- Stay upwind of any fire.
- Keep area surrounding the problem source clear after the incident occurs.

3.4.5 Hazardous Materials Release

In the event of a spill, immediately contact the local hazardous response team. Emergency contacts, numbers, lines of authority, and evacuation routes are provided above. Federal, state, and local planning or response groups must also be notified.

3.4.6 Standard Safe Work Practices

The following are considered standard safe work practices:

1. Eating, drinking, chewing tobacco, smoking and carrying matches or lighters are prohibited in a contaminated or potentially contaminated area or where the possibility for the transfer of contamination exists.
2. Avoid contact with potentially contaminated substances. Do not walk through puddles, pools, mud, etc. Avoid, whenever possible, kneeling on the ground, leaning or sitting on equipment or ground. Do not place monitoring equipment on potentially contaminated surfaces (i.e., ground, etc.).
3. Acknowledge crew member senses which alert to potentially dangerous situations in which they should not become involved (i.e., presence of strong and irritating or nauseating odors).
4. Prevent spills to the extent possible. In the event that a spill occurs, contain liquid if possible.
5. Field crew members shall be familiar with the physical characteristics of investigations, including:

- Wind direction in relation to nearby buildings
- Accessibility to associates, equipment, vehicles communication
- Hot zone (areas of known or suspected contamination)
- Site access
- Nearest water sources

6. All wastes generated during activities onsite should be disposed of as directed by the project manager or onsite Health and Safety Coordinator.
7. Protective equipment as specified in Section 7 will be utilized by workers during the excavation and confirmatory sampling procedures.

3.4.7 Personal Protective Equipment Failure

Before donning PPE, workers should fully inspect all PPE. If PPE fails during site work, evacuate the area, remove and dispose of equipment, and replace it with new equipment.

3.5 ACCIDENT/INCIDENT REPORTING

Reporting and investigation of accidents are important parts of any health and safety program. They provide safety personnel with the means for objective evaluation of the progress and effectiveness of the health and safety program. Additionally, they allow the safety officer to identify problem areas where preventive measures can be taken. For corrective or preventive measures to be effective, reports on the causes of the accident must be unbiased. The purpose of an accident report is to obtain information, not to affix blame.

The Occupational Safety and Health Act (OSHA) requires that certain elements be included in all accident reports (29 CFR Part 1094). These elements are met by the contractor's Accident Report Form (Figure 3.2). The Project Manager or Project Health and Safety Manager is responsible for the documentation of all field injuries. Information concerning a field injury must be reported to the Contractor Program Health and Safety Manager as soon as possible.

Figure 3.2
Accident Report Form

Project Name:____

INJURED OR ILL EMPLOYEE

1. Name ____________________ Social Security #____________

   (First) (Middle) (Last)

2. Home Address ______________________________________

   (No. and Street) (City or Town) (State and Zip)

3. Age _____ 4. Sex: Male ( ) Female ( )

5. Occupation ______________________________________

   (Specific job title, not the specific activity employee was performing at time of injury)

6. Department ______________________________________

   (Enter name of department in which injured person is employed, even though they may have been temporarily working in another department at the time of injury)

EMPLOYER

7. Name ______________________________________

8. Mailing Address ______________________________________

   (No. and Street) (City or Town) (State and Zip)

9. Location (if different from mailing address):____________________

   ____

THE ACCIDENT OR EXPOSURE TO OCCUPATIONAL ILLNESS

10. Place of accident or exposure ______________________________

    (No. and Street) (City or Town) (State and Zip)

11. Was place of accident or exposure on employer's premises? __(Yes/No)

FIGURE 3.2 (CONT'D)
ACCIDENT REPORT FORM

12. What was the employee doing when injured?________________________________

(Be specific - was employee using tools or equipment or handling material?)

13. How did the accident occur? ____

(Describe fully the events that resulted in the injury or occupational illness. Tell what happened and how. Name objects and substances involved. Give details on all factors that led to accident. Use separate sheet if needed)

14. Time of accident: ________________

15. Date of injury or initial diagnosis of occupational illness _____________
(Date)

16. WITNESS TO ACCIDENT

(Name)	(Affiliation)	(Phone No.)
(Name)	(Affiliation)	(Phone No.)
(Name)	(Affiliation)	(Phone No.)

OCCUPATIONAL INJURY OR OCCUPATIONAL ILLNESS

17. Describe the injury or illness in detail; indicate part of body affected.

FIGURE 3.2 (CONT'D)
ACCIDENT REPORT FORM

18. Name the object or substance which directly injured the employee. (For example, object that struck employee; the vapor or poison inhaled or swallowed; the chemical or radiation that irritated the skin; or in cases of strains, hernias, etc., the object the employee was lifting, pulling, etc.)

____

____

19. Did the accident result in employee fatality? ________ (Yes or No)

20. Number of lost workdays ____/restricted workdays _____ resulting from injury or illness?

OTHER

21. Did you see a physician for treatment? ________ (Yes or No) ________ (Date)

22. Name and address of physician ______________________________________

____

(No. and Street) (City or Town) (State and Zip)

23. If hospitalized, name and address of hospital __________________________

____

(No. and Street) (City or Town) (State and Zip)

Date of report ____________________ Prepared by ___________________

Official position ___________________________

SECTION 4
TASK HAZARD ANALYSIS

4.1 TASK HAZARD ANALYSIS

While working on hazardous waste sites on ANG bases, contractor personnel are likely to encounter chemical and physical hazards. These hazards are associated primarily with preparation for sampling and/or remediation activities. The chemical and physical hazards are detailed in Section 5. The site-specific activity analysis for the proposed soil sampling and monitoring well installation and sampling is provided below.

4.1.1 Soil and Groundwater Sampling

Hazards of handling soil or groundwater while sampling include potential exposure to chemicals. Employees may be working next to an active drill rig, so drilling safety applies to their activities. Other hazards include risk of slip, trip and fall, lacerations and contusions, noise-induced hearing loss from exposure to excessive noise from a drill rig or generator. Employees shall keep clothing dry with adequate rain gear. Use proper personal protective clothing, to include splash protection if baling by hand during sampling. Inspect equipment to ensure that it is proper working order. All handling of potentially contaminated soils or groundwater will begin in Level D with careful monitoring of the sampler's breathing zone using the Photoionization Detector (PID). Outer nitrile and inner latex gloves will be included in standard Level D requirements whenever handling samples.

Refer to the following references:

29 CFR 1926.200	Accident Prevention Signs and Tags
29 CFR 1926.201	Signaling
29 CFR 1926.202	Barricades
29 CFR 1926.600	Equipment
29 CFR 1926.601	Motor Vehicles
29 CFR 1926.602	Material Handling Equipment

4.1.2 Drilling/Monitoring Well Installation

Chemical exposure typically occurs as drill cuttings are brought to the surface. Drill cuttings and split spoon samples will be screened with a PID. If contaminant levels reach action limits as specified in Section 8, upgrades in personal protection will be initiated. Drill cuttings may be containerized as they accumulate in order to control volatile emissions in the driller's breathing zone and to prevent release of chemical vapors off site. Drillers and geologists on site within 50 feet of the drill rig shall start work in Level D PPE and will include use of hearing protection when the rig is operational.

SECTION 5
SAFETY AND HEALTH ANALYSIS

5.1 CHEMICAL HAZARDS

The chemicals of primary concern that may be encountered and may be associated with Site 15 will be those originating from previous jet fueling activities and storage of PCB-containing transformers. Compounds of primary concern include BTEX, several SVOCs, and PCBs. Other compounds were also detected, but did not exceed soil criteria. These compounds can be taken into the body by oral ingestion, by absorption through the skin, and by inhalation. Action Levels for Site 15 are discussed in Section 8.11.

In addition to the chemicals that may be present on site, personnel may bring chemicals onto the site (e.g., for equipment decontamination) that could pose health hazards. Material Safety Data Sheets (MSDSs) for these chemicals will be brought on site when used.

5.2 PHYSICAL HAZARDS

5.2.1 Subsurface Hazards

Before any excavation or drilling operations are performed, efforts must be made to determine if underground installations (e.g., sewers, telephone, water, fuel, electrical lines or liners) will be encountered, and, if so, where such underground installations are located. Utility companies and/or facility engineering shall be contacted before starting any subsurface activities and information concerning buried utilities shall be obtained.

5.2.2 Motor Vehicles and Heavy Equipment

Working adjacent to heavy equipment can be a major hazard at a site. Injuries can result from equipment hitting or running over personnel, or from the overturning of vehicles. Vehicles and heavy equipment design and operation will be according to 29 CFR Subpart O, 1926.600 through 1926.602. In particular, the following precautions shall be used by the subcontractor to help prevent injuries and accidents:

- Brakes, hydraulics lines, light signals, fire extinguishers, fluid levels, steering, tires, horn, and other safety devices will be checked and recorded on a log sheet at the beginning of each week.
- Heavy equipment will not be backed up unless the vehicle has a reverse signal alarm audible above the surrounding noise level or a signal man is present.

Because heavy equipment can be an ignition source, spark arrestors will be included on all heavy equipment as standard equipment. These will prevent sparks from the engine igniting potentially explosive atmospheres. All heavy equipment will be inspected for the presence of spark arrestors prior to performing work on the site.

5.2.3 Overhead Electrical Lines

Precautions will be exercised when drilling near any overhead electrical lines. The minimum clearance between overhead electrical lines of 50 kilovolts (KV) or less and the drill rig is 10 feet. For line rated over 50 KV, the Field Manager will verify that the minimum clearance between the line and any part of the rig is 10 feet plus 0.4 inch for each KV over 50 KV. The site Health and Safety Coordinator will contact the utility company to determine the kilovolts of electrical lines.

5.2.4 Noise-Induced Hearing Loss

Planned activities at Site 15 involve the use of heavy equipment. The unprotected exposure of site workers to this noise during activities can result in noise-induced hearing loss. The site Health and Safety Coordinator will ensure that either earmuffs or disposal foam earplugs are made available to all personnel near sources of high intensity noise.

5.2.5 Slip, Trip, and Fall Hazard

Site 15 may contain slip, trip, and fall hazards for site workers, such as:

- Holes, pits or ditches
- Slippery surfaces
- Steep grades
- Uneven grades
- Sharp object, such as nails, metal shards, and broken glass

Site personnel will be instructed to look for potential safety hazards and immediately inform the site Health and Safety Coordinator or the Field Manager about any new hazards. If the hazards cannot be immediately removed, actions must be taken to warn site workers about the hazard.

5.2.6 Rigging Equipment for Material Handling

Ropes, u-bolts, wires, and clamps used in drilling must be inspected prior to use and periodically during the course of the project to ensure the equipment is safe. Defective equipment must be removed from service. Rigging equipment must never exceed its recommended safe working load. The manufactures' recommendations shall be followed in determining the safe working loads of the various size and types of hooks used during drilling.

5.2.7 Electric and Energized Lines

All electrical equipment and energized lines shall be considered energized until isolated, tested or otherwise determined to be de-energized and grounded. A qualified electrician will verify all electrical lines that may interfere with work activities are locked out and tagged. To prevent physical contact with energized power lines, equipment or machines shall not be operated within 10 feet of any power line rated at 50 KV or below. This 10-foot rule will strictly be enforced at all times.

Daily inspections on all electrical equipment prior to distribution to employees will be performed by a competent person. Tools that do not pass inspection will be removed from service until repaired or replaced. All tools, cords and receptacles will be tested monthly for ground continuity, correct conductor termination and inspected for defects. All repairs to be made on electrical tools and equipment will be performed by a certified electrician. Records detailing the inspection and repair of electrical equipment will be kept with tool number, type, date inspected, repairs, and other comments.

5.2.8 Cranes and Lifting Devices

All lifting activities conducted will comply with all federal, state, and local laws; safe practices prescribed by the manufacturer of crane; and generally followed by the construction industry.

All contractors will use only those cranes and other hoisting equipment which are maintained in safe working conditions. All hoisting equipment brought onto the project site will be inspected for structural integrity, smooth operations performance, and proper functioning of all critical safety devices. The site Health and Safety Coordinator will conduct the inspection in conjunction with the crane operator. Any piece of equipment found not to be in compliance with these operation and safety requirements will not be put into service until all necessary repairs have been made.

Only qualified crane operators familiar with their equipment are permitted to operate the crane. Subcontractors are required to present proof of their operators' capability and experience to operate the crane in a safe manner.

All hooks, slings, and other fittings shall be the correct size for the task being performed. The use of defective or damaged hooks, pins, shackles, or other fitting attachments is prohibited. Chain or wire rope shall be free of kinks, sharp bends, or twists. All such items must have sufficient strength (including an ample margin of safety) to safely hoist the anticipated load. All rigging equipment shall be inspected prior to use to verify good working conditions.

No one is allowed to stand or walk beneath crane booms. No one is permitted to ride loads, hooks, medicine balls, or slings suspended from hoisting equipment. Booms will not be permitted to operate within 10 feet of an energized power line.

Side pulls should be avoided in all cases. The load must be directly under the hoist. The safety "throat" latch must be in the closed position at all times during a lift. Accessible areas within the swing radius will be barricaded to prevent injury. No crane will operate in a heavy lift mode without its outriggers fully extended to assure maximum stabilization of the equipment.

5.2.9 Biological Hazards

The planned field activities may bring contractor personnel into contact with snakes, spiders, ticks, chiggers, mosquitoes and poisonous plants (poison ivy and poison oak). The following precautions will be taken as necessary by field personnel to avoid contact with biological hazards:

- Hat to ward off insects
- Snake guards
- Insect/tick spray, especially on hat, ankles, wrist, and waist (may only be used when not operating a photoionization detector (PID) and not collecting samples)
- Use of Tyvek ™ suit sealed with duct tape at ankles and wrist
- Use of Oak-N-Ivy™ cleanser or equivalent at field hand-wash station
- Wash hands, face, and other exposed skin after each work period, and take a hot shower at the end of each day.

5.2.10 Sunburn

Sunscreen and/or sun visors should be worn when work must be performed in the heat of the day and where no shelter is available. Shade or air conditioned areas must be available on site for rest periods to reduce the likelihood of heat stress.

5.2.11 Fire or Explosion

Several flammable materials (e.g., fuels, cutting gases, waste oils, etc.) may be stored at or brought onto the site. To reduce the risk of fire and explosion, small quantities of flammable liquids must be stored in approved "safety" cans and labeled according to contents. Bulk storage of flammable materials should only be allowed in areas designated for this purpose. Open flames must be prohibited within 50 feet of flammable storage areas. Flammable materials in confined spaces can produce an explosive atmosphere which can be ignited by a spark or other energy source. OSHA standards for fire protection and prevention, and welding and cutting are contained in

29 CFR, Subpart F, 1926.150 through 1926.154 and 29 CFR, Subpart J, 1926.350 through 1926.354, respectively. Of particular concern are:

- Proper storage of flammable chemicals
- Adequate numbers and types of fire extinguishers
- Proper handling of cutting equipment, cylinders, and hoses
- Allowing open flames or cutting only in certain locations and with appropriate precautions
- Proper use of mechanical or local exhaust ventilation

Gasoline vapors can be highly explosive, having a flash point of about -40°F. Diesel oil is combustible, with a flash point of 110°F to 190°F, and is considered to be a moderate fire hazard. Ethylene glycol is considered to be a slight fire hazard (flash point of 232°F) and a moderate explosion hazard.

5.2.12 Other Hazards

Other physical hazards at Site 15 may include vehicular traffic, overhead power lines, and underground utilities. Safe work practices will be used to avoid all unnecessary hazards.

SECTION 6

TRAINING AND MEDICAL MONITORING REQUIREMENTS

Training is the foundation upon which all other protective measures depend. All contractor health and safety training programs will cover:

- The contractor health and safety policy
- Understanding of the hazards of the work
- Safe work practices
- Standard health and safety procedures
- Protective clothing, equipment, or engineering controls (where appropriate)
- Emergency procedures
- Contractor's personnel rights and responsibilities under OSHA

The content and extent of health and safety training will depend on the nature of the work and the responsibilities of the personnel performing the work. At a minimum, all contractor personnel must be given training in the overall contractor health and safety program. Additionally, all onsite personnel are required to read and abide by this site-specific HSP.

The medical surveillance program is a major element in the contractor health and safety program. The two major components of the program are (1) routine monitoring of the health of contractor personnel whose work may expose them to health hazards and (2) arrangements for emergency medical care in the event of work-related health emergencies.

6.1 SITE SAFETY TRAINING REQUIREMENTS

All onsite personnel must have received 40 hours of initial training in hazardous waste operations before participating in IRP projects, as required by 29 CFR Part 1910.120(e). All onsite personnel must be up to date on their annual 8-hour refresher training. Prior to beginning site activities, all contractor and subcontractor personnel must present certificates of the above training and evidence of participation in an annual medical monitoring program to the Site Health and Safety Coordinator or Project Manager. Additionally, CPR and first aid certification will be required for onsite personnel. This information will be kept in the project files.

Prior to beginning work on a site, the Site Health and Safety Coordinator will provide a briefing that covers the following topics:

- History of site
- Hazards at the site
- Proper use of personal protective equipment
- Work practices by which the employee can minimize risk from hazards
- Work zones and their locations, and the level of protection to be used in each zone on the site
- Acute effects of compounds at the site
- Decontamination procedures
- Emergency procedures, evacuation routes, and emergency telephone numbers

Tailgate safety meetings will be held daily and as appropriate as site tasks or safety conditions change (i.e., PPE upgrade, weather condition change). Topics covered will include a review of the anticipated activities, the appropriate safety procedures, and any associated physical or chemical hazards. The meeting will be recorded on the tailgate safety meeting form (Figure 6-1). All personnel attending the meeting must sign the form. Records of this training will be maintained in the project files.

6.2 MEDICAL MONITORING REQUIREMENTS

Personnel engaged in hazardous waste operations are required to be enrolled in a medical monitoring program as required by 29 CFR Part 1910.120(f). The medical monitoring program is conducted using the services of licensed, local occupational physicians. All examinations will include tests and analyses appropriate to the nature of the work the employee will be required to perform.

6.2.1 Pre-placement Screening

All contractor personnel who will be involved in the medical monitoring program must have an initial physical examination before assignment to work requiring regular health monitoring. The pre-placement screening has two major functions: (1) to determine contractor personnel's fitness for duty, including the ability to work while wearing protective equipment and (2) to establish a baseline physiological profile for comparison with future medical data.

6.2.2 Periodic Medical Examinations

Periodic medical examinations will be given. Comparison of sequential medical reports with baseline data is essential to determine physiological changes that may mark early signs of adverse health effects and, thereby, may facilitate appropriate protective measures.

The frequency and content of examinations will vary, depending on the nature of the work and exposure. Generally, medical examinations have been recommended annually. More frequent examinations may be necessary, depending on the extent of potential or actual exposure, the duration of the work assignment, and the individual worker's profile.

6.2.3 Termination Examination

A physical examination shall be performed as a part of the checkout procedure for terminating contractor personnel.

6.2.4 Special Examination

Special medical examinations, care, and counseling will be provided in cases of known exposures to toxic substances. Any special tests performed would depend on the substance to which the person was exposed.

6.2.5 Subcontractor's Medical Certification

Subcontractors that are to work at hazardous waste sites must furnish to the Project Manager or Site Health and Safety Coordinator a doctor's certification of each assigned worker's ability to wear personal protective equipment. The certification should be dated not more than one year before subcontractor personnel begin onsite work.

6.2.6 Medical Records

The contractor will keep in a locked file the physician's opinion on specific findings or diagnoses. When a worker terminates employment, the medical file should be archived for 30 years.

Figure 6.1
Tailgate Health and Safety Meeting

Date:

Specific Location:

Safety Topics Presented:

Protective Clothing/Equipment:

Chemical Hazards:

Physical Hazards:

Other:

Attendees: Name Printed:	Signature

MEETING CONDUCTED BY

Name Printed	Signature

SECTION 7

PROTECTIVE EQUIPMENT

7.1 PURPOSE

These guidelines are provided to establish a personal protective equipment and safety equipment program for hazardous waste operations.

7.2 GUIDELINE

Personal protective equipment (PPE) is needed to ensure the health and safety of field personnel involved with hazardous substances. It can only provide a high degree of protection if it is used properly. Clothing is selected by evaluating the performance characteristics of the clothing against the requirements and limitations of the site- and task-specific conditions. The following areas must be addressed for an effective PPE program:

- Training
- Work duration
- Fit testing
- Donning of equipment
- In-use monitoring
- Doffing of equipment
- Inspection
- Storage
-

7.3 CONSIDERATIONS FOR CHOICE OF PROTECTIVE CLOTHING

7.3.1 Performance Requirement

Clothing must be able to withstand a variety of physical abuses. The advantages and disadvantages of reusable versus disposable clothing must be considered.

7.3.2 Construction Requirements

The construction requirements of any garment depend on the intended use of the garment. The material that the garment is made of has been selected because of its effectiveness as a barrier against specific hazards there is no such thing as "universal" protection.

1. The physical construction of the garment must prevent penetration (e.g., location of seams and zippers, size of clothing).
2. The material that the garment is constructed of must resist penetration. In some instances, it may be necessary to layer protective clothing to achieve the desired protection.

7.3.3 *Permeation Rate*

Permeation rate is affected by a combination of the base material, the nature of the chemicals to which the material is exposed, and the duration and nature of exposure. Most materials allow some degree of permeation.

7.3.4 *Ease and Cost of Decontamination*

Considerations that should be made upon purchasing garments are the ability and degree to which the garment can be decontaminated and the cost of decontamination. Disposable clothing may be advantageous in some situations; however, such clothing is rather expensive in the long run. In most instances, field personnel will use a combination of disposable and reusable clothing.

7.3.5 *Protective Materials*

The following materials are generally available for a number of garments:

1. Cellulose or paper
2. Natural and synthetic fibers
   - Tyvek™
   - Nomex™
3. Elastomers
   - Polyethylene
   - Saran ™-Dow-product
   - Polyvinyl chloride
   - Neoprene
   - Butyl rubber
   - Chlorapel™
   - Viton™

Materials such as Tyvek™ or paper offer little or no protection against hazardous contaminants. Such materials can, however, protect against particulate contaminants. Tyvek™ should be used as an outer covering over the primary protective gear such as splash or fully encapsulating suits. Although Tyvek™ provides little chemical resistance, it does limit the amount of direct contamination on the primary protective gear. Tyvek™ garments are disposable.

Elastomers (polymeric materials that, after being stretched, return to about their original length) provide the best protection against chemical degradation, permeation, and penetration from toxic and corrosive liquids or gases. Elastomers are used in boots, gloves, overalls, and fully encapsulating suits. They are sometimes combined with a flame-resistant fabric called Nomex™ to enhance durability and protection.

The abilities of elastomers to resist degradation and permeation range from poor to excellent. The selection of a particular material should be based on its resistance to chemical degradation, as well as on its ability to resist permeation.

Protective clothing containing significant amounts of polyester or other synthetic fibers have the ability to build a static electricity charge from the wearer's movements. If the project site requires non-sparking uniforms due to explosion hazards, cotton/polyester blends for coveralls should be avoided. Zippers manufactured from brass which is non-sparking, should be used on projects where explosion hazards are a concern.

7.4 SELECTION OF WORK ENSEMBLE

7.4.1 Protection Level

The individual components of clothing and equipment must be assembled into a full protective ensemble that both protects the worker from the site-specific hazards and minimizes the hazards and drawbacks of the personal protective equipment ensemble itself. Protective clothing selected should provide the maximum chemical protection available while allowing flexibility, dexterity, and visibility. These benefits of protective clothing must often be weighed and compared against increased risk of heat stress. Protective equipment selection must be coordinated with the site Health and Safety Coordinator or Program Health and Safety Manager.

7.4.2 Training

Training in PPE use is required as part of the initial training for all working at the site. This training allows the user to become familiar with the equipment in a non-hazardous environment. As a minimum, the PPE training portion should delineate the user's responsibilities and explain the following:

1. OSHA requirements as delineated in 29 CFR Part 1910 Subparts I and Z

2. The proper use and maintenance of the selected PPE, including capabilities and limitations
3. Instruction in inspecting, donning, checking, fitting, and using PPE
4. Individualized respirator fit testing to ensure proper fit
5. The user's responsibility (if any) for decontamination cleaning, maintenance, and repair of PPE
6. Emergency procedures and self-rescue in the event of PPE failure

7.4.3 Work Mission Duration

Before entering a hazardous waste site in personal protective equipment, the anticipated work mission duration must be established in the project health and safety plan. Several factors limit the work mission length. These are:

1. Air supply
2. The permeation and penetration rates of chemical contaminants
3. Ambient temperature

7.4.4 Donning of Equipment

Periodic practice for donning chemical resistant clothing and respirators are required. Assistance should be provided because donning and doffing operations are difficult to perform alone.

After the equipment has been donned, the fit should be evaluated. Clothing that is too small will restrict movement, thus increasing the possibility of tearing the suit and increasing worker fatigue. Clothing that is too large increases the possibility of snagging the suit and the worker's dexterity and coordination may be compromised. In each instance, the worker should be recalled and refitted.

7.4.5 In-Use Monitoring

The wearer of protective clothing must understand all aspects of the clothing's operation and limitation. This is particularly important for fully-encapsulating ensembles where misuse could result in suffocation.

Worker should report any perceived problems or difficulties with equipment to their Project Health and Safety Officer. These malfunctions include, but are not limited to:

- Degradation of protective clothing
- Perception of odor while wearing a respirator
- Skin irritation

- Resistance in breathing during respirator use
- Fatigue because of respirator use
- Vision or communication difficulties
- Personal responses such as rapid pulse, chest pain, and nausea

If a supplied-air respirator is being used, all hazards that might endanger the integrity of the air line should be removed from the working area before use. During use, air lines should be kept as short as possible and other workers and vehicles should be excluded from the area.

7.4.6 Doffing of Equipment

Procedures for removing chemically-resistant suit/SCBA ensembles must be developed and followed precisely to prevent the spread of contaminants from the work area to the wearer's body, and to decontamination personnel. Doffing should be performed in concert with the decontamination of the suited worker. Throughout the doffing procedure, both the worker and decontamination personnel should avoid direct contact with the outside surface of the suit.

7.4.7 Inspection

An effective PPE program will consist of three different inspections:

1. Inspection of equipment as it is issued to workers
2. Inspection after use in training
3. Periodic inspection of stored equipment

Each inspection will cover different areas in varying degrees of detail. Explicit inspection procedures are usually available from the manufacturer. It is the responsibility of the field worker to inspect the integrity of his or her equipment before use on a site.

Records must be maintained of all inspection procedures. Identification numbers should be assigned to all reusable pieces of equipment (ID numbers) and records should be kept by that number. As a minimum, each inspection should record the ID number, date, inspector, findings, and any future actions to be taken. Periodic review of these records may indicate an item or type of item with excessive maintenance costs or a high level of down time.

7.4.8 Storage

Clothing and respirators must be properly stored to prevent damage or malfunction due to exposure to dust, moisture, sunlight, temperature extremes, and impact.

Procedures should be developed for pre-issuance warehousing and post-issuance (in-use) storage. Improper storage can cause equipment failures.

7.5 PROTECTION LEVELS

7.5.1 Level A

Level A protection should be used when percutaneous hazards exist or where there is no known data to rule out percutaneous hazards. Because wearing a fully encapsulated suit is physiologically and psychologically stressful, the decision to use this protection must be carefully considered. The following conditions suggest a need for Level A protection.

1. The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or based on the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the intact skin.
2. Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible.
3. Operations must be conducted in confined, poorly ventilated areas and the absence of conditions requiring Level A have not yet been determined.

The following items constitute Level A protection:

1. Pressure-demand, full-face piece, self-contained breathing apparatus (SCBA), or pressure-demand supplied-air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH)
2. Totally-encapsulating chemical-protective suit
3. Coveralls
4. Long underwear*
5. Gloves, outer, chemical resistant
6. Gloves, inner, chemical resistant
7. Boots, chemical-resistant, steel toe and shank

---

* Optional, as applicable

8. Hard hat (under suit)*
9. Disposable protective suit, gloves, and boots (depending on suit construction, may be worn over totally-encapsulating suit)
10. Two-way radios (worn inside encapsulating suit)

Before a fully encapsulated suit can be worn into a hazardous situation the suit must be properly inspected. The following is a checklist for visually inspecting all types of fully encapsulated suits.

1. Spread suit out on flat surface.
2. Examine the following:
    a. Fabric and seams for abrasions, cuts, or holes
    b. Zippers and other connecting devices for proper sealing
    c. Visor for dirt and cracks
    d. Exhaust valves (if applicable) for inhibiting debris and proper functioning
3. If air source is available, seal the suit and inflate it. Check for any leaks on surface and seams using a mild soap solution.
4. Record each suit's inspection, use, and repair status.

7.5.2 Level B

Level B protection should be worn when the highest level of respiratory protection is necessary, but a lesser level of skin protection is needed. The following conditions constitute a need for Level B protection.

1. Atmospheres with concentrations of known substance greater than protective factors associated with full-face, air-purifying respirators
2. The atmosphere contains less than 19.5 percent oxygen.
3. Site operations make it highly unlikely that the small, exposed areas of the head or neck will be contacted by splashes of extremely hazardous substances.
4. Type(s) and concentration(s) of vapors in air do not present a cutaneous or percutaneous hazard to the small, unprotected areas of the body.

The following items constitute Level B protection:

1. Pressure-demand, full-face piece, self-contained breathing apparatus (SCBA), or pressure-demand supplied air respirator with escape SCBA (NIOSH approved)

2. Hooded chemical-resistant clothing (overalls and long-sleeved jacket, coveralls, one or two-piece chemical splash suit; disposable chemical-resistant overalls)
3. Coveralls*
4. Gloves, outer, chemical-resistant
5. Gloves, inner, chemical-resistant
6. Boots, outer, chemical-resistant, steel toe and shank
7. Boot covers, outer, chemical-resistant (disposable)*
8. Hard hat
9. Two-way radios*
10. Face shield*

7.5.3 Level C

Level C protection should be worn when the type(s) of airborne substance(s) is measured, and the criteria for using air-purifying respirators are met. The following conditions suggest a need for Level C protection:

1. The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin.
2. The types of air contaminants have been identified, concentrations measured, and a canister or cartridge respirator is available that can remove the contaminants.
3. All criteria for the use of air-purifying respirators are met.

The following items constitute Level C protection:

1. Full-face or half-mask, air-purifying canister or cartridge equipped respirators (NIOSH approved)
2. Hooded chemical-resistant clothing (overalls; two-piece, chemical-splash suit; disposal, chemical-resistant overalls)
3. Coveralls*
4. Gloves, outer, chemical-resistant
5. Gloves, inner, chemical-resistant

---

* Optional, as applicable
.

6. Boots (outer), chemical-resistant, steel toe and shank*
7. Boot covers, outer, chemical-resistant (disposable)*
8. Hard hat*
9. Escape mask*
10. Two-way radios*
11. Face shield*

7.5.4 Level D

Level D protection should not be worn on any site where respiratory or skin hazard exist. Level D protection should be used when:

1. The atmosphere contains no known hazard.
2. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

The following items constitute Level D protection:

1. Coveralls
2. Gloves*
3. Boots/shoes, chemical-resistant, steel toe and shank
4. Boots, outer, chemical-resistant (disposable)*
5. Safety glasses or chemical splash goggles*
6. Hard hat*
7. Escape mask*
8. Face shield*

The type of clothing used and the overall level of protection should be reevaluated periodically as information about the site increases and as workers perform different operations. The Project Health and Safety Officer will determine when to upgrade or downgrade the level of protection for site personnel.

Reason to upgrade:

1. Known or suspected presence of dermal hazards
2. Occurrence or likely occurrence of gas or vapor emission

* Optional, as applicable.

3. Change in work task that will increase contact or potential contact with hazardous materials
4. Request of the individual performing the task

Reasons to downgrade:

1. New information indicating that the situation is less hazardous than was originally thought
2. Change in site conditions that decreases the hazard
3. Change in work task that will reduce contact with hazardous materials

7.6 SAFETY EQUIPMENT

Additional safety equipment should be located in the support zone (discussed in Section 10) for use in the event of an emergency. This equipment should be centrally located with respect to the project site and kept free of all obstructions for ease of access. This is a general list of safety equipment to be used at the site.

- Portable fire extinguisher (Type ABC)
- Industrial first aid kit
- Additional eye and face protection (glasses, goggles, face shields)
- Hearing protection
- Additional PPE (Tyvek®, over-boots, duct tape, hard hats)
- Decontamination water
- Drinking water
- Spill kit (sorbent pads or equivalent)

7.7 SITE-SPECIFIC PPE REQUIREMENTS

All field work performed as part of the supplemental investigation will begin in Level D PPE as described above. If soil or sediment samples must be handled directly by personnel, outer nitrile and inner latex gloves shall be used.

Higher levels of PPE are not anticipated for the investigation; however, an upgrade of protection levels will be completed if conditions warrant as described in Section 7.5.4. or as prescribed in air monitoring requirements as specified in the action level table in Section 8.11

SECTION 8

HEALTH HAZARD ASSESSMENT

8.1 PURPOSE

OSHA, in 29 CFR Part 1910.120 (h), requires air monitoring to be used to identify and quantify airborne concentrations of hazardous substances. The purpose of this guideline is to establish fundamental air monitoring principles that can be used to evaluate potential risks at a site. Section 8.2 through 8.10 provide general information regarding monitoring, instruments, and training. Section 8.11 provides site-specific monitoring requirements for the Site 15 investigation.

8.2 GUIDELINE

Various dangers may exist when working at a hazardous waste site. Explosive vapors, oxygen deficient atmospheres, and a variety of toxic gases and vapors can be encountered with lethal properties.

When first approaching a waste site, the potential hazards must be recognized and exposure risks evaluated. This can be done by a methodical initial site survey. To perform initial site surveys and subsequent monitoring, various portable instruments must be available. The following sections describe the types of air monitoring that can be performed and how to interpret monitoring results.

8.3 INITIAL SITE SURVEY AIR MONITORING

Site surveys provide the information needed to identify potential site hazards and to select worker respiratory protection methods and equipment. Site surveys generally proceed in three phases:

- Conduct off-site characterization before site entry. Gather information away from the site by consulting or inspecting site owner's files, agency personnel and files, former site employees, and other applicable literature and personnel. (The off-site characterization effort has been completed for Hancock Site 15.) Conduct a reconnaissance from the site perimeter.
- Next, conduct onsite surveys. During this phase, restrict site entry to reconnaissance personnel.

- Once the site has been determined safe for beginning other activities, perform ongoing monitoring to provide a continuous source of information about site conditions.

It is important to recognize that site characterization is a continuous process. At each phase of site characterization, information shall be obtained and evaluated to define the potential hazards of the site.

The following information (to the extent it is available) shall be obtained before perimeter reconnaissance or initial site entry:

- Location and approximate size of the site;
- Description of the response activity or the job task to be performed;
- Duration of the planned employee activity;
- Site topography;
- Meteorologic data such as prevailing wind direction, precipitation levels, and temperature profiles;
- Site accessibility by air and roads;
- Pathways for hazardous substance dispersion;
- Present status and capabilities of emergency response teams (including contact names and phone numbers) that would provide emergency assistance to onsite employees;
- Hazardous substances and health hazards present or expected at the site and their chemical and physical properties; and
- All suspected conditions that may pose inhalation or skin absorption hazards that are immediately dangerous to life or health (IDLH) or other conditions that may cause death or serious harm shall be identified during the preliminary site characterization and carefully evaluated during the initial site entry and subsequent site surveys.

8.3.1 Perimeter Reconnaissance

Following the data-gathering exercise, and at a site where the hazards are largely unknown, a perimeter reconnaissance should be conducted. Reconnaissance personnel should use Level D or C protection as appropriate. Portable air monitoring instruments should be used, particularly when working downwind of the site. The perimeter reconnaissance should be conducted by at least two individuals. The Project Health and Safety Coordinator should be present. The perimeter reconnaissance should involve the following actions:

- Develop a preliminary site map and review available aerial photography;

- Note any labels, markings, or placards on containers or vehicles;
- Note the amount of deterioration or damage of containers;
- Note any biological indicators, such as dead animals or plants;
- Note any unusual conditions such as clouds or vapors, discolored liquids, or soil staining;
- Note any unusual odors; and
- Collect and analyze offsite soil, water, or air samples as appropriate.

8.3.2 Initial Site Entry

OSHA requires that an ensemble of PPE shall be selected and used during the initial site entry that will provide protection to a level of exposure below established PELs for known or suspected hazardous substances and other safety and health hazards identified during the preliminary site evaluation (29 CFR Part 1910.120[c]).

In the rare instance when the preliminary site evaluation does not produce sufficient information to identify the hazards or suspected hazards of the site, Level B respiratory protection (SCBA) and appropriate protective clothing shall be used as minimum protection for the initial site entry. Direct reading instruments shall be used for identifying IDLH conditions. If available information indicates that Level B protection is not required for initial site entry, and if respiratory protection is warranted by the potential hazards identified during the initial site investigation, an escape SCBA of at least five minutes duration shall be carried by each employee or kept at their immediate work station (29 CFR Part 1910.120[c][5]).

The initial site entry team should consist of three persons: two workers who will enter the site and one outside support person, suited in PPE and prepared to enter the site in case of emergency. It is important that the Project Health and Safety Coordinator be present as one of the team members. Entry personnel should:

- Use monitoring instruments to monitor the air for IDLH and other safety or health conditions that may cause death or serious injury;
- Note the types and condition of containers, impoundments, or other storage systems;
- Note the physical condition of the hazardous substances;
- Determine potential pathways for dispersion; and
- Collect air, water, and soil samples.

8.4 AIR MONITORING INSTRUMENTS

Airborne contaminants may pose a significant threat to worker health and safety, and identification and quantification of airborne contaminants is essential for a good health and safety program at a hazardous waste site. Reliable measurements of airborne contaminants are needed for:

- Selecting personal protective equipment;
- Delineating areas where protection is needed;
- Assessing the potential health effects of exposure; and
- Determining the need for specific medical monitoring.

8.4.1 Measuring Instruments

The purpose of air monitoring is to identify and quantify airborne contaminants to determine the level of worker protection needed. Two principal approaches are available for identifying and quantifying airborne contaminants:

- The onsite use of direct-reading instruments; and
- Laboratory analysis of air samples obtained by gas sampling bag, filter, sorbent, or wet-contaminant collection methods.

8.4.2 Direct-Reading Instruments

Direct-reading instruments are used for rapid detection of flammable or explosive gases, oxygen deficiency, and specific gases and vapors. The information provided by these instruments must be used to institute appropriate protective measures.

It is important that direct-reading instruments be operated by trained individuals who are familiar with the device's operating principles and limitations. At hazardous waste sites where unknown and multiple contaminants are usually the rule, instrument readings should be interpreted conservatively. The following guidelines should be used to facilitate accurate recording and interpretations:

- Calibrate instruments according to the manufacturer's instructions;
- Develop chemical response curves if these are not provided by the instrument manufacturer;
- A reading of zero should be reported as "no instrument response" rather than "clean" because quantities of chemicals may be present that are not detectable by the instrument; and
- The survey should be repeated with several detection systems to maximize the number of chemicals detected.

A description of the direct reading instruments is presented below.

8.4.2.1 Oxygen-Deficient Atmospheres

At sites where oxygen depletion or displacement is anticipated, oxygen levels must be monitored by the use of a portable oxygen detector. A typical oxygen detector measures the percent oxygen in the immediate atmosphere using a galvanic cell. Terrain variations in the land and unventilated rooms or areas often do not contain enough oxygen to support life, making these instruments invaluable to response personnel. The normal ambient oxygen concentration is 20.8 percent.

NIOSH requires that if oxygen levels in the ambient air become less than 19.5 percent, supplied air respirators must be worn. Oxygen-enriched atmospheres (oxygen greater than 25 percent) increase the potential for fire or explosion; no work or testing should ever be performed under such conditions.

The operation of oxygen detectors depends on the absolute atmospheric pressure. The concentration of natural oxygen (not manufactured or generated oxygen) is a function of the atmospheric pressure at a given altitude.

At sea level, where the weight of the atmosphere is greatest, more oxygen molecules are compressed into a given volume than at higher elevations. As elevation increases, this compression decreases, resulting in fewer oxygen molecules being "squeezed" into a given volume. Consequently, an oxygen indicator calibrated at sea level and operated at an altitude of several thousand feet will falsely indicate an oxygen-deficient atmosphere (less than 19.5 percent).

8.4.2.2 Combustible Gases/Vapors

The presence or absence of combustible vapors or gases must be evaluated at a waste site. A typical combustible gas detector determines the concentration of combustible vapors and gases present in an atmosphere. The level is recorded as a percentage of the lower explosive limit (LEL), which is measured as the change in electrical resistance in a wheatstone bridge circuit.

The LEL of a combustible gas or vapor is the lowest concentration by volume in air that will explode, ignite, or burn when there is an available ignition source. NIOSH has established the following guidelines concerning working in an explosive environment:

1. If combustible gas is detected between 10 to 25 percent LEL, work activities in the area should be limited to those that do not generate sparks.
2. If the explosivity reading on the combustible gas indicator is above 25 percent, operations will stop and the onsite area must be immediately evacuated until appropriate action can be taken to eliminate the hazard.

Once a site has been evacuated, onsite activities cannot resume until project contractor personnel have consulted with personnel experienced in fire or explosion hazards.

Onsite activities around enclosed spaces and material containers should be carefully monitored for the presence of combustible gases and vapors. Around well drilling and welding operations, the air above the borehole and around the work area also needs to be monitored for combustible/explosive gases and vapors.

The combustible gas detector cannot be used to test the vapors of leaded gasoline, halogens, and sulfur compounds. These substances interfere with the filament unit, reducing the instrument's sensitivity. Compounds containing silicone will also destroy the platinum filament.

The combustible gas detector can only be used in normal atmospheres, not oxygen-enriched or -deficient. Oxygen concentrations that are less than or greater than normal may cause erroneous readings.

8.4.2.3 Organic Vapor/Gases

The initial survey of a site should always include measurements for organic vapors. Sufficient data should be obtained during the initial entry to screen the site for various levels of organic vapors. These gross measurements can be used on a preliminary basis to (1) determine levels of personnel protection, (2) establish site work zones, and (3) select candidate areas for more thorough qualitative and quantitative studies.

Organic vapor concentrations at a site can be determined by the use of a photoionization detector (PID) or a flame-ionization detector (FID).

8.4.2.3.1 Photoionization Detector

Photoionization instruments (HNU® for example) use an ultraviolet (UV) light to ionize chemical compounds. The photoionization process can be illustrated as:

$$RH + hv \text{ ---> } RH^{+} + e^{-}$$

where: RH is an organic or inorganic molecule and hv represents a photon of UV light.

The photon has energy equal to or greater than the molecules ionization potential and causes the emission of an electron, "e-".

The PID consists of a chamber containing a pair of electrodes. When a positive potential is applied to one electrode, the field created drives any ions formed by the absorption of UV light to the collector electrode, where the current (proportional to the concentration) is measured.

Compounds with high ionization potentials will not be detected if the lamp used does not have the sufficient energy required to ionize the compound (HNU® manufactures three UV lamps with different ionization energies).

The response to a gas or vapor may radically change when the gas or vapor is mixed with other materials. As an example, a PID calibrated to ammonia and surveying an atmosphere containing 100 ppm ammonia would indicate 100 on the meter. Likewise, an instrument calibrated to benzene would record 100 in an atmosphere containing 100 ppm benzene. However, in an atmosphere containing 100 ppm of each compound, the instrument could indicate considerably less or more than 200 ppm, depending on how it was calibrated.

8.4.2.3.2 Flame Ionization Detector

The flame ionization detector (FID) uses ionization as the detection method much the same as in the PID, except that the ionization is caused by a hydrogen flame, rather than UV light. The flame has enough energy to ionize any organic molecule with an ionization potential of 15.4 ev or less.

Inside the instrument's detection chamber, the sample is exposed to a hydrogen flame that ionizes the organic vapors. As the organic vapors burn, positively charged, carbon-containing ions are produced and collect on a negatively charged electrode. As the positive ions accumulate, a current proportional to the hydrocarbon concentration is generated on the input electrode.

Flame ionization detectors do not detect inorganic gases and vapors and many synthetic compounds. Similar to the PID, the FID responds differently to different compounds. For example, an FID that has been calibrated to methane will read 100 ppm methane in an atmosphere containing 100 ppm methane. However, this instrument may only register 10 ppm of carbon tetrachloride in an atmosphere actually containing 100 ppm of that compound. The relative sensitivity to various compounds must be considered when using this instrument.

8.4.2.3.3 Colorimetric Indicator Tubes

Often, while evaluating a hazardous waste site, the need arises to quickly measure a specific gas. Direct-reading colorimetric indicator tubes can successfully fill that need. These tubes are usually calibrated in parts per million (ppm) or percent concentration for easy interpretation.

Colorimetric indicator tubes consist of a glass tube impregnated with an indicator chemical. A known volume of contaminated air is drawn through the tube at a predetermined rate. The contaminant reacts with the indicator chemical in the tube, producing a discoloration that is proportional to the chemical’s concentration. Detector tubes are chemical specific and must be selected before leaving for the site.

Several indicator chemicals may be able to measure the concentration of a particular gas or vapor. Each chemical operates on a different chemical principle and is affected in varying degrees by temperature, air volume pulled through the tube, and interference from other gases or vapors. A "true" concentration versus the "measured" concentration may vary considerably among and between tube manufacturers.

A major limitation of this apparatus involves the process by which the operator "reads" the endpoint. The jagged edge where contaminant meets indicator chemical makes it difficult to get accurate results from this seemingly simple test. However, a diligent and experienced operator should be able to accurately read the endpoint.

8.5 PERSONAL MONITORING

Selective monitoring of high risk workers (i.e., those closest to the source of contamination generation) is recommended during cleanup activities. This methodology is based on the rationale that the probability of significant exposure varies with distance from the source. If workers closest to the source of contamination are not significantly exposed, then all other workers are supposedly not exposed and do not need to be monitored.

Personal monitoring samples should be collected in the breathing zone. These samples represent the inhalation exposure of workers who are not wearing respiratory protection. "Full shift" or 8-hour air samples are analyzed in a laboratory. Full shift air samples may be collected using passive dosimeters, or by a pump that draws air onto a sorbent or filter. It is best to use pumps that maintain a constant flow rate to collect samples, because it is difficult to adjust the pump with protective equipment on.

8.6 PERIODIC MONITORING

The monitoring surveys made during the initial site entry phase are for a preliminary evaluation of atmospheric hazards. In some situations, the information obtained may be sufficient to preclude additional monitoring. However, because site activities and weather conditions change during the course of a day, a program to periodically monitor atmospheric changes must be implemented. At a minimum, periodic monitoring of air quality during excavation sampling will be conducted every 15 minutes.

8.7 TRAINING

It is imperative that personnel using monitoring instruments be thoroughly familiar with their use, limitations, and operating characteristics. All instruments have inherent constraints in their ability to detect and/or quantify the hazard for which they were designed. Unless trained personnel use the instruments properly and accurately assess the data readout, air hazards can be grossly misinterpreted, endangering the health and safety of field personnel.

8.8 INSTRUMENT SENSITIVITY

Although the measurement of total vapor/gas concentrations can be a useful adjunct to professional judgment in the selection of an appropriate level of protection, caution should be used in the interpretation of the readout of the measuring instrument. The response of an instrument to a gas or vapor cloud containing two or more substances does not provide the same sensitivity as measurements involving the individual, pure constituents. Hence, the instrument readout may overestimate or underestimate the concentration of an unknown composite cloud. This same type of inaccuracy could also occur in measuring a single unknown substance with the instrument calibrated to a different substance. The idiosyncrasies of each instrument must be considered in conjunction with the other parameters in selecting the protection equipment needed. Using the total vapor/gas concentration to determine levels of protection should provide protection against concentrations greater than the readout of the instrument. However, when the upper limits of Levels C and B are approached, serious consideration should be given to selecting a higher level of protection. Cloud constituents must be identified as rapidly as possible and levels of protection based on the toxic properties of the specific substances identified.

8.9 HEAT STRESS MONITORING

Sweating does not cool the body unless moisture is removed from the body. The use of PPE reduces the body's ability to eliminate large quantities of heat because the evaporation of sweat is decreased. The body's effort to maintain an acceptable temperature may become impaired and this may cause heat stress. Increased body temperature and physical discomfort also promote irritability and a decreased attention to the performance of hazardous tasks.

Heat related problems include heat rash, fainting, heat cramps, heat exhaustion and heat stroke. Heat rash occurs because sweat isn't evaporating, making the skin wet most of the time. Standing erect and immobile in the heat allows blood to pool in the lower extremities. As a result, blood does not return to the heart to be pumped back to the brain and fainting may occur. Heat cramps are painful spasms of the muscles due to excessive salt loss from profuse sweating. Heat exhaustion occurs due to the large fluid and salt loss from profuse sweating. A person's skin is clammy and moist. Nausea, dizziness and headache may also be exhibited.

Heat stroke occurs when the body's temperature regulatory system has failed. Skin is hot, dry red, and spotted. The affected person may be mentally confused and delirious, and convulsions may occur. A person exhibiting signs of heat stroke should be removed from the work area to a shaded area immediately. The person should be soaked with water and fanned to promote evaporation. Medical attention should be obtained immediately. Early recognition and treatment of heat stroke are the only means of preventing brain damage or death.

Monitoring of personnel wearing PPE should commence when the ambient temperature is 70°F or above. Monitoring frequency should increase as the ambient temperature increases or as slow recovery rates are observed. Heat stress monitoring should be performed by a person with a current first aid certification who is trained to recognize heat stress symptoms. For monitoring the body's recuperative abilities to excessive heat, one or more of the following techniques should be used. Other methods for determining heat stress monitoring, such as the wet bulb globe temperature (WBGT) index from American Conference of Governmental Industrial Hygienist (ACGIH) threshold limit value (TLV) booklet can be used.

8.9.1 Early Symptoms of Heat Related Problems:

1. Decline in task performance;
2. Incoordination;
3. Decline in alertness;
4. Unsteady walk;
5. Excessive fatigue;
6. Muscle cramps; or
7. Dizziness.

8.9.2 Susceptibility to Heat Stress Increases

The following conditions may make one susceptible to heat stress:

1. Lack of physical fitness;
2. Lack of acclimatization to the ambient temperature;
3. Increased age;
4. Dehydration;
5. Obesity;
6. Drug or alcohol use;
7. Sunburn; or
8. Infection.

To monitor the worker, measure:

- Heart rate. Count the radial pulse during a 30-second period as early as possible in the rest period;
  - If the heart rate exceeds 100 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same;
  - If the heart rate still exceeds 100 beats per minute at the next rest period, shorten the following work cycle by one-third.
- Oral temperature. Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking).
  - If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period;
  - If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following cycle by one-third;
  - Do not permit a worker to wear a semi-permeable or impermeable garment when oral temperature exceeds 100.6°F (38.1°C).

8.9.3 Prevention of Heat Stress

Proper training and preventive measures will aid in averting loss of worker productivity and serious illness. Heat stress prevention is particularly important because once a person suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat related illness. To avoid heat stress the following steps should be taken:

- Adjust work schedules;
  - Modify work/rest schedules according to monitoring requirements,
  - Mandate work slowdowns as needed, and
  - Perform work during cooler hours of the day, if possible, or at night if adequate lighting can be provided;
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods;
- Maintain worker's body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, i.e., eight fluid ounces (0.23 liters) of water must be ingested for approximately every eight ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy

sweating occurs, encourage the worker to drink more. The following strategies may be useful:

- Maintain water temperature at 50°-60°F (10°-16.6°C),
- Provide small disposable cups that hold about four ounces (0.1 liter),
- Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work, and
- Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight;

- Train workers to recognize the symptoms of heat-related illnesses;
- Rotate personnel and alternate job functions; and
- Avoid double shifts and/or overtime.

8.10 COLD STRESS MONITORING

Exposure to low temperatures presents a risk to employee safety and health both through the direct effect of the low temperature on the body and collateral effects such as slipping on ice, decreased dexterity and reduced dependability of equipment. All personnel must exercise increased care when working in a cold environment to prevent accidents that may result from the cold. The symptoms of cold exposure include frostbite and hypothermia. Wind increases the impact of cold on a person's body.

Frostbite is both a general and a medical term given to areas of local cold injury. Unlike systemic hypothermia, frostbite rarely occurs unless the ambient temperatures are less than freezing and usually less than 20°F. Symptoms of frostbite are: a sudden blanching or whitening of the skin; the skin has a waxy or white appearance and is firm to the touch; tissues are cold, pale, and solid. Superficial frostbite occurs when the skin is white but the underlying tissue is firm. The skin will return to shape when depressed. Deep frostbite causes the underlying tissues to freeze. The skin will either not depress when pressed by the finger or it will depress but not return to the original contour. Deep frostbite is a serious injury.

Hypothermia is defined as a decrease in a person's core temperature below 96°F. The body temperature is normally maintained by a combination of central (brain and spinal cord) and peripheral (skin and muscle) activity. Interferences with any of these mechanisms can result in hypothermia, even in the absence of "cold" ambient temperatures. The first symptom of systemic hypothermia is shivering. Maximum shivering starts when the core body temperature drops below 95°F. The next set of symptoms as the body's cooling progresses is apathy, listlessness, and sleepiness. The person remains conscious and responsive with normal blood pressure and a core temperature of 93.2°F. The person must be immediately removed to a facility with heat. As hypothermia advances beyond this point, the person has a glassy stare, slow pulse, slow respiratory rate and may lose consciousness. Severe hypothermia starts when the core body temperature reaches 91.4°F. Finally, the extremities start to freeze hard and death could result.

8.10.1 Prevention of Cold-Related Illnesses

- Educate worker to recognize the symptoms of frostbite and hypothermia;
- Identify and limit known risk factors;
    - Prohibit phenothiazine (a sedative) use.
    - Identify/warn/limit beta blocker use.
- Assure the availability of an enclosed, heated environment on or adjacent to the site;
- Assure the availability of dry changes of clothes;
- Develop capability for temperature recording at the site; and
- Assure the availability of warm drinks.

8.10.2 Monitoring

Start (oral) temperature recording at the job site:

- At the Field Team Leader's discretion when suspicion is based on changes in worker's performance or mental status;
- At worker's request;
- As a screening measure, two times per shift, under unusually hazardous conditions (e.g., wind-chill less than 20°F, or wind-chill less than 30°F with precipitation); and
- As a screening measure whenever any one worker on the site develops hypothermia.

Any person developing moderate hypothermia (a core temperature of 92°F) cannot return to work for 48 hours.

8.11 SITE-SPECIFIC RISK ANALYSIS

8.11.1 Chemical Hazards

All intrusive activities at Site 15 property should be considered to have potentially impacted soil. The primary chemical hazards have been identified in Section 5. These compounds are most likely to have adverse effects if encountered in a significant quantity during field activities.

8.11.1.2 Direct Contact

Level D personal protective equipment, will be used by all personnel in areas potentially impacted by past activities. Level D equipment will require steel toed rubber boots, or boot covers that prevent contamination of steel toed boots. Nitrile outer and latex inner gloves should provide adequate protection from direct contact hazards.

8.11.1.3 Volatile Compounds (Vapor Pressure >10 mm Hg)

Of the listed volatile chemicals, benzene has the lowest PEL as set by OSHA and hence sets the action limit for monitoring with a PID. For any activities taking place in areas of potential site contaminants, continuous measurements shall be taken in the breathing zone with a PID equipped with a 10.6 eV lamp.

Background PID levels should be taken initially upwind from planned site activities. If, during site activities, PID readings reach 5 ppm above background levels in the breathing zone (and are sustained for 15 minutes), then all personnel must upgrade to Level C personal protective gear. Upon upgrading to Level C, a Draeger□ benzene 2/a color detector tube (part number 8101231) should be used to verify the absence of benzene. If benzene is greater than 5 ppm, all personnel must upgrade to Level B or retreat until air monitoring shows that concentrations have fallen below 5 ppm so that work may continue in a lower level of protection.

Furthermore, if PID readings reach 25 ppm above background (sustained for 15 minutes), then personnel should retreat and consult the Parsons Health and Safety Officer before deciding to upgrade to Level B equipment.

An upper limit of 5 ppm for PID readings for Level D work is specified in this health and safety plan. It is our experience that this upper limit will prevent over-exposures to benzene. Due to the calibration to isobutylene, the Photovac MicroTIP 2000 PID benzene response will be twice as high as the actual benzene concentrations. Thus, a pure benzene vapor of 2.5 ppm will cause the PID to read 5 ppm. Furthermore, based on experience at other sites, detectable levels of total organic vapors typically consist of other volatile constituents such as xylene, toluene and ethyl benzene in addition to benzene. The PID will detect the sum total of these volatiles.

When 5 ppm is reached on the PID response, actual benzene levels should remain below occupational limit values. To verify that this is the case, workers are to use the specified Draeger tube to check for the presence of benzene. It is our experience that Draeger tube screening with the 2/a benzene tube has not shown measurable levels of benzene in worker breathing zones or downwind from drilling areas when PID readings have reached 5 ppm. The Draeger benzene 2/a tube is specified for this use as it is the only Draeger-manufactured tube which does not respond positively to the presence of ethyl benzene, toluene or xylenes vapors. The 2/a tube has a limit of detection of 2 ppm.

8.11.1.4 Semivolatile and Nonvolatile Compounds (Vapor Pressure <10 mm Hg)

Polynuclear aromatic hydrocarbons (PAHs) could pose significant health threats if ingested or inhaled as a dust. On-site personnel will avoid activities that could generate potentially contaminated dust, and work upwind of soils and groundwater during excavation activities. Should visible dust emissions occur in potentially contaminated areas, real time aerosol monitoring or upgrading to level C may be warranted for affected personnel. Consult the Parsons ES Health and Safety Officer.

8.11.2 Summary of Work Area Action Levels

Based on a review of the potential chemical hazards at the site, the following conditions will determine the level of protective equipment that will be used by personnel while on-site:

Conditions for Level D: - All areas

· PID readings < 5 ppm.

Conditions for Level C: - All areas

· PID readings > 5 ppm and < 25 ppm

and · Draeger benzene 2/a tube readings < 2 ppm

or · Any visible fugitive dust emissions from site activities that disturb contaminated soil.

Conditions for Level B (or retreat): - All areas

· PID readings > 25 ppm.

or · Draeger Benzene 2/a Tube readings > 2 ppm

SECTION 9

SITE PREPARATION, ZONES, AND SECURITY

9.1 PURPOSE

OSHA requires (29 CFR Part 1910.120[d]) that a site control program be developed before the initiation of hazardous waste operations. The purpose of this guideline is to establish site control principles that will minimize potential contamination for contractor personnel and protect the public from the site's hazards.

9.2 GUIDELINE

The activities required during hazardous waste operations involve the movement of materials (contaminants) from the site to unaffected areas. Contractor personnel and equipment may become contaminated and carry the materials into clean areas. Contaminants may become airborne because of their volatility, or the disturbance of contaminated soil may cause it to become wind blown. Contamination control procedures are needed and will reduce the transfer of hazardous substances from the site.

Several site control procedures can be implemented to reduce worker and public exposure to chemical, biologic, physical, and safety hazards:

- Compile a site map;
- Establish work zones;
- Use the buddy system when necessary;
- Establish and strictly enforce decontamination procedures for both personnel and equipment (see Section 10);
- Establish site security measures as needed;
- Set up communication networks;
- Enforce safe work practices;
- When contaminants other than those previously identified are handled;
- When different operations are begun;
- When employees are handling leaking drums or working with obvious liquid contamination; and
- When weather conditions change.

Field operations are to be conducted with a minimum of two persons on site. For operations requiring Level B personal protective equipment a minimum of three people will be required.

9.3 SITE WORK ZONES

One method of preventing or reducing the migration of contamination is to delineate zones on the site where prescribed operations occur. Movement of personnel and equipment between zones and onto the site itself would be limited by access control points. By these means, contamination would be expected to be contained within certain relatively small areas on the site and its potential for spread minimized. Three contiguous zones are recommended.

9.3.1 Exclusion Zone

The Exclusion Zone is an area where contamination does or could occur. Major activities that are performed in the Exclusion Zone include:

- Site characterization, such as mapping, photographing, and sampling;
- Installation of wells for groundwater monitoring; and
- Cleanup work, such as drum movement, drum staging, and materials bulking.

Everyone entering the Exclusion Zone must wear prescribed levels of protection. An entry and exit check point must be established at the periphery of the Exclusion Zone to regulate the flow of contractor personnel and equipment in and out of the zone and to verify that the procedures established to exit and enter are followed.

The outer boundary of the Exclusion Zone, the Hotline, is initially established by visually surveying the immediate environs of the incident and determining where the hazardous substances involved are located; where any drainage, leachate, or spilled material is; and whether any discolorations are visible. Guidance in determining the boundaries is also provided by data from the initial site survey indicating the presence of organic or inorganic vapors/gases or particulates in air, combustible gases, and radiation, or the results of water and soil sampling.

Additional factors that should be considered include the distances needed to prevent fire or an explosion from affecting contractor personnel outside the zone, the physical area necessary to conduct site operations, and the potential for contaminants to be blown from the area. Once the Hotline has been determined, it should be physically secured, fenced, or well-defined by landmarks. During subsequent site operations, the boundary may be modified and adjusted as more information becomes available.

9.3.2 Contamination Reduction Zone

The Contamination Reduction Zone (CRZ) is located between the contaminated area and clean area. This zone is designed to reduce the probability that the clean Support Zone will become contaminated and/or affected by other hazards on site. The distance between the Exclusion Zone and Support Zone provided by the CRZ, together with decontamination of workers and equipment, limits the physical transfer of hazardous chemicals into clean areas. The degree of contamination in the CRZ decreases as one moves from the Exclusion Zone to Support Zone because of the distance and the decontamination procedures.

The boundary between the Support Zone and the CRZ, the Contamination Control Line, separates the possibly low contamination area from the clean Support Zone. Access to the CRZ from the Support Zone is through a control point. Contractor personnel entering through the control point must wear the prescribed PPE, for working in the CRZ. Entering the Support Zone requires removal of any protective equipment worn in the CRZ.

9.3.3 Support Zone

The Support Zone, the outermost part of the site, is considered noncontaminated or clean area. The Support Zone is the location of the administrative and other support functions necessary to maintain smooth operations in the Exclusion Zone and CRZ. Contractor personnel may wear normal work clothes in this area. Any potentially contaminated equipment or clothing must be decontaminated before entry into this area.

The location of the Support Zone depends on a number of factors including:

- Accessibility: topography; open space available; locations of highways, railroad tracks; or other limitations;
- Wind direction: preferably the support facilities should be located upwind of the Exclusion Zone. However, shifts in wind direction and other conditions may be such that an ideal location based on wind direction along does not exist;
- Resources: adequate roads, power lines, water, and shelter.

9.4 SITE SECURITY

Site security at a hazardous waste site is necessary to:

- Prevent the exposure of unauthorized, unprotected people to the site hazards;
- Prevent theft;
- Avoid interference with safe working procedures.

During the work day, site security can consist of:

- Assign responsibility for enforcing authority for entry and exit requirements;
- Maintain security in the Support Zone and at Access Control Points;
- If the site is not fenced, post signs around the perimeter;
- Have the Field Team Leader approve all visitors to the site. Make sure they have a valid purpose for entering the site. Have trained site personnel accompany visitors at all times.

During off-duty hours, site security can consist of:

- If needed, use security guards to patrol the site boundary. Guards must be fully apprised of the hazards at the site; and
- Secure the equipment.

9.5 SITE COMMUNICATION

Two communication systems should be established during hazardous waste operations; an internal communication among contractor personnel on site, and an external communication between onsite and off-site contractor personnel.

Internal communication at site is used to:

- Alert personnel to emergencies;
- Convey safety information (e.g., amount of time left in air tanks, heat stress check, etc.);
- Communicate changes in the work to be performed; and
- Maintain site control.

Often at a site, communications can be impeded by background noise and the use of PPE. For communications to be effective, commands must be prearranged. In addition, audio or visual cues can aid in conveying the message. Some common internal communication devices are: two-way radios, noisemakers (e.g., bells, whistles, compressed air horns, etc.), and visual signals (e.g., flags, hand signals, and lights). Radios used in the Exclusion Zone must be intrinsically safe and not capable of sparking.

An external communication system between onsite and off-site contractor personnel is necessary to:

- Report to management;
- Coordinate emergency response; and

- Maintain contact with essential off-site contractor personnel.

The primary means of external communication is the telephone. If a telephone is not present at the site, all team members must know where the nearest phone is located. The correct change and necessary phone number should be readily available.

9.6 SAFE WORK PRACTICES

To ensure a strong safety awareness during hazardous waste operations, a list of standing orders stating the practices that may never occur in contaminated areas should be developed. Sample standing orders for contractor personnel entering an Exclusion Zone may include:

- No smoking, eating, drinking, or application of cosmetics in this zone;
- No matches or lighters in this zone;
- Check in at the entrance Access Control Point before you enter this zone;
- Check out at the exit Access Control Point before you leave this zone;
- Always have your buddy with you in this zone;
- Wear an air purifying respirator in this zone; and
- If you discover any signs of radioactivity, explosivity, or unusual conditions such as dead animals at the site, exit immediately and report this finding to your supervisor.

Standing orders should be posted conspicuously at the site.

In addition to standing orders, contractor personnel should be briefed on the chemical information of the site contaminant at the beginning of the project. Daily site safety meetings should be held for field team members and any other site contractor personnel.

Working with tools and heavy equipment is a major hazard at sites. Injuries can result from equipment hitting personnel, impacts from flying objects, burns from hot objectives, and damage to protective equipment such as supplied-air respirator systems. The following precautions will help prevent injuries because of such hazards:

- Keep all heavy equipment that is used in the Exclusion Zone in that zone until the job is done. Completely decontaminate such equipment before moving it into the clean zone;
- Train personnel in proper operating procedures;

- Install appropriate equipment guards and engineering controls on tools and equipment;
- Where portable electric tools and appliances can be used (i.e., where there is no potential for flammable or explosive conditions), use three-wire grounded extension cords to prevent electric shocks;
- Keep all non-essential people out of the work area;
- Prohibit loose-fitting clothing around moving machinery;
- Do not exceed the rated load capacity of a vehicle; and
- Do not operate cranes or derricks within 10 feet of power lines.

SECTION 10

DECONTAMINATION PROCEDURES

10.1 PURPOSE

To establish fundamental decontamination principles to be used as a guide on developing site and activity specific decontamination procedures.

10.2 GUIDELINE

Contractor personnel responding to hazardous substance incidents may become contaminated during the course of their work at a site. Protective clothing and respirators help to prevent the wearer from becoming contaminated or inhaling contaminants. Good work practices help reduce the contamination of protective clothing, instruments, and equipment. Even with these safeguards, contamination may occur. Harmful materials can be transferred into clean areas, exposing unprotected personnel. In removing contaminated clothing, personnel may come into direct contact with and/or inhale contaminants. To prevent such occurrences, contamination reduction and decontamination procedures must be developed and implemented. Such procedures are to be in place before anyone enters a hazardous area and must continue (modified if necessary) throughout the period of operation.

Decontamination consists of physically removing contaminants and/or converting them chemically into innocuous substances. The extent of decontamination depends on a number of factors, the most important being the type of contaminants involved. The more harmful the contaminant, the more extensive and thorough the decontamination required. Combining decontamination, the correct donning of protective equipment, and the zoning of site work areas minimizes the possibility of cross-contamination from protective clothing to wearer, or from equipment to workers. Only general guidance can be given on methods and techniques for decontamination. The exact procedure is determined by evaluating several factors specific to the site.

10.3 INITIAL PLANNING

The initial decontamination plan is based on the assumption that all contractor personnel and equipment leaving the Exclusion Zone (area of potential contamination) are grossly contaminated. The plan includes a system for washing and rinsing, at least once, all of the protective equipment worn. The washing and rinsing are done in combination with a sequential doffing of clothing, starting at the first station with the most heavily contaminated article and progressing to the last station with the least contaminated article.

10.4 CONTAMINATION AVOIDANCE

Contamination avoidance is the best method for preventing the spread of contamination from a hazardous waste site. While planning site operations, methods are to be developed to prevent the contamination of personnel and equipment. Each person involved in site operations must regularly practice the basic methods of site contamination avoidance listed below.

- Know the limitations of all protective equipment being used;
- Do not enter a contaminated area unless it is necessary to carry out a specific objective;
- Avoid touching anything unnecessarily when in a contaminated area;
- Walk around pools of liquids, discolored areas, or any area that shows evidence of possible contamination;
- Walk upwind of contamination, if possible;
- Do not sit or lean against anything in a contaminated area. If you have to kneel (e.g., to take samples), use a plastic ground sheet;
- Before sampling any hazardous waste, read the label and manifest (if available) for all containers to determine the identity of the substance to be sampled and the potential contamination hazard;
- Check for potential incompatibility of wastes while checking for waste contents. These conditions might be caused by heat, fire, or gas; an explosion; the contact of water and alkali metals; violent polymerization; or solubilization of toxic substances. Check waste containers for evidence of these conditions such as bulged drums, blistered paint, exploded drums, bubbles, dead vegetation, or melted plastic;
- Avoid setting sampling equipment directly on contaminated areas. Place equipment on a protective cover such as a ground cloth; and
- Use the proper tools necessary to safely conduct the study.

Where possible, plan very specific methods to reduce the risk of contamination. Using remote sampling techniques, opening containers by non-manual means, bagging monitoring instruments, using drum grapplers, watering down dusty areas, and avoiding areas of obvious contamination reduces the possibility of contamination and precludes elaborate decontamination procedures.

10.5 SITE ORGANIZATION

An area within the CRZ is designated the Contamination Reduction Corridor (CRC). The CRC controls access into and out of the Exclusion Zone and confines personnel decontamination activities to a limited area. The size of the corridor depends on the number of stations in the decontamination procedure, the overall dimension of work controls zones, and the amount of space available at the site. A corridor of 75 feet by 15 feet should be adequate for full decontamination. Whenever possible, it should be a straight path. The CRC boundaries should be conspicuously marked, with entry and exit restricted. The boundary between the Exclusion Zone and the CRZ is referred to as the hotline. Contractor personnel exiting the Exclusion Zone must go through the CRC. Anyone in the CRC should be wearing the level of protection designated for the decontamination crew. Within the CRC, distinct areas are set aside for decontamination of personnel, portable field equipment, and clothing. These areas must be marked and restricted to those workers wearing the appropriate protection. All activities within the corridor are confined to decontamination. The level of decontamination must be spelled out in the project health and safety plan.

Protective clothing, respirators, monitoring equipment, sampling supplies, and other equipment are all maintained in a support area outside of the CRC. Contractor personnel don their protective equipment (dressout) away from the CRC and enter the Exclusion Zone through a separate access control point at the hotline.

10.6 DECONTAMINATION GUIDANCE

The protection selected for an investigation and the specific pieces of clothing worn in the exclusion zone dictate the items required and layout of the decontamination line. Different degrees of protection present a different situation with respect to the type of decontamination procedure required. Level C and D protection and decontamination procedures are anticipated for Site 15.

The reason for leaving the Exclusion Zone determines the need for and extent of decontamination. Also, the time required for worker decontamination must be determined and incorporated in the scheduling of site activities. A worker leaving the Exclusion Zone to pick up or drop off tools or instruments and immediately returning may not require full decontamination. A worker leaving to get a new air cylinder or change a respirator or canisters, however, would require some degree of decontamination. Contractor personnel wearing self-contained breathing apparatuses must leave their work areas with sufficient air to walk to the CRC and go through decontamination. Contractor personnel departing the CRC at break time, lunchtime, or the end of the day must be thoroughly decontaminated.

The type of decontamination equipment, materials, and supplies are generally selected on the basis of availability. The ease of equipment decontamination and disposability are also considered. Most equipment and supplies are easily procured. Soft-bristle scrub brushes or long-handle brushes are used to remove contaminants. Buckets of water or garden sprayers are used for rinsing. Large galvanized wash tubs, stock tanks, or children's wading pools can be used as containers for wash and rinse solutions. Large plastic garbage cans or containers lined with plastic bags are useful for the storage of contaminated clothing and equipment, and metal or plastic cans or drums are useful for the storage of contaminated liquids. Other gear includes paper or cloth towels for drying protective clothing and equipment.

Heavy equipment such as bulldozers, trucks, backhoes, and drilling equipment are difficult to decontaminate. The method generally used is to wash them with water under high pressure and scrub accessible parts with detergent/water solution, also under pressure if possible. Particular attention should be given to tires, scoops, and other components that directly contact contaminated areas. Provisions should be made to collect rinsate for treatment or disposal.

Protective equipment is usually decontaminated by scrubbing with detergent water using a soft-bristle brush followed by rinsing with copious amounts of water. While this process may not be fully effective in removing some contaminants (in some instances the contaminants may react with water), it is a relatively safe option compared to the use of a decontaminating solution. The contaminant must be identified before a decontamination chemical is used, and reactions of such a chemical with unidentified substances or mixtures could be especially troublesome.

Sampling devices and tools may require special cleaning depending on the specific contaminants found at the site. General decontamination procedures should typically be followed.

10.7 EXTENT OF DECONTAMINATION REQUIRED

The project health and safety plan must be adapted to specific conditions. These conditions may require more or less personnel decontamination than was incorporated into the initial plan, depending on the following factors:

- Type of contaminant. The extent of personnel decontamination depends on the effects the contaminants have on the body. Whenever it is known or suspected that personnel can come in contact with highly toxic or skin-destructive substances, full decontamination procedures should be followed. If less hazardous materials are involved, the procedure can be downgraded;
- Amount of contamination. The amount of contamination on the protective clothing is usually determined visually. If the clothing is badly contaminated, a thorough decontamination is generally required. Gross materials remaining

on the protective clothing for any extended period of time may degrade or permeate it. This likelihood increases with higher air concentrations and greater amounts of liquid contamination. Gross contamination also increases the probability of personnel contact;

- Level of protection. The level of protection and specific pieces of clothing worn determine, on a preliminary basis, the layout of the decontamination line. Each level of protection incorporates different problems in decontamination such as the harness straps and backpack assembly of the self-contained breathing apparatus. A butyl rubber apron worn over the harness makes decontamination easier. Clothing variations and different levels of protection may require adding or deleting stations in the original decontamination procedure;
- Work function. The work each person does determines the potential for contact with hazardous materials. In turn, this dictates the layout of the decontamination line. For example, observers, photographers, operators of air samplers, or others in the Exclusion Zone performing tasks that will not bring them in contact with contaminants may not need to have their garments washed and rinsed. Others in the Exclusion Zone with a potential for direct contact with the hazardous material will require a more thorough decontamination. Different decontamination lines could be set up for different job functions, or certain stations in a line could be omitted for personnel performing certain tasks; and
- Location of contamination. Contamination on the upper areas of the protective clothing poses a greater risk to the worker because volatile compounds may generate a hazardous breathing concentration both for the worker and for the decontamination personnel. There is also an increased probability of contact with skin when removing clothing from the upper body.

10.8 TESTING THE EFFECTIVENESS OF DECONTAMINATION

Decontamination methods vary in their effectiveness for removing chemicals. The decontamination method chosen for a site should be assessed at the beginning of the program and periodically throughout the program by the Project Health and Safety Manager. If contaminants are not being removed or are permeating protective clothing, the decontamination program should be changed. The following methods may be useful in assessing the effectiveness of decontamination:

- Natural light. Discolorations, stains, corrosive effects, visible dirt, or alterations in clothing fabric may indicate that contaminants have not been removed. Not all contaminants leave visible traces; many contaminants can permeate clothing and are not easily observed;

- Ultraviolet light. Certain contaminants, such as polycyclic aromatic hydrocarbons, which are common in many refined oils and solvent wastes, fluoresce and can be visually detected when exposed to ultraviolet light. Ultraviolet light can be used to observe contamination of skin, clothing, and equipment. However, the use of ultraviolet light can increase the risk of skin cancer and eye damage; therefore, a qualified health professional should assess the benefits and risks associated with ultraviolet light before its use at a waste site;
- Photoionization detector. A photoionization detector can be used to determine the effectiveness of the decontamination procedure in removing many volatile organic compound. However, this method would be ineffective in determining the extent of residual pesticides or metal on personal protective equipment because these substances are not volatile; and
- Wipe testing. This method provides after-the-fact information on the effectiveness of decontamination. In this procedure, a dry or wet cloth, glass fiber filter paper, or swab is wiped over the surface of a contaminated object and then analyzed in a laboratory. Both the inner and outer surfaces of protective clothing should be tested. Skin may also be tested using wipe samples.

10.9 DECONTAMINATION DURING MEDICAL EMERGENCIES

The project health and safety plan should establish methods for decontaminating personnel with medical problems and injuries. It is possible that decontamination may aggravate or cause more serious health effects. If prompt life-saving first aid and medical treatment is required, decontamination procedures should be omitted. Whenever possible, response personnel should accompany contaminated victims to the medical facility to advise on matters involving decontamination.

10.9.1 Physical Injury

Physical injuries can range from a sprained ankle to a compound fracture, from a minor cut to massive bleeding. Depending on the seriousness of the injury, treatment may be given at the site by trained response personnel. For more serious injuries, additional assistance may be required at the site or the victim may have to be transported to a medical facility.

Life-saving care should be started immediately, without considering decontamination. The outside garments can be removed if they do not cause delays, interfere with treatment, or aggravate the problem. Respirators and backpack assemblies must always be removed. Fully encapsulating suits or chemical-resistant clothing can be cut away. If the outer contaminated garments cannot be safely removed, the individual should be wrapped in plastic, rubber, or blankets to help prevent contaminating medical personnel and the inside of ambulances. Outside garments are then removed at the medical facility. No attempt should be made to wash or rinse the victim at the site. One exception would be if it is known that the individual has been contaminated with an extremely toxic or corrosive material that could also cause severe injury or loss of life. For minor medical problems or injuries, the normal decontamination procedure should be followed.

10.9.2 Heat Stress

Heat-related illnesses range from mild heat fatigue to a serious heat stroke. Heat stroke requires prompt treatment to prevent irreversible damage or death. Unless the victim is obviously contaminated, decontamination should be omitted or minimized and treatment begun immediately. Protective clothing may have to be cut off. Less serious stages of heat stress require prompt attention because they can lead to heat stroke.

10.9.3 Chemical Exposure

Exposure to chemicals can be divided into two categories:

1. Injuries from direct contact, such as acid burns or inhalation of toxic chemicals;
2. Potential injury caused by gross contamination on clothing or equipment.

For inhaled contaminants, treatment can only be performed by qualified physicians. If the contaminant is on the skin or in the eyes, immediate measures must be taken to counteract the substance's effect. First aid treatment generally includes flooding the affected area with water. For a few chemicals, water may cause more severe problems.

When protective clothing is grossly contaminated, contaminants may be transferred to treatment personnel or the wearer and cause injuries. Unless severe medical problems have occurred simultaneously with splashes, the protective clothing should be washed off as rapidly as possible and carefully removed.

10.10 CLOSURE OF THE CRC

When the CRC is no longer needed, it must be closed down by the operators. All disposable clothing and plastic sheeting used during the operation must be double-bagged and either contained on site or removed to an approved off-site disposal facility. Decontamination and rinse solutions should be discarded on site if approved by regulatory agencies or it must be removed to an approved disposal facility. Reusable rubber clothing should be dried and prepared for future use (if gross contamination had occurred, additional decontamination of these items may be required). Cloth items must be bagged and removed from the site for final cleaning. Commercial laundries or cleaning establishments that decontaminate protective clothing or equipment shall be informed of the potentially harmful effects of exposures to hazardous substances. All wash tubs, pails, containers, etc., must be thoroughly washed, rinsed, and dried before removal from the site.

10.11 NECESSARY EQUIPMENT

Based on the expected levels and types of contaminants at the site, modifications to the OSHA-specified modifications, the equipment listed below may be necessary for personnel decontamination.

10.12 EQUIPMENT DECONTAMINATION

Sampling equipment such as split spoon samplers, probes, and stainless steel bowls and spoons will be decontaminated before each use and at the end of the day. Decontamination procedures include:

- Rinse with potable water;
- Wash with phosphate-free detergent;
- Rinse with potable water;
- Rinse with technical grade methanol;
- Rinse with deionized water; and
- Allow to air dry.

10.13 DRILL RIG DECONTAMINATION

The drill rig will be steam-cleaned and sampling equipment will be decontaminated prior to moving offsite. The equipment will be decontaminated in the following manner:

- The drill rig will be steam cleaned to remove gross contamination;
- Down hole equipment will be steam cleaned to remove gross contamination; and
- Equipment will be air-dried.

A drilling sequence hierarchy (from less-likely to more-likely contaminated locations) will be imposed to reduce the potential for cross contamination.

All sampling equipment will be decontaminated prior to use at each sampling location. The sampling equipment will be decontaminated in the following manner:

- The sampling spoon and bowl will be washed with Alconox, rinsed with methanol, and rinsed with deionized water.

SECTION 11

RECORDKEEPING

Good record keeping is essential for an effective health and safety program that will meet the needs of the contractor and the requirements of state and federal laws and regulations. The following subsections describe the health and safety records that must be maintained.

11.1 HEALTH AND SAFETY TRAINING RECORDS

Document all formal training of contractor personnel and have these records kept by the Program Health and Safety Manager. Retain these records in the contractor's project health and safety file separate from the normal personnel records.

Each record of training must contain:

- Name and ID number of the person trained;
- Date of training;
- Content or scope of training provided;
- Names of the trainers; and
- Results of certification test (for 40-hour hazardous waste operations training).

Where it is required, field training (level B, instrumentation training, etc.) will be performed and documented by the Program Health and Safety Manager. These records will then be transferred to the contractor's health and safety files for permanent storage.

When an employee terminates, his or her training records are forwarded to the Corporate Health and Safety Manager. Each employee's training records are maintained during his or her employment with the contractor and for a period of 30 years after termination of employment with contractor.

11.2 MEDICAL SURVEILLANCE RECORDS

Two types of medical surveillance records must be kept: (1) The medical reports furnished by the physician to the Program Health and Safety Manager and (2) the clinical records of the employee's past medical history and the results of medical examinations.

11.2.1 Archival Storage of Medical Records

OSHA requires that the employer maintain and preserve medical records on potentially exposed workers for 30 years after they leave employment. The contractor Corporate Health and Safety Manager will maintain the medical surveillance records of terminated employees in a locked file separate from other personnel records. The sealed files shall not be opened by or released to anyone except: (a) on express authorization by the employee – in which case copies of the records will be provided to the employee, (b) on direct order of a court, or (c) by order of an authorized federal or state OSHA representative.

11.2.2 Confidential Information

The physician's opinion report must be treated as confidential information. A separate, locked file is to be maintained for the segregation and storage of these reports. This information can only be made available to the site Health and Safety Coordinator, and the employee. The employee may request to review the medical opinion. The Program Health and Safety Manager will then transfer the physician's statement to the employee. The Program Health and Safety Manager must properly record the transfer of the document. The medical information must be returned to the locked file at the conclusion of each day. Copies of the report cannot be issued to unauthorized personnel or organizations without the employee's written consent. Copies of all confidential information must be sent with an accompanying transmittal form.

11.3 OSHA 200 FORM

The contractor is not required by federal law to maintain and post the OSHA No. 200 form (log and summary of occupational injuries and illnesses) because the contractor is classed under S.I.C (Standard Industrial Classification) code 8711, Engineering Services. (Our laboratories would be S.I.C. code 8734.) Under federal law, facilities with S.I.C. codes 87xx are exempt from the reporting requirements. However, several states have their own occupational safety and health programs qualified under federal OSHA. These state program requirements differ in some respects from the federal requirements.

The contractor maintains an up-to-date OSHA 200 log. The Program Health and Safety Manager is responsible for maintaining the log and summary of **all** occupational injuries and illnesses occurring at the site.

Each injury or illness shall be recorded on the log as soon as practicable (but no later than six working days) after receiving information that an injury or illness has occurred. The OSHA 200 form is recommended for recording of this information.

The OSHA 200 form states that only 'recordable' (as defined on the form) injuries and illnesses be entered. However, all injuries and illnesses should be entered so that we have better information for evaluation of the contractor's health and safety program. Each recordable entry on the OSHA 200 form should be so marked. Injury and illness records shall be kept on a calendar year basis. The OSHA 200 form shall be retained in the contractor's corporate office for five years following the end of the year to which they pertain.

11.4 AUDIT REPORTS

A health and safety project audit refers to the auditing of project activities for compliance with the project health and safety plan, applicable contractor health and safety guidelines, and federal and state OSHA requirements. A project specific audit checklist will be developed based on the in the project health and safety plan. An example of areas that will be addressed in an audit checklist for hazardous waste site investigations include:

- Decontamination procedures;
- Air-monitoring procedures;
- Emergency planning;
- Completeness of Site Health and Safety Plan;
- Choice of level of protection;
- Documentation of respirator fit-testing; and
- Documentation of health and safety training.

Audit reports will be prepared by the Program Health and Safety Manager after gathering and evaluating all available data. Items, activities, or documents determined to be deficient shall be identified at the post-audit meeting with the audited team. Deficiencies will be logged, documented, and controlled through Health and Safety Audit Notices that should be attached as part of the audit report. Project audit reports are sent to the Program and Project Manager.

Responses to audit findings must be addressed in a specified and timely manner. The adequacy of the response shall be evaluated by the Program health and Safety Manager. For a response to be considered adequate, it must:

1. Correct the situation that created the deficient conditions;
2. Provide a mechanism for preventing recurrence of the situation;
3. Identify the target date for the completion of these activities.

If the response is satisfactory, this fact will be noted on the Health and Safety Audit Notice form. After all notices have been accepted, the Program Health and Safety Manager will close out the audit report. Copies of the audit report and responses may be distributed to the appropriate levels of management.

11.5 ACCESS TO OTHER HEALTH AND SAFETY RECORDS

The majority of health and safety documents (accident reports, audit reports, etc.) shall be stored and maintained in a file with controlled access. Entry into the file shall be restricted to personnel designated by the Program Health and Safety Manager.

SECTION 12

REFERENCES

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APPENDIX B

QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN FOR THE SUPPLEMENTAL INVESTIGATION WORK PLAN

*Adapted from Parsons Engineering Science's ***Quality Assurance Plan for Site 15 at Hancock Field Syracuse, NY*** dated December 2000.

Site 15 Interim Remedial Action
174th Fighter Wing of the Air National Guard
Hancock Air National Guard Base
Town of Dewitt
Onondaga County, New York

New York State Department of
Environmental Conservation
Site Number 734054

July 2007

ERM Project Number 0066227

Prepared by:

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1.0 PROJECT DESCRIPTION

1.1 INTRODUCTION

The below site description information was obtained from the *Proposed Remedial Action Plan for Hancock Air National Guard Site 15* (Parsons, 2004).

Site 15 is part of land used by the 174th Fighter Wing of the New York Air National Guard. The entire site located within the Air National Guard Base at Hancock Field directly adjacent to the Syracuse Hancock Airport. The Air National Guard facility at Hancock Field is bordered by the Town of Dewitt to the east and south, the Town of Salina to the west, and the Town of Cicero to the north. Syracuse International Airport is located directly to the north of the Air National Guard facility (Parsons, 2004).

Site 15 is approximately 2.5 acres in area consisting of brush vegetation, wooded vegetation in the southern portion adjacent to Molloy Road, a large concrete pad, a bermed area where a 215,000-gallon aboveground tank was formerly located, and two drainage swales. One drainage swale borders the site on its north-northeast side, and a second drainage swale is located along the west side of the site. The drainage swales contain water only intermittently following storm events. Water within the drainage swales does not appear to be hydraulically connected to underlying groundwater (Parsons, 2004).

Several site structures were removed as part of a removal action for PCB-impacted soils. The foundation of the former pump house and associated underground structures, consisting of six underground tanks, three drainage sumps, and an oil-water separator were recently removed. Additionally, a transformer pad adjacent to the southeast side of the former pump house was removed (Parsons, 2004).

ERM's approach to performing an Interim Remedial Action (IRA) for the ANG is to first understand the nature of the problem from a regulatory and technical perspective, and most importantly from the ANG's risk management perspective. If previous investigations have been conducted, we refine our understanding through review of the existing data and findings. This enables us to identify any data gaps that may exist and evaluate the appropriateness of current ongoing activities and planned actions. Evaluation of existing site data identifies data gaps critical to supporting the desired remedial strategy for the site, and field investigation fills those gaps. ERM's systematic approach to addressing site investigation emphasizes planning, analysis, and integration of engineering data requirements to facilitate efficient selection of the appropriate remedy.

1.2 PROJECT OBJECTIVES

The purpose of the supplemental investigation as part of an IRA at Sire 15 is to addresses tasks necessary to accomplish the characterization and delineation of the extent of BTEX-affected ground water at Site 15, including both on-Site and off-Site portions of the affected area. Results derived from additional investigation at the Site will be presented to NYSDEC and other interested parties in an Addendum to the FS Report. The resulting data will be used to expand on the remedial alternative(s), besides soil removal, selected in the Final Feasibility Study Report for the 174^{th} Fighter Wing, Hancock Air National Guard Base (ANGB), Syracuse New York, February 2002, and monitor or enhance natural attenuation of contaminants in the groundwater. The scope of the groundwater monitoring and investigation program includes groundwater level measurements and sampling from the existing monitoring wells, the installation of five or six permanent monitoring wells, a direct push delineation, a soil vapor investigation (optional), and hydrogeologic testing.

1.3 SCOPE OF WORK

The scope of work to be conducted under the supplemental investigation of the IRA is as follows:

- Prepare this Supplemental Remedial Investigation Workplan and submit the Workplan to NYSDEC, NYSDOH, and Mr. Easter for review and approval.
- Perform a direct-push investigation on-site and off-site to evaluate the current extent of BTEX-affected groundwater and obtain additional hydrogeologic information potentially relevant to remediation of the Site.
- Measure soil vapor concentrations at selected locations to evaluate the potential for soil vapor intrusion issues at off-site buildings (optional task).
- Install three permanent monitoring wells off-site east of Fairway Drive, at locations to be determined subsequent to review of results from the direct-push investigation.
- Install t two permanent monitoring wells side-gradient of the Site 15 source area at locations to be determined in the field based on results the direct-push investigation.
- The new monitoring wells will be developed. All wells previously sampled in November 2006 and the new wells will be sampled to obtain an existing baseline condition. Hydrologic testing as deemed appropriate will be performed.

2.0 PROJECT ORGANIZATION

ERM shall maintain and use a project management system capable of tracking scheduled tasks, and percentage of individual tasks completed. This schedule shall present the timing of events and deliverables necessary to complete this project. ERM shall streamline the schedule, conducting as many activities concurrently as is technically feasible. The schedule shall be based on a work break down structure that corresponds to the breakdown of tasks in this SOW. The initial approved schedule by the HQ ANG PM shall not be modified and shall remain as the baseline for which to compare the progress of activities. A current schedule shall be updated as the schedule changes caused by new requirements or activity slippage. The most current timeline shall be submitted in the progress report every month.

3.0 PURPOSE AND OBJECTIVES

3.1 PURPOSE

This Quality Assurance Project Plan (QAPP) was prepared for the Work Plan for the Hancock Air National Guard Site 15. It is intended to set forth guidelines for the generation of reliable data by measurement activities, such that data generated are scientifically valid, defensible, comparable and of known precision and accuracy.

This QAPP contains a detailed discussion of the quality assurance (QA) and quality control (QC) protocols to be utilized by Environmental Resources Management (ERM) and laboratory personnel, as well as a project description, and project organization and responsibilities.

3.2 DEFINITIONS

The parameters that will be used to specify data quality objectives (DQO), and to evaluate the analytical system performance for all analytical samples are precision, accuracy, representativeness, completeness and comparability (PARCC). Definitions of these and other key terms used in this QAPP are provided below.

- ***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 will be reported as µg/l and solid samples will 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 impacts 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 of 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 will include a trip blank (TB), a duplicate and one sample collected in a sufficient volume to allow the laboratory to perform a matrix spike.

- ***Field Blanks*** – field blanks (FB) (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 once during a sampling episode. If analytes pertinent to the project are found in the FB, 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 FB 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.
- ***Representativeness*** - degree to which data represent a characteristic of a set of samples. The representativeness of the data is a function of the procedures and caution utilized in collecting and analyzing the samples. The representativeness can be documented by the relative percent difference between separately collected, but otherwise identical sample volumes.
- ***Trip Blanks (TB)*** - trip blanks are samples that originate from analyte-free media taken from the laboratory to the sampling site and returned to the laboratory with the volatile organic samples. One TB should accompany each sampling shipment containing volatile organics; it will be stored at the laboratory with the samples, and analyzed with the sample set. TBs are only analyzed for volatile organic compounds (VOCs).

3.3 OVERALL DATA QUALITY OBJECTIVES

Data Quality Objectives (DQO) are quantitative and qualitative statements specifying the quality of the environmental data necessary to support the decision-making process to guide the Work Plan and any subsequent corrective actions. DQO define the total uncertainty in the data that is acceptable for each activity. This uncertainty includes both sampling error and analytical error. Ideally, the prospect of zero uncertainty is the objective; however, the very processes by which data are 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.

As discussed above, the parameters that will be used to specify data quality requirements and to evaluate the analytical system performance for the samples are PARCC. The overall objectives are established such that there is a high degree of confidence in the measurements.

3.4 FIELD INVESTIGATION DATA QUALITY OBJECTIVES

In order to permit calculation of precision and accuracy for the sampling media, blind field duplicate samples will be collected, analyzed and evaluated.

Through the submission of field QC samples, the distinction can be made between laboratory problems, sampling technique considerations, sample matrix effects, and laboratory artifacts. To assure media sample representativeness, all sample collection will be performed in strict accordance with the procedures set forth in this QAPP.

Precision will be calculated as RPD if there are only two analytical points and percent relative standard deviation (% RSD) if there are more than two analytical points. Blind field duplicate sample analyses will provide the means to assess precision.

Representativeness will be assured through the implementation of the structured and coherent Work Plan building characterization and pre-sampling location inventory of which this QAPP is a part. This Work Plan has been designed so that the appropriate numbers of samples of each location of interest are obtained for analysis.

Ideally, 100% completeness is the goal. However, it must be recognized that unforeseen issues may result in the generation of some data that may not be acceptable for use. Therefore, a completeness target of 90%, as determined by the total number of usable data points versus the total number of data points measured, will be the realistic goal of this program.

Comparability is defined as the extent to which data from one data set can be compared to similar data sets. Comparability between data sets is often questionable due to issues such as different analytical methods used or inter-laboratory differences. In order that the data generated as part of this project remain comparable to any previously generated data or data to be generated in the future, currently published analytical methods have been identified for the analysis of the collected samples. An analytical laboratory with a demonstrated proficiency in the analysis of similar samples by the referenced methods will perform these methods. In addition, samples will be collected using documented procedures to ensure consistency of effort and reproducibility if necessary.

3.5 LABORATORY DATA QUALITY OBJECTIVES

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 spike compounds, and will be presented as percent recovery (%R). 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.

4.0 PROJECT ORGANIZATION AND RESPONSIBILITY

While all personnel involved in an investigation and in the generation of data are implicitly a part of the overall project management and QA program, certain members of the Project Team have specifically designated responsibilities. Project Team members with specific management and quality assurance roles in the Work Plan are the ERM Project Director (PD), the ERM Project Manager (PM), the ERM Field Team Leader (FTL) and the ERM Quality Assurance Officer (QAO). In the following sections, the roles and responsibilities of key personnel are identified.

4.1 ERM PROJECT DIRECTOR

The ERM Project Director (PD), Mr. Edward Hinchey, will oversee the ERM PM and be responsible for all technical aspects of the project, including the overall quality of the project and project deliverables for ERM. Mr. Hinchey is responsible for ensuring the successful completion of each project phase and the project as a whole. Mr. Hinchey has extensive experience with the management and coordination of multi-disciplinary environmental field investigation and remedial projects in New York State.

4.2 ERM PROJECT MANAGER

The ERM Project Manager (PM), Mr. David W. Myers, C.G., will report to the ERM PD. Mr. Myers will oversee the ERM QAO and the ERM FTL, field investigation staff, and any subcontractors. Mr. Myers will also be responsible for all technical aspects of the project for ERM. This includes scheduling, communicating to the PD, technical development and review of all field activities, subcontracting, and the overall quality of the project and project deliverables for ERM. Mr. Myers has extensive experience in the management and coordination of multi-disciplinary field investigation and remedial projects in New York State.

4.3 ERM QUALITY ASSURANCE OFFICER

The ERM Quality Assurance Officer (QAO), Mr. Andrew Coenen, will report to the ERM PM. Mr. Coenen 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. Mr. Coenen has extensive analytical laboratory experience and experience in the validation of analytical data and the protocols and QC specifications of the analytical methods and the data validation guidance, USEPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review and USEPA Region II Data Review SOPs.

4.4 ERM FIELD TEAM LEADER

The ERM Field Team Leader (FTL), Mr. Robert Sents, will report to the ERM PM and the RPMs. Mr. Sents will be responsible for the day-to-day management and coordination of ERM field staff and subcontractors. Mr. Sents will be responsible for the implementation and quality of the field activities. Mr. Sents has extensive environmental field investigation/subcontractor oversight experience in New York State.

The following table summarizes the Personnel Information on this project and also provides contact information.

Name	*Title*	*Company*	*Address*	*Telephone Number*
Edward Hinchey	Project Director (PD)	ERM	5788 Widewaters Pkwy Dewitt, New York 13214	(315) 445-2554
David W. Myers	Project Manager (PM)	ERM	5788 Widewaters Pkwy Dewitt, New York 13214	(518) 461-8936
Andrew Coenen	Quality Assurance Officer (QAO)	ERM	520 Broad Hollow Road Suite 210 Melville, New York 11747	(631) 756-8959
Robert Sents	Field Team Leader (FTL)	ERM	5788 Widewaters Parkway Dewitt, New York 13214	(315) 445-2554

5.0 FIELD QUALITY ASSURANCE/QUALITY CONTROL

5.1 EQUIPMENT MAINTENANCE

In addition to the laboratory analyses conducted during the course of this Work Plan, sampling locations will be screened with a photo-ionization detector (PID) prior to sample collection to preliminarily assess the presence of VOCs. At ground water sampling locations using existing wells, ground water field tests for various parameters will be performed using a Horiba U-22 prior to sample collection. In addition, an interface probe will be used at ground water sampling locations at existing wells to determine the presence or absence of non-aqueous phase liquid (NAPL).

A maintenance, calibration, and operation program will be implemented to ensure that routine calibration and maintenance is performed on all field instruments. ERM's equipment manager ERM's Field Team Leader, the Quality Assurance Officer (QAO) and the field team members will administer the program. ERM's equipment manager will perform the scheduled monthly and annual calibration and maintenance. Monthly and annual maintenance, calibration and equipment operation will follow the procedures outlined in the manufacturer's Operation and Field Manuals accompanying the respective instruments.

5.2 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. A trained team member will perform daily field checks and instrument maintenance prior to use. A trained team member using standard calibration gas will calibrate the PID. 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 will be documented on an instrument-specific calibration/ maintenance form.

The Field Team Leader (FTL) will be responsible for keeping a master instrument calibration/maintenance form for each measuring device. Each form will include at least the following relevant information:

- Name of device and/or instrument calibrated;
- Device/instrument serial and/or identification (I.D.) number;

- Frequency of calibration;
- Date of calibration;
- Results of calibration;
- Name of person performing the calibration; and
- Identification of the calibration standards.

In lieu of a form, this information may be recorded in the field logbook.

5.3 EQUIPMENT DECONTAMINATION

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

5.3.1 General Procedures

All heavy equipment will be decontaminated in a designated clean area. If equipment and probes have a visible sheen or discernable odor after sampling, they will be decontaminated in an area covered by plastic near the sampling location and 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 will 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 will be kept to a minimum in the field, and wherever possible, dedicated sampling equipment will be used. Personnel directly involved in equipment decontamination will wear appropriate protective equipment.

5.3.2 Heavy Equipment

All drilling equipment will be decontaminated by alconox and potable water rinse, cleaning prior to performance of the first boring/sampling point installation and between all subsequent boring/sampling point installations. This will include all hand tools, drill bits, tremie pipe and other related tools and equipment.

All water used during drilling and/or cleaning operations will 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. The equipment will be cleaned to the satisfaction of ERM Field Staff.

5.3.3 Air Sampling Equipment

Factory prepared Summa canisters will be used during all soil vapor sampling activities performed under the Work Plan. In the event that field decontamination of reusable sampling equipment is necessary, decontamination procedures will be as follows:

- Laboratory-grade glassware detergent and tap water scrub to remove visual contamination;
- Generous tap water rinse;
- Distilled and deionized (American Standard for Testing of Materials (ASTM) Type II) water rinse;
- 10% nitric acid rinse, followed by a distilled and deionized water rinse (metals only), or
- Methanol (pesticide grade) rinse (volatiles only);
- Total air dry; and
- Distilled and deionized water rinse.

Since dedicated new lengths of polyethylene tubing will be used for sampling, the tubing will not be decontaminated. A laboratory certified clean Summa canister and certified clean regulator will be used for each sampling location.

Prior to preparing each sampling location, the reusable equipment will be decontaminated as follows:

- Potable water rinse;
- Alconox detergent and potable water scrub;
- Potable water rinse;
- Distilled/deionized water rinse; and
- Wrap in aluminum foil, shiny side facing out.

5.3.4 Ground Water Sampling Equipment

Factory pre-cleaned disposable bailers will be used during the ground water sampling. In the event that field decontamination of reusable sampling equipment is necessary, decontamination procedures will be 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;
- 10% nitric acid rinse, followed by a distilled and deionized water rinse (metals only), or
- Methanol (pesticide grade) rinse (volatiles only);
- Total air dry; and
- Distilled and deionized water rinse.

5.3.5 Meters and Probes

All meters and probes that are used in the field will be decontaminated between uses as follows:

- phosphate-free laboratory detergent solution;
- tap water;
- alconox rinse (at the FTL's discretion if deemed necessary); and
- deionized water (triple rinse).

5.4 QUALITY ASSURANCE/ QUALITY CONTROL SAMPLING

The procedures for soil vapor and ground water sample collection during the Work Plan are discussed in the Work Plan For Vapor Intrusion Evaluation. Specific guidance regarding the collection of field and laboratory QA/QC samples is presented separately below.

5.4.1 Field QA/QC Samples

Trip Blanks

The trip blank will be used to determine if any cross-contamination occurs between aqueous samples during shipment. Trip blanks will be supplied by the analytical laboratory as aliquots of distilled, deionized water that will be sealed in a sample bottle prior to initiation of each day of fieldwork. Glass vials (40 ml) with Teflon®-lined lids will be used for trip blanks. The sealed trip blank bottles will be placed in a cooler with the empty sample bottles and will be shipped to the site by the laboratory personnel. If multiple coolers are necessary to store and transport aqueous VOC samples, then each cooler must contain an individual trip blank. Trip blanks will not be collected in conjunction with the air samples.

Field Blanks

Field blanks will be collected to evaluate the cleanliness of aqueous sampling equipment, sample bottles and the potential for cross-contamination of samples due to handling of equipment, sample bottles and contaminants present in the air. Field blanks will be collected at a frequency of one per decontamination event for each type of sampling equipment (e.g., a ground water bailer for groundwater) at a minimum of one per equipment type and/or media per day. Field blanks will not be collected in conjunction with the air samples.

Field blanks will be collected 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 will provide field blank water and sample jars with preservatives for the collection of all field blanks. Glass jars will be used for organic blanks. The field blanks as well as the trip blanks will accompany field personnel to the sampling location. The field blanks will be analyzed for the same analytes as the environmental samples being collected that day and will be shipped with the samples taken.

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

- Decontaminate sampler using the procedures specified in the QAPP;
- Pour distilled/deionized water over the sampling equipment and collect the rinseate water in the appropriate sample bottles;
- The sample will be immediately placed in a sample cooler and maintained at a temperature of 4°C until receipt by the laboratory; and

- Fill out sample log, labels and COC forms, and record in field notebook.

Temperature Blanks

Laboratory will use an infrared instrument to measure the temperature of liquid samples.

5.4.2 Laboratory QA/QC

Blind Field Duplicate Samples

Blind field duplicate samples for soil vapor and ground water will be collected and analyzed to check laboratory reproducibility of analytical data. Blind field duplicate samples will be collected at a frequency of 5% (one out of every 20 samples) of the samples collected to evaluate the precision and reproducibility of the analytical methods. If 20 samples are not collected at each site, one blind field duplicate sample will be collected for each sampled media (soil vapor and ground water). The 5% duplicate frequency is applied to the sampling method (i.e. soil vapor and ground water) rather than the total sample number. All blind field duplicate samples will be submitted to the analytical laboratory as normal samples; however, the sample will have a traceable, fictitious sample identification and fictitious time of sample collection. Each blind field duplicate will be cross-referenced to document which actual sample it is in the field notes and on the master sample log.

Matrix Spike/Matrix Spike Duplicate

Additional environmental sample volume will be collected for use as MS/MSD samples at a frequency of at least 5% (one out of every 20 samples) of the total number of samples collected to evaluate the precision and reproducibility of the analytical methods. To ensure the laboratory has sufficient volume for 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). MS/MSD samples will not be collected in conjunction with the air samples.

5.5 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 (COC) procedures to track a sample from collection through analysis, noting when and how samples are split (if necessary), making regular and complete entries in the field logbook, and the consistent use and completion of field management forms. Field management forms and the field logbook will 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 and field management forms are identified in the following sections.

5.5.1 Field Logbook

The sample team or individual performing a particular sampling activity will keep a weatherproof 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 will be kept as a permanent record. The field notebook will be filled out at the location of sample collection immediately after sampling. It will 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 will contain any deviations from protocol and why, visitor's names, community contacts made during sampling, geologic investigation activities, and other site-specific information which may be noteworthy.

5.5.2 Field Management Forms

In addition to maintenance of a field logbook, the use of field management forms will supplement field logbook entries for all field activities associated with this project. Field management forms provide a regular format to record the relevant information for a particular field activity. Use of these forms will ensure that the field team consistently and completely records all pertinent data relative to a particular field activity on a regular basis. All forms, sample labels, custody seals and other sample documents will be filled out completely.

A list of the forms and the associated activities for which each form could potentially be completed is presented below.

Form	*Activity*	*Attachment*
Daily Field Report	Every day of field activity.	Attachment A
Daily Instrument Calibration Log	Every day a field instrument is used.	Not Applicable
Air Sampling Record	All soil vapor, sub-slab vapor, indoor air and outdoor air sampling locations.	Attachment B
Ground Water Sampling Record	All ground water sampling locations.	Attachment C
COC Forms	All field sampling efforts.	Attachment D

5.6 SAMPLE PREPARATION AND CUSTODY

5.6.1 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 notebook. This notebook must be water resistant with sequentially numbered pages. Field activities will be sequentially recorded in the notebook.
- The notebook, along with the COC form, must contain sufficient information to allow reconstruction of the sample collection and handling procedure at a later time.
- Each sample will have a corresponding notebook entry which includes:
  - Sample ID number;
  - Sample location;
  - Date and time;

- Analysis for which sample was collected;
- Additional comments as necessary; and
- Sampler's name.

- Each sample must have a corresponding entry on a COC manifest.
- The manifest entry for sampling at any one location is to be completed before sampling is initiated at any other location 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 will be designated by an alphanumeric code that will identify the Site and a specific sample designation (identifier). The Site identification number will be "ANG".

The specific sampling designation (identifier) will be identified using an alphanumeric sub-code; ground water sample identifiers will be consecutive numbers for temporary points, or if collected from an existing monitoring well, the identifier will be the well designation. Soil vapor sample identifiers will have an alphanumeric sub-code "VP" and a number prefix 01 through 05 in the order of sample collection. For example:

ANG-MW-1 for designated monitoring wells;

ANG-TP-01 for temporary monitoring wells; and

ANG-VP-01 for soil vapor samples.

In the case of QC samples such as blind field duplicate samples, the nomenclature will be as follows:

ANG–VP-DUP(date) for soil vapor duplicate samples.

ANG–GW-XX-DUP(date) for ground water samples.

The "XX" will be replaced with a consecutive numeric code if more than one duplicate sample will be collected during any particular day.

Six digits will be used to represent the date (e.g., DUP080105 would represent a duplicate collected on 1 August 2005).

5.6.2 Sample Containers

- The analytical laboratory will provide all containers for ground water sample collection and Summa® canisters for air sample collection.
- The vials and canisters will be inspected and the flow controller certified clean by the laboratory prior to shipping. All sample canisters will be handled carefully so that flow controllers or canisters are not inadvertently compromised and all vials will be handled carefully so they do not break or the preservatives are not spilled.

The table below lists the analyses, preservative added, number of containers and container size for samples to be collected.

Analyses For:	Method Number	Preservative	Number of Containers	Container Size/type	Sample Holding Time
BETX & MTBE (GW)	EPA 8260	HCL	2	40 ml/VOA	14 days
Methane	Assorted	HCL	2	40 ml/VOA	14 days
Nitrate, Sulfate	Gen. Chem.	None	1	500ml/poly	48 hrs.
Total Hardness	Gen. Chem.	HNO_3	1	250ml/poly	28 days
Ammonia	EPA 350.2	H_2SO_4	1	250ml/poly	28 days
Alkalinity, Total	Gen. Chem.	None	1	250ml/poly	14 days
BETX & MTBE (SV)	TO-15	None	1	6-liter/Summa	

5.6.3 Sample Preservation

Once ground water samples have been collected, they will be sealed in a waterproof bag and placed in a pre-cooled container and held at a temperature of not more than 4°C.

No special handling is required for Summa® canister.

Sample Holding Time

- All samples will be shipped the same day they are collected to the analytical laboratory. Any exceptions will be documented in the field logbook and proper preservation techniques will be followed.

- The samples must be analyzed within specified holding times. See above table.
- The analytical laboratory will be a New York State Department of Health (NYSDOH) ELAP-certified laboratory and conform to meeting specifications for documentation, data reduction and reporting. The laboratory will follow all method specifications pertaining to sample holding times contained in the NYSDEC Analytical Services Protocol (ASP) revised 2000 and/or as prescribed by the specific analytical method.

Sample Custody

COC - 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 will 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.

Custody Transfer to Field Personnel – The field personnel will 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. COC records will be completed at the time of sample collection and will accompany the samples inside the cooler or shipping box for shipment to the selected laboratory.

Each individual who has the samples in their possession will sign the COC record. Preparation of the COC record is as follows:

- For each sample, the person collecting the sample will initiate the COC record in the field. Every sample will be assigned a unique identification number that is entered on the COC Record (see Section 5.6.1 above).
- 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 a commercial carrier ships the samples to the laboratory, the original COC 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 COC record will be maintained in the field file.
- If the samples are directly transported to the laboratory, the COC will be kept in the possession of the person delivering the samples.
- For samples shipped by commercial carrier, the waybill will serve as an extension of the COC record between the final field custodian and the laboratory.
- Upon receipt in the laboratory, the Sample Custodian or designated representative will open the shipping containers, compare the contents with the COC record, and sign and date the record. Any discrepancies will be noted on the COC record.
- If discrepancies occur, the samples in question will be segregated from normal sample storage and the field personnel immediately notified.
- COC records will be maintained with the records for a specific project, becoming part of the data package.

Custody Transfer to Laboratory - All samples collected during the Work Plan will be submitted to a NYSDOH ELAP-certified laboratory meeting specifications for documentation, sample login, internal chain of custody procedures, sample/analysis tracking, data reduction and reporting. The laboratory will follow all specifications pertaining to laboratory sample custody procedures contained in the NYSDEC ASP (revised 2000).

In general, the following procedures will be followed upon sample receipt. The laboratory will not accept samples collected by project personnel for analysis without a correctly prepared COC record.

The first step in the laboratory receipt of samples is completing the COC records and project sample login 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 samples have been compromised during shipment. If samples have been damaged during shipment, the remaining samples will be carefully examined to determine whether they were affected. Any affected samples will also be considered damaged. It will be noted on the COC 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 COC record.
- Verify that sample holding times have not been exceeded.
- Sign and date the COC record and attach the waybill to the COC 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 COC records in the project file.

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

5.6.4 Sampling Packaging and Shipping

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

Packaging

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

- Check that all Summa canister and vial labels are complete.
- Remove previously used labels, tape and postage from the box or cooler.
- Summa canisters will be transported in their original cardboard packing, if applicable, or similar materials. Canisters will be wrapped in bubble pack, or other suitable materials, and placed in boxes.
- Ground water samples will be wrapped in bubble pack and placed in dry plastic bags, which will then be tightly sealed. They will be placed in coolers and covered with ice that has been sealed in at least two watertight plastic bags.
- Affix an address and return address label to box or cooler.
- Be sure COC forms are complete.
- Separate and retain the sampler's copy of COC and keep with field notes.
- Tape paperwork (COC, manifest, return address) in zipper bag to the inside of sample package.
- Close package and apply signed and dated custody seal in such a way that the seal must be broken to open box or cooler.
- Securely close package with packing or duct tape.

Shipping

Samples should arrive at the laboratory as soon as possible following sample collection to ensure that 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 package 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 COC form.
- When packages have been released to transporter, call receiving laboratory and give information regarding samplers' names and method of arrival.
- Call the laboratory on the day following shipment to be sure all samples arrived intact. If samples have been compromised, locations can be determined from COC and resampled.

5.7 ANALYTICAL LABORATORY

The data collected during the course of the Work Plan will be used to determine the presence and concentration of certain analytes in air and ground water.

Ground Water samples collected during the execution of the Work Plan will be submitted to Life Science Laboratories (LSL) located at 5854 Butternut Dr., East Syracuse, NY 13057.

Soil Vapor samples collected during the execution of the Work Plan will be submitted to a Laboratory to be determined.

5.8 ANALYTICAL TEST PARAMETERS

Analytical test parameters are listed in the table included in Section 5.6.2 of this work plan.

5.9 INSTRUMENT CALIBRATION

The frequency of laboratory instrument calibration and associated procedures for the specific analytical methods to be followed by the selected laboratory are specified in the individual USEPA analytical method procedures. The selected laboratory's calibration schedule will adhere to all analytical method specifications.

6.0 DATA MANAGEMENT AND REPORTING PLAN

6.1 DATA USE AND MANAGEMENT OBJECTIVES

Data Use Objectives

The typical data use objectives for this Work Plan are:

- Ascertaining if there is a threat to public health or the environment.
- Locating and identifying potential sources of impacts to air, soil and ground water.
- Delineation of soil vapor intrusion zone, identifying clean areas, and estimating the areal extent and/or volume of impacted soil and/or ground water.

Data Management Objectives

The primary objective of proper data management is to ensure and document that all necessary work is conducted in accordance with the Work Plan and QAPP in an efficient and high quality manner thereby maximizing the confidence in the data in terms of PARCC. Data management procedures not only include field and laboratory documentation, but also include how the information is handled after the conclusion of field investigation and after laboratory analyses are completed. Data handling procedures include project file management, reporting, usability analysis (review and validation) and use of consistent formats for the final presentation of the data.

Project File Specifications

The ERM Project Manager in ERM's Syracuse, New York office location will keep all project information in a central Project File maintained. The Project File will be assigned a unique project number that will be clearly displayed on all project file folders (including electronic files). Electronic files will be maintained in a similarly organized Project File located on the ERM Central Network system that is backed up on a weekly basis. Both hard copy and electronic Project Files will contain, at a minimum, copies or originals of the following key project information:

- All correspondence including letters, transmittals, telephone logs, memoranda, and emails;

- Meeting notes;
- Technical information such as analytical data, field survey results, field notes, field logbooks and field management forms;
- Project calculations;
- Subcontractor agreements/contracts and insurance certificates;
- Project-specific health and safety information/records;
- Access agreements;
- Project document output review/approval documentation; and
- Reports: Monthly Progress, Interim Technical and Draft/Final Technical.

6.2 REPORTING

Field Data

Field data will be recorded and reported by field personnel using appropriate field data documentation materials such as the field logbook, field management forms and COC forms.

Good field management procedures include following proper COC procedures to track a sample from collection through analysis, noting when and how samples are split (if necessary), making regular and complete entries in the field logbook, and the consistent use and completion of 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.

Laboratory Data

The analytical results of all samples collected as part of this project will be reported following NYSDEC ASP 2000 specifications. All laboratory analytical data will be reported as NYSDEC Category B deliverables. The Category B data deliverables include all backup QA/QC documentation necessary to facilitate a complete validation of the data.

In addition, NYSDEC "Sample Identification and Analytical Requirement Summary" and "Sample Preparation and Analysis Summary" forms will be completed and included with each data package. The sample tracking forms are specified and supplied by the 2000 NYSDEC ASP.

The laboratory will also transmit the analytical data in an electronic format to minimize the chances of transposition errors in summarizing the data. The data will be transmitted in an electronic data deliverable (EDD) in GISKey (most recent version) format and a PDF copy of each ASP deliverable.

6.3 DATA VALIDATION

All field and laboratory data will be reviewed, validated and qualified as necessary to assess data usability by direct comparison to the specified DQOs and/or procedures set forth in this QAPP. Information that can be obtained includes comparison of results obtained from samples taken at the same location, and the identification of missing data points. Examination of the data at the end of the process allows for the assessment of data quality with respect to PARCC.

Field Data Validation Protocol

Field data generated in accordance with the Work Plan will primarily consist of VOC concentrations of soil vapor samples and ground water samples. This data will be validated by review of the project documentation to check that all forms specified in the Field Sampling Plan and this QAPP have been completely and correctly filled out and that documentation exists for the specified instrument calibrations. This documentation will be considered sufficient to provide that proper procedures have been followed during the field investigation.

Laboratory Data Validation Protocol

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

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 Category B deliverables). The data review will evaluate data for its quality and usability. This process will qualify results so that the end user of the analytical results can make decisions with consideration of the potential accuracy and precision of the data. For example, the results are acceptable as presented, qualified as estimated and flagged with a "J", or rejected and not useable and therefore flagged with an "R".

ERM will utilize all guidance documents and/or criteria relying on the most comprehensive reference sources to perform the most complete validation possible.

The data validation process will provide an informed assessment of the laboratory's performance based upon contractual requirements and applicable analytical criteria. The report generated as a result of the data validation process will provide a base upon which the usefulness of the data can be evaluated by the end user of the analytical results.

During the validation process, it will be determined whether sufficient back-up data and QA/QC results are available so the reviewer may conclusively determine the quality of data support laboratory submittals for sample results. Each data package will be checked for completeness and technical adequacy of the data. Upon completion of the review, the reviewers will develop a QA/QC data validation report for each SDG.

For the organic parameter analyses, the following items or criteria will be reviewed:

- Case narrative and deliverable compliance.
- Holding times, both technical and procedural.
- Surrogate Compound recoveries, summary and data.
- Blank Spike Sample (BSS) recoveries.
- Method blank summary and data.
- Gas Chromatography (GC)/Mass Spectroscopy (MS) tuning and performance.
- Initial and continuing calibration summaries and data.
- Internal standard areas, retention times, summary and data.
- Blind Field Duplicate sample results.
- Organic analysis data sheets (Form I).
- GC/MS chromatograms, mass spectra and quantitation reports.
- Quantitation and detection limits.
- Qualitative and quantitative compound identification.

After the Summary Reports are prepared for each SDG, the validator will prepare a Data Usability Summary Report (DUSR). The DUSR will be prepared according to the guidelines established by Division of Environmental Remediation Quality Assurance Group and will review the following:

- Is the data package complete as defined under the requirements for the NYSDEC ASP Category B deliverables?
- Have all holding times been met?
- Do all the QC data, including blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls and sample data, fall within the protocol required limits and specifications?
- Have all of the data been generated using established and agreed upon analytical protocols?
- Does an evaluation of the raw data confirm the results provided in the data summary sheets and qualify control verification forms?
- Have the correct data qualifiers been used?

Once the data package has been reviewed and the above questions asked and answered, the DUSR proceeds to describe the samples and the analytical parameters. Data deficiencies, analytical protocol deviations and quality control problems are identified and their effect on the data is discussed. The DUSR shall also include recommendations on resampling/reanalysis. All data qualifications must be documented following the NYSDEC ASP '00 Rev. guidelines.

6.4 DATA PRESENTATION FORMATS

Project data will be presented in consistent formats for all letters, Monthly Progress Reports, Interim Technical Reports, and Draft/Final Technical Reports. Specific formats will be tailored to best fit the needs of the data being presented but general specifications are described below.

Data Records

The data record will generally include one or more of the following:

- Unique sample or field measurement code;
- Sampling or field measurement location and sample or measurement type;
- Sampling or field measurement raw data;
- Laboratory analysis ID number;
- Property or component measured; and
- Result of analysis (e.g., concentration).

Tabular Displays

The following data will generally be presented in tabular displays:

- Unsorted (raw) data;
- Results for each medium or for each constituent monitored;
- Data reduction for statistical analysis;
- Sorting of data by potential stratification factors (e.g., location, soil layer/depth, topography, etc.); and
- Summary data.

Graphical Displays

The following data will be presented in graphical formats (e.g., bar graphs, line graphs, area or plan maps, isopleth plots, cross-sectional plots or transects, three dimensional graphs, etc.):

- Sample locations and sampling grid;
- Boundaries of sampling area;
- Areas where additional data are necessary;
- Constituent concentrations at each sample location;
- Geographical extent of impacts;
- Constituent concentration levels, averages, minima and maxima;
- Changes in concentration in relation to distance from the source, time, depth or other parameters;
- Features affecting intramedia transport; and
- Potential receptors.

7.0 PERFORMANCE AUDITS

7.1 FIELD AUDITS

During field activities, the QAO may accompany sampling personnel into the field to verify that the sampling program is being properly implemented and to detect and define problems so that corrective action can be taken. All findings will be documented and provided to the ERM Project Manager and FTL.

7.2 LABORATORY AUDITS

The NYSDOH ELAP CLP certified laboratory that has satisfactorily completed performance audits and performance evaluation samples will be used for all sample analysis. The results of the most recent performance audits and performance evaluations will be made available upon request.

7.3 CORRECTIVE ACTIONS

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

Prior to mobilization for the field investigation, a meeting may be scheduled among representatives of ERM and the laboratory to discuss a general corrective action approach and establish procedures to ensure good and timely communications among all parties during the investigation. New procedures will be put into effect as appropriate.

8.0 WASTE DISPOSAL PLAN

8.1 INVESTIGATIVE DERIVED WASTES

The following section describes the general protocol for handling and disposal of solid and liquid wastes generated during the Work Plan. Waste generated during the Work Plan is expected to consist of trash (boxes, paper, etc.), decontamination wash water, concrete dust/soil cuttings from drilling operations, and used PPE.

The following guidance documents and regulations may be relied upon to guide the management, staging and storage of investigative derived waste materials:

- NYSDEC's Proposed TAGM Concerning " Disposal of Contaminated Groundwater Generated During Remedial Investigations {No Final Date Available};
- NYSDEC's RCRA TAGM #3028 on " Contained-In Criteria for Environmental Media" {November 30, 1992};
- 40 C. F. R. Part 262 (Standards Applicable to Generators of Hazardous Waste);
- 40 C. F. R. Part 263 (Standards Applicable to Transporters of Hazardous Waste;
- 40 C. F. R. Part 264 (Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities); and
- 40 C. F. R. Part 268 (Land Disposal Restrictions).

Accordingly, handling and disposal will be as follows:

- Liquids generated from contaminated equipment decontamination that exhibit visual staining; sheen; or discernable odors will be collected in drums or other containers at the point of generation. They will be stored in the staging area. A waste subcontractor will then remove the drums and dispose at an off-site location.
- Used protective clothing and equipment that is suspected to be contaminated with hazardous waste will be placed in plastic bags,

packed in 55-gallon ring-top drums, and transported to the drum staging area.

- Liquid generated during well purging or decontamination activities that does not exhibit visible staining, sheen, or discernable odors will be discharged to an unpaved area on the Site, where it can percolate into the ground.
- Concrete dust will be collected in shop-vacuums and disposed of as non-regulated solid waste, unless PID readings, or visual indications of contamination are noted during field operations. Soil cuttings from drilling operations will be disposed of on-Site.

8.2 OTHER WASTES

- Non-contaminated trash and debris will be placed in a trash dumpster and disposed of by a local garbage hauler.
- Non-contaminated protective clothing will be packed in plastic bags and placed in a trash dumpster for disposal by a local garbage hauler.

ATTACHMENT A

DAILY FIELD REPORT FORM

ATTACHMENT B

AIR SAMPLING RECORD FORM

ATTACHMENT C

GROUND WATER SAMPLING RECORD FORM

ATTACHMENT D

CHAIN OF CUSTODY FORMS