Environmental Restoration Program
Final Site 15 Supplemental Remedial Investigation/Pilot Test Work Plan

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

October 2008

NGB/A7OR
Andrews AFB, Maryland

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October 2008

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Acronym	Definition
µg/L	Micrograms per liter
ANG	Air National Guard
bgs	Below ground surface
BEX	Benzene, Ethylbenzene, and Total Xylenes
EPA	United States Environmental Protection Agency
ERM	Environmental Resources Management
ft	Feet, foot
FW	Fighter Wing
GPR	Ground Penetrating Radar
MTBE	Methyl tert-butyl ether
NYSDEC	New York State Department of Environmental Conservation
PID	Photoionization Detector
PT	Pilot Test
PVC	Polyvinyl Chloride
RamTech	RamTech Consulting Corporation
RI	Remedial Investigation
VOC	Volatile Organic Compound

SECTION 1.0

INTRODUCTION

This Supplemental Remedial Investigation (RI)/Pilot Test (PT) Work Plan has been prepared for the Environmental Restoration Program at the 174th Fighter Wing (FW) of the New York Air National Guard (ANG) in DeWitt, New York. This Work Plan was completed under Task 2A of Delivery Order 0109 under National Guard Bureau contract DAHA92-01-D-0005 between ERM-West, Inc. (ERM) and the National Guard Bureau, Departments of the Army and Air Force.

1.1 Objectives and Scope of Work

This Work Plan addresses a Supplemental RI and an enhanced natural attenuation PT that will be conducted at the 174th FW. The objective of the Supplemental RI is to characterize the down-gradient leading edge of benzene, ethylbenzene, and xylene (BEX) on property south of the 174th FW.

The scope of work for the Supplemental RI is to:

- Install up to 40 soil borings using direct-push technology;
- Collect up to 30 groundwater samples for laboratory analysis of BEX;
- Install six to eight monitoring wells;
- Develop and survey the monitoring wells; and
- Collect groundwater samples from the newly installed wells for laboratory analysis of BEX and natural attenuation parameters.

The objectives of the enhanced natural attenuation PT are to:

- Evaluate the effectiveness of enhanced natural attenuation in treating BEX in groundwater; and
- Prevent further migration of the BEX plume onto down-gradient properties.

The scope of work for the enhanced natural attenuation PT is to:

- Install up to 20 injection points using a geoprobe rig;
- Inject calcium peroxide (CaO_2) into the groundwater; and
- Collect groundwater samples from all existing monitoring wells and submit the samples for laboratory analysis of BEX, alkalinity, ammonia, methane, nitrate, sulfate, total hardness, and ferrous iron.

All activities will be conducted in accordance with the United States Environmental Protection Agency (EPA) guidance documents, ANG requirements, and New York State Department of Environmental Conservation (NYSDEC) regulations.

1.2 Site Description and History

The 174th FW of the New York ANG is based at Hancock Field, an active international airport and a former Air Force Base located two miles north-northeast of the City of Syracuse in Onondaga County in central New York (Figures 1-1 and 1-2). The 174th FW supplies air reconnaissance for the eastern portion of the United States. The ANG facility is currently operating within the southern portion of the former Hancock Air Force Base located south of the municipal airport. Facilities on the base include hangers, support buildings, office buildings, and maintenance buildings. Hancock ANG is bordered by the airport to the north, the Town of Dewitt to the east and south, and the Town of Salina to the west.

Site 15 was formerly used as a pump house for the Petroleum, Oil and Lubricants area. It is approximately 2.5 acres in area, and consists of brush and wooded vegetation, a large concrete pad, a formerly bermed area where a 215,000-gallon aboveground tank was located, and two drainage swales. One drainage swale borders the site along the north-northeast side, and a second borders the west side of the site. The drainage swales contain water 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 spills of polychlorinated biphenyls and JP-4 and JP-8 military aviation fuels over the years. Several site structures were removed in 2003 as part of a removal action for polychlorinated biphenyl-impacted soils, including a transformer pad, the foundation of the former

pump house, six underground tanks, three drainage sumps, and an oil-water separator (Parsons 2004).

1.3 Surrounding Land Use

The surrounding land use is currently a mixture of transportation with the Syracuse Hancock International Airport, recreational, industrial, commercial, and residential within one-quarter mile down-gradient (south) of the site. Lands to the west, north, and east of the 174th FW are used for military and transportation purposes that have continued for decades. Land directly to the south of Site 15 across Molloy Road is used for a golf course. Overall land use in the site vicinity has not changed significantly in the last 30 to 40 years and is not expected to change significantly in the foreseeable future.

1.4 Geology

The surficial geology at Site 15 consists of glacial sediments deposited by glacial meltwater overlying poorly sorted till deposited directly by glaciers. The glaciofluvial sediments include silty clays, sands, and gravels, with thickness ranging from 45 to 55 feet (ft). The underlying till consists of gravel, cobbles, and boulders entrained in a silty clay matrix and ranges in thickness from 30 to 100 ft (Lockheed 1997). Bedrock is encountered at depths ranging from 75 to 109 ft below ground surface (bgs), and is one of the Upper Silurian Vernon Formation. This formation consists of thinly bedded soft red shale with thin beds of green shale, gypsum, halite, and dolomite. Competence varies from soft and crumbly to dense and hard. The degree of competence appears to be proportional to the density of the fractures in the shale. The shale is characterized by enlarged fractures, joints, and bedding planes (Lockheed 1997).

1.5 Hydrogeology

Site 15 is located in a coastal plain containing glaciated sediment. Visual observations of soil type indicate, in order from shallow to deep, continuous silty clay for the top 10 to 15 feet followed by 5 to 10 feet of silty sand and then clayey silt and a second silty sand zone. Groundwater is generally encountered within the silty clay at depths of 5 to 11-feet bgs

during the spring season and at depths of 9 to 15-feet bgs during the fall season.

Based on February 2008 groundwater monitoring data, groundwater at the 174th FW, and in the PT area appears to flow in a southeasterly direction (Figure 1-6) towards the North Branch of Ley's Creek which flows generally to the south–southwest where it joins Ley's Creek. Ley's Creek then flows generally south-southwest and discharges into Onondaga Lake.

1.6 Summary of Remedial Investigation Results

During RI activities conducted in 2006, elevated photoionization detector (PID) readings and visual evidence of residual petroleum (sheen) were noted in soil overlying the groundwater table within the former pump house area at Site 15. A total of 44 soil borings were installed during a supplemental RI in August 2007 to delineate the extent of the source area located above saturated soil at Site 15. PID results from soil screening in the unsaturated zone ranged from not-detected to 1,754 ppm in the soil borings at Site 15.

Ten soil samples were selected for laboratory analysis based on field observation at the sample location and also to cover the full spectrum of recorded volatile organic compound (VOC) concentrations measured in the field with a calibrated PID. One of the ten soil samples contained compounds of potential concern at concentrations exceeding recommended soil cleanup objectives for protection of ground water as outlined in NYSDEC Part 375-6.8(b). Specific VOCs that exceeded recommended soil cleanup objectives include benzene, ethylbenzene, and total xylenes.

1.7 Supplemental Investigation

ERM performed a supplemental investigation in August 2007 and January/February 2008 to delineate BEX-impacted soil in the former source area, and the leading edge of the dissolved BEX plume on off-site Ram Tech Consulting Corporation (RamTech) property. The off-site portion of the supplemental investigation involved the installation of soil borings and monitoring wells using direct push technology. Results for soil and groundwater samples that were collected and submitted for

laboratory analysis of BEX are provided on Figure 1-3 and summarized on Tables 1-1 and 1-2.

The historical extents of the total BEX plumes in groundwater are presented in Figure 1-4. Geologic cross sections of the subsurface soil on the 1724th FW and down-gradient off-site areas are provided on Figure 1-5. A review of Figure 1-4 coupled with Figure 1-5 suggest that a sand channel within the soil may be a preferential flow path for dissolved-phase VOCs.

Summaries of the groundwater sample results for the most recent groundwater monitoring event conducted in February 2008 are provided in Tables 1-3 and 1-4 and Figures 1-6 through 1-9. The data indicates that benzene, ethylbenzene, and xylene were detected at concentrations greater than the respective NYSDEC standards of 1.0 micrograms per liter (µg/L), 5.0 µg/L, and 5 µg/L, respectively. In addition, the leading edge of the benzene, ethylbenzene, and xylene plumes are not laterally defined in the down-gradient area located south of the off-site RamTech facility, and additional characterization is required to adequately characterize the plumes. Concentrations of methyl tert-butyl ether (MTBE) and toluene were not detected above the respective NYSDEC standards in the sampled wells.

An analysis and discussion of natural attenuation indicators based on February 2008 data is presented in Appendix A of ERM's *Draft Feasibility Study Report* dated September 2008 and sent via overnight delivery to the ANG on 25 September 2008.

1.8 Work Plan Structure

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

- Section 1.0 – Introduction;
- Section 2.0 – Investigative Approach;
- Section 3.0 – Investigative and Pilot Test Procedures;
- Section 4.0 – Sample Collection Procedures;
- Section 5.0 – Project Schedule and Deliverables; and

- Section 6.0 – References.

SECTION 2.0

INVESTIGATIVE APPROACH

This section describes the investigation approach for the 174th FW Supplemental RI and enhanced natural attenuation PT.

2.1 General Approach for Supplemental Remedial Investigation

The Supplemental RI involves the installation of soil borings and monitoring wells to evaluate the down-gradient extent of the BEX plume in off-site groundwater. Prior to installation of the soil borings and monitoring wells, ERM and their subcontractor will have to remove existing trees, bushes, brush and shrubs (grubbing) to access proposed soil boring and monitoring well locations in portions of the proposed investigation area. Approximately two days are planned for this activity. Upon completion of the grubbing activities, ERM will mobilize their portable one-man ground penetrating radar (GPR) unit to the grubbed area(s) at all proposed soil boring and monitoring well locations to verify that underground utilities are not present in the proposed locations.

Up to 40 soil borings will be installed using direct-push technology on property east of Fairway Drive and south of the RamTech Facility (Figure 2-1). Advancement of soil borings will begin east of Fairway Drive and continue along a west-to-east axis. The borings have been spaced to adequately obtain pertinent sub-surface information required for the completion of this investigation. Continuous cores samples will be collected from each boring for observation of BEX. PID readings will also be collected from the continuous core samples.

Up to 30 groundwater samples will be obtained from soil borings with high PID readings and submitted for expedited (24-hour turn-around) laboratory analysis of BEX. If BEX concentrations are detected at concentrations greater than their respective NYSDEC standards, the investigation will continue southward from each boring location. This "step-out" process will be repeated until BEX is no longer observed/detectedabove soil cleanup objectives or above the applicable ground water standards in the continuous cores or groundwater samples.

Groundwater samples will not be collected from borings with non-detectable PID readings.

Six to eight groundwater monitoring wells will be installed east and south of the RamTech facility. The installation of each well will be determined in the field based on observations of the continuous soil cores collected during borehole installation. Actual locations may vary from those shown on Figure 2-1 based upon receipt of laboratory analyses.

One round of groundwater samples will be collected from the newly installed monitoring wells prior to the enhanced natural attenuation PT as part of the 174th FW quarterly groundwater monitoring program. These six to eight samples will be submitted for laboratory analysis of BEX.

2.2 General Approach for Pilot Test

ERM will conduct an enhanced natural attenuation PT west and south of the RamTech facility to evaluate the effectiveness of enhanced natural attenuation at treating BEX in groundwater, and to prevent further migration of the BEX plume onto off-site property.

CaO_2 will be injected into groundwater during the PT. The introduction of CaO_2 will increase the amount of oxygen in the soil, thereby increasing the microbial digestion of BEX compounds.

Approximately 20 injection points will be installed using a geoprobe rig in the locations depicted on Figure 2-2 over a period of 10 days. Each injection point will be advanced to the bottom of the sand layer (approximately 20 to 30 ft bgs), the geologic unit where BEX has historically been observed in groundwater. A maximum of 50 pounds of CaO_2 will be injected at each location. Injection of the CaO_2 will start on the northern most area on ANG property and move southerly.

One round of groundwater samples will be collected from all site monitoring wells approximately one-month after completion of the enhanced natural attenuation PT. All samples will be submitted for laboratory analysis of BEX plus natural attenuation parameters, and the results will be used to evaluate the performance of the enhanced natural attenuation PT.

SECTION 3.0

INVESTIGATIVE AND PILOT TEST PROCEDURES

3.1 Preparatory Activities

3.1.1 Access Agreements

It is ERM's understanding that Ms. Patricia A. Smith, Real Property Examiner, 174th FW Hancock Field, is discussing and obtaining Site Access Agreements with the property owners on and adjacent to the property included in this Site 15 Supplemental RI and PT Work Plan. The properties include the following: Ram Tech Consulting Engineers; Paper Conversions; the Brooklawn Golf Course (Mr. Guy Easter); National Grid and General Electric (GE).

Ms. Smith has been provided by ERM with copies of the Draft Site 15 Supplemental RI and PT Work Plan, dated September 2008 and an ERM insurance certificate naming the requested property owners as additionally insured. Discussions with Ms. Smith indicate that it takes approximately six to eight weeks for the paperwork to go through its "system", which would indicate that field work could begin around the proposed date for implementation of field work scheduled for 5 November 2008.

Historically, GE has been reluctant to sign any access agreements. If GE does not allow access for the installation of test borings on their property, the proposed test borings and monitoring wells will be re-located to obtain required subsurface data at locations as close to the GE property as legally possible.

3.1.2 Subsurface Clearance

Prior to any field activities, subsurface clearance will be conducted for the proposed investigation and enhanced natural attenuation PT locations. Subsurface clearance will be conducted in accordance with the procedures

provided in the *ERM Subsurface Clearance Program* and the *Supplemental Investigation Work Plan* (ERM 2006a, ERM 2006b).

3.1.3 Grubbing

Prior to installation of the soil borings and monitoring wells, ERM and their subcontractor will have to remove existing trees, bushes, brush and shrubs (grubbing) to access proposed soil boring and monitoring well locations in portions of the proposed investigation area(s). Removed vegetation will be piled and staged so as to allow natural decaying processes to proceed as rapidly as possible. Approximately two days are planned for this activity.

3.1.4 Ground Penetrating Radar

Upon completion of the grubbing activities, ERM will mobilize their portable one-man GPR unit to the grubbed area(s) at all proposed soil boring and monitoring well locations to verify that underground utilities are not present in the proposed locations. The operator of the GPR unit, will be trained in the proper operation and interpretation of data developed during field operations.

3.2 Direct Push Borehole Installation

The proposed soil boring locations are shown on Figure 2-1. Direct-push technology will be used to collect continuous soil cores during drilling. Each soil boring will be advanced to the bottom of the sand layer (approximately 20 ft bgs), the geologic unit where BEX has historically been observed in groundwater. The following information will be documented for each soil core: soil color, grain size, moisture content, field-screening results, percent recovery, and other pertinent observations. A calibrated PID will be used to conduct headspace VOC screening of the soil cores.

3.3 Well Construction

The proposed locations of the monitoring wells (MW-113 through MW-118) are provided on Figure 2-1. The construction of the monitoring wells will be in accordance with the procedures provided in the *ANG Investigation Guidance* (ANG 2005a). The top of the screened interval of the

new monitoring wells will be located approximately 1 ft above the top of the sand unit. The wells will be constructed with 1.5-inch poly vinyl chloride (PVC) pre-pack well screens, threaded flush joint Schedule 40 PVC casing and 0.010-inch factory slotted screens. ERM had submitted a request to the NYSDEC to revise the previously approved monitoring well construction technique. In a letter dated 18 July 2007, the NYSDEC approved the use of 1.5-inch PVC pre-pack well screens for the construction of monitoring wells during the RI.

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-ft above the top of each well screen. The well casing will be raised no more than 0.5 ft to allow sand to fill the borehole beneath the well screen. A 2-ft 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 one ft bgs. Surface completions will be performed for each new monitoring well. The surface completions will be installed following the procedures provided in the *ERM Supplemental Investigation Work Plan* (ERM 2006b).

3.4 Borehole Abandonment

Direct push bore holes and injection points will be abandoned with cement/bentonite grout. Abandonment will be performed in accordance with the well abandonment procedures provided in the *ANG Investigation Guidance* (ERM 2005a).

3.5 Well Development

Each new monitoring well will be developed after installation. The well development procedures, which will be performed following the *ANG Investigation Guidance*, are provided in the *ERM Supplemental Investigation Work Plan* (ANG 2005a, ERM 2006b).

3.6 Decontamination

Heavy equipment and field equipment utilized during Supplemental RI and PT field activities will be decontaminated in accordance with the procedures provided in the *ERM Supplemental Investigation Work Plan* (ERM 2006b).

3.7 Investigation Derived Waste

Investigation derived waste will be managed in accordance with the *ANG Investigation Guidance* (ANG 2005). Soil and wastewater are anticipated to be generated during Supplemental RI and PT activities. Handling of investigation derived waste will be performed in accordance with the procedures provided in the *ERM Supplemental Investigation Work Plan* (ERM 2006b).

3.8 Pilot Test Procedures

Approximately 20 injection points will be installed using a geoprobe rig in the locations depicted on Figure 2-2. Each injection point will be advanced to the bottom of the sand layer (approximately 20 to 30-ft bgs), the geologic unit where BEX has historically been observed in groundwater.

CaO_2, a powdery, flour-like material, is typically available in 30-gallon drums that weigh approximately 100 pounds. A maximum of 50 pounds of CaO_2 will be injected at each location. The CaO_2 will be mixed with potable water obtained from the 174th FW in a 300-gallon poly tank supplied by the drilling contractor. A portable pump skid and educator feeder will be used to thoroughly mix the solution, which will be injected into the groundwater using a recirculation pump. The CaO_2 solution will be added to groundwater in a "bottom-to-top" method in three 5-ft injection intervals, starting at the bottom of the injection point. The geoprobe will drive the injection screen to the bottom of the sandy layer and CaO_2 solution will be injected into the bottom interval. The geoprobe rig will retract the injection screen approximately 5 ft, and CaO_2 solution will be injected into the second interval. This process will be repeated a third time.

3.9 Surveying

The soil borings, monitoring wells, and PT injection points will be surveyed as to the horizontal and vertical locations by a New York State licensed land surveyor. Surveying will be performed in accordance with the procedures provided in the *ERM Supplemental Investigation Work Plan* (ERM 2006b).

3.10 Field Quality Assurance/Quality Control

Several types of field QC samples will be collected and submitted for analysis. Each type of QC sample monitors a different aspect of the field effort, and analytical results provide information regarding the adequacy of the sample collection and transportation of samples. Collection of QC samples will be performed in accordance with the Quality Assurance Project Plan provided in the *ERM Supplemental Investigation Work Plan* (ERM 2006b).

3.11 Health and Safety

Field personnel will be briefed of health and safety issues associated with the PT (including hazards associated with CaO_2) prior to field activities in a Level II Health and Safety Short form. The Level II Health and Safety Short form is a supplement to the Health and Safety Plan included in the *ERM Supplemental Investigation Work Plan* (ERM 2006b).

SECTION 4.0

SAMPLE COLLECTION PROCEDURES

4.1 Groundwater Sampling Procedures

4.1.1 Direct Push Sample Collection

Groundwater samples will be collected from Supplemental RI soil borings at the interval with the highest-recorded PID reading of saturated soil. 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 an SP-16 or equivalent hydro punch-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 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.

4.1.2 Monitoring Well Sampling

Only the new monitoring wells installed during this Supplemental Investigation will be sampled two weeks after their installation. In addition, a second round of groundwater samples will be collected from these newly installed monitoring wells and all the Site 15 monitoring wells as part of the 174th FW quarterly groundwater monitoring program. The second round of monitoring will be performed approximately two months following completion of the PT. The wells will be sampled in general conformance with EPA low-flow (minimal drawdown) well purging and sample collection techniques (EPA 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, dissolved

oxygen, and oxidation reduction potential. 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 Level II Health and Safety Form. Samplers should put on new sampling gloves at each individual well location prior to sampling.

- The locking well cap shall be unlocked and a calibrated 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-ft using an electronic water level indicator or an interface probe. The water level indicator or the interface probe will be cleaned between wells using decontamination procedures described in the *Supplemental Investigation Work Plan* (ERM 2006b).

- If LNAPL is encountered on the top of the groundwater table, the thickness of LNAPL will be measured 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 6-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 per minute. Ideally, the pumping rate should cause minimal

(less than 0.3 ft) 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 5 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, oxidation reduction potential, and dissolved oxygen shall be measured and recorded every 5 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 nephelometric turbidity units and/or field parameters have stabilized as follows for three consecutive readings:

    - ±0.1 for pH;

    - Temperature ±0.1 degree Celsius; and

    - ±10 percent for specific conductance (conductivity).

- If drawdown in the well is measured at 1-ft or greater 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 an Environmental Laboratory Approved Program certified laboratory for analyses.

4.2 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.

4.3 Laboratory Analytical Methods

Groundwater samples will be analyzed for BEX by EPA Method 8260. In addition, during both ground water sampling events, all monitoring wells will be analyzed for the following natural attenuation parameters to evaluate the performance of the PT:

- Alkalinity using SM 18 2320B;
- Ammonia using EPA 350.2;
- Methane using GC FID;
- Nitrate using EPA 300;
- Sulfate using EPA 300; and
- Total hardness using EPA 200.7.

All natural attenuation parameters listed above will be analyzed at an approved environmental laboratory using EPA-approved or standard methods. In addition, the samples will be field-tested for ferrous iron 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.

4.4 Quality Assurance

Groundwater sampling, sample handling, and laboratory analysis will be performed in accordance with the previously accepted Quality Assurance Project Plan.

SECTION 5.0

PROJECT SCHEDULE AND DELIVERABLES

The anticipated schedule for the Supplemental RI and PT activities and deliverables is illustrated in Figure 5-1. This schedule is subject to change due to unforeseen events, including weather and/or delays in document review. The schedule will be updated monthly to show progress and will be submitted to the ANG with the scheduled monthly progress report deliverables.

The results of the Supplemental RI and PT, and an evaluation of whether the objectives and goals set forth in this Work Plan were met, will be provided in a forthcoming Technical Memorandum.

SECTION 6.0

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FIGURES

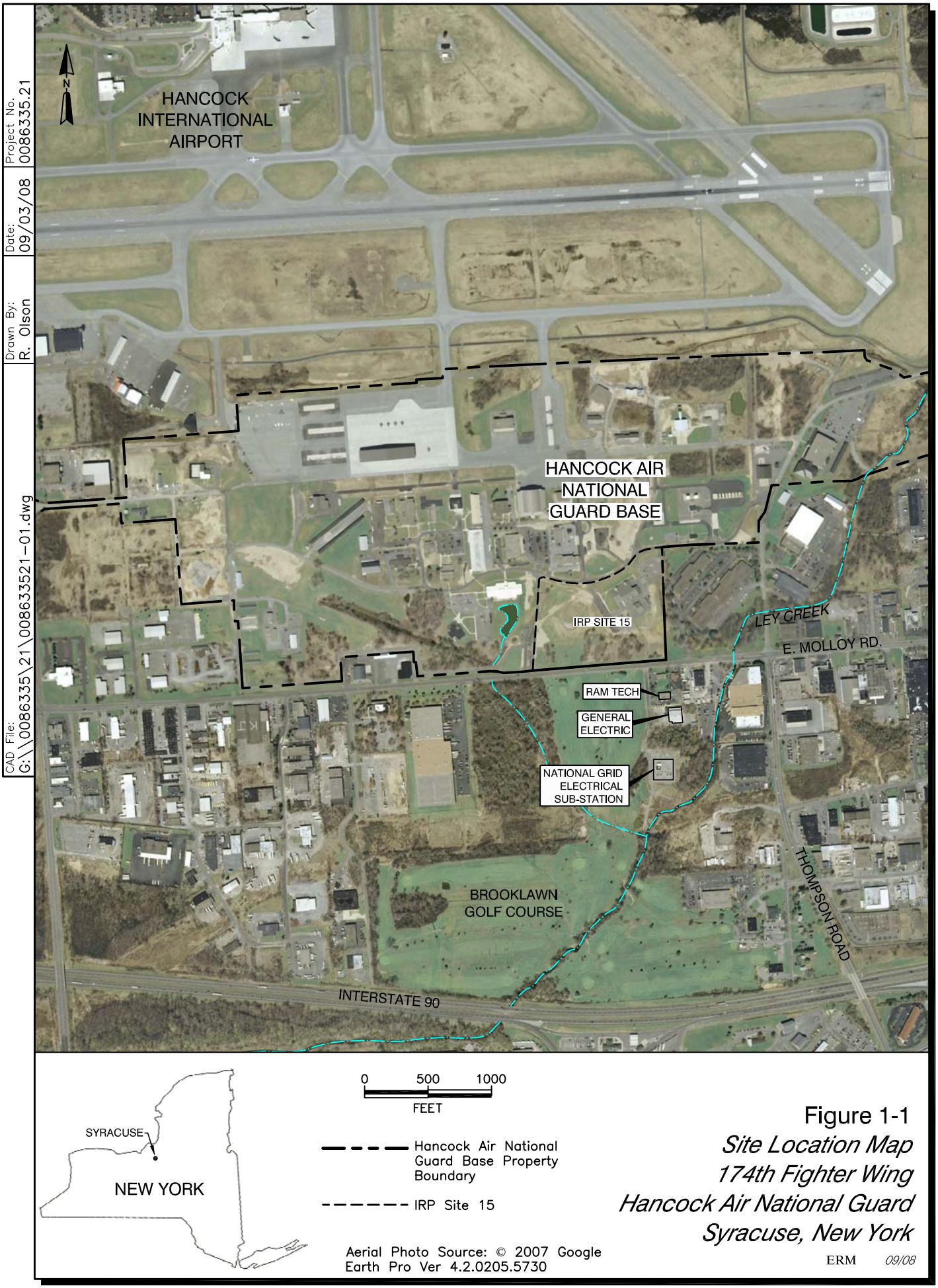


Figure 1-1
Site Location Map
174th Fighter Wing
Hancock Air National Guard
Syracuse, New York

ERM 09/08

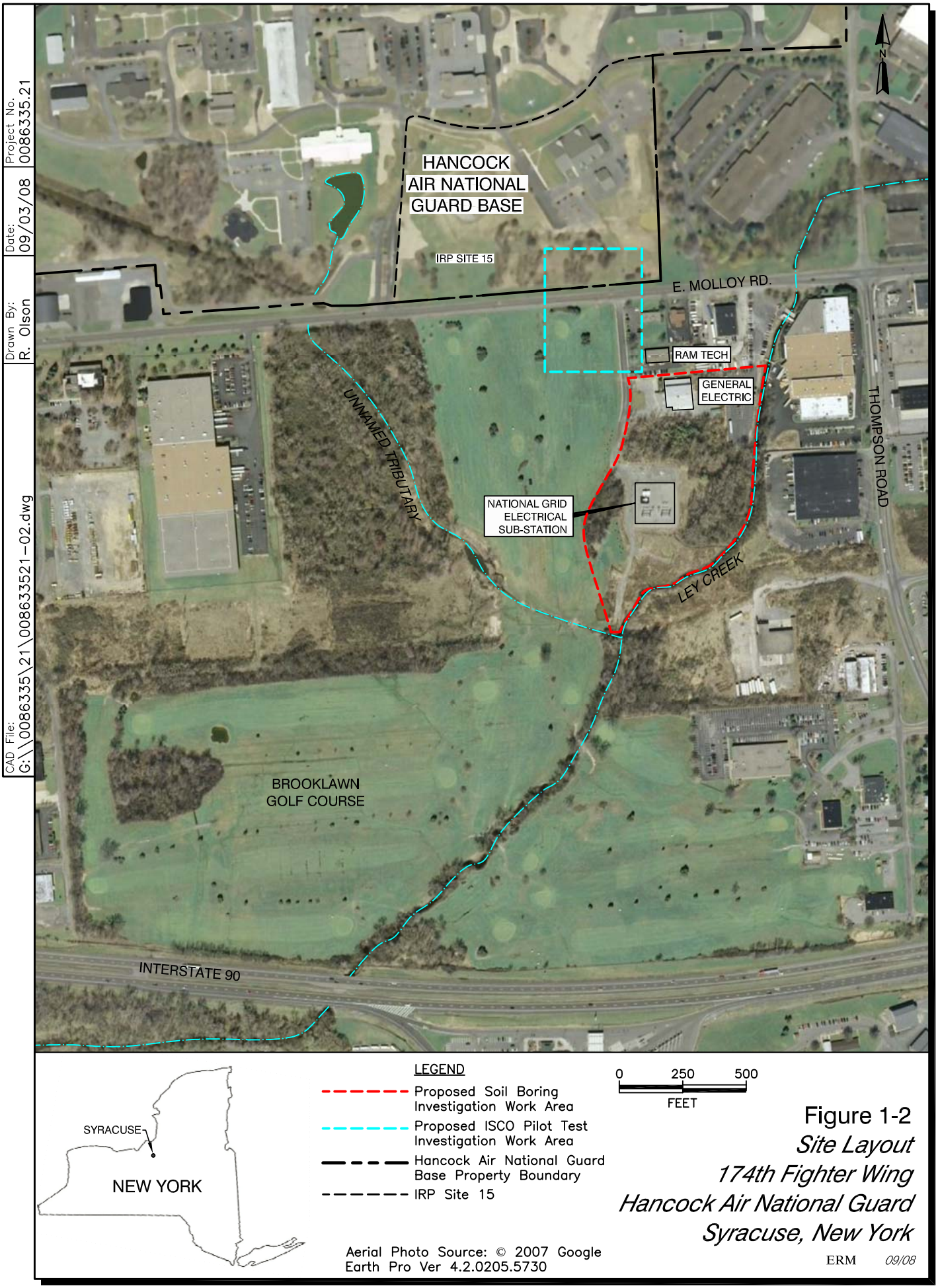


Figure 1-2
Site Layout
174th Fighter Wing
Hancock Air National Guard
Syracuse, New York

ERM 09/08

Project No. 0086335.21
Date: 09/03/08
Drawn By: R. Olson
CAD File: G:\0086335\21\0086335 21-03.dwg

N

GP-102A

GP-102B

GP-102C

GP-102D

MW-107
ND

MW-106
ND

BROOKLAWN GOLF COURSE

FAIRWAY DRIVE

ASPHALT

GRASS

GP-122
ND

TRANSFORMER

SV-106

GP-111
ND

GP-115
ND

GP-112
ND

MW-110
ND

GP-113
311

GP-116

RAMTECH ENGINEERING

GP-121
ND

ASPHALT

GRASS

SV-109

GP-114
610
17.2

MW-112
1,150

MW-111
ND

SV-108

GP-120

GP-119
ND

GP-118

GP-117
79

TRANSFORMER

CONCRETE

GENERAL ELECTRIC BUILDING

ASPHALT

0 15 30
FEET

LEGEND

- Monitoring Well Location
- Direct Push Sample Location
- Soil Vapor Sample Location
- 610 Total BTEX Concentration in Groundwater (µg/L)
- ND Not Detected in Groundwater above Laboratory Reporting Limit (in Blue)
- 17.2 Total BTEX Concentration in Soil (µg/kg)
- ND Not Detected in Groundwater above Laboratory Reporting Limit (in Red)

Figure 1-3
Offsite Delineation Field Data
174th Fighter Wing
Hancock Air National Guard
Syracuse, New York
ERM 09/08

CAD File:	Drawn By:	Date:	Project No.
G:\\0086335\22\008633522-01.dwg	R. Olson	09/24/08	0086335.22

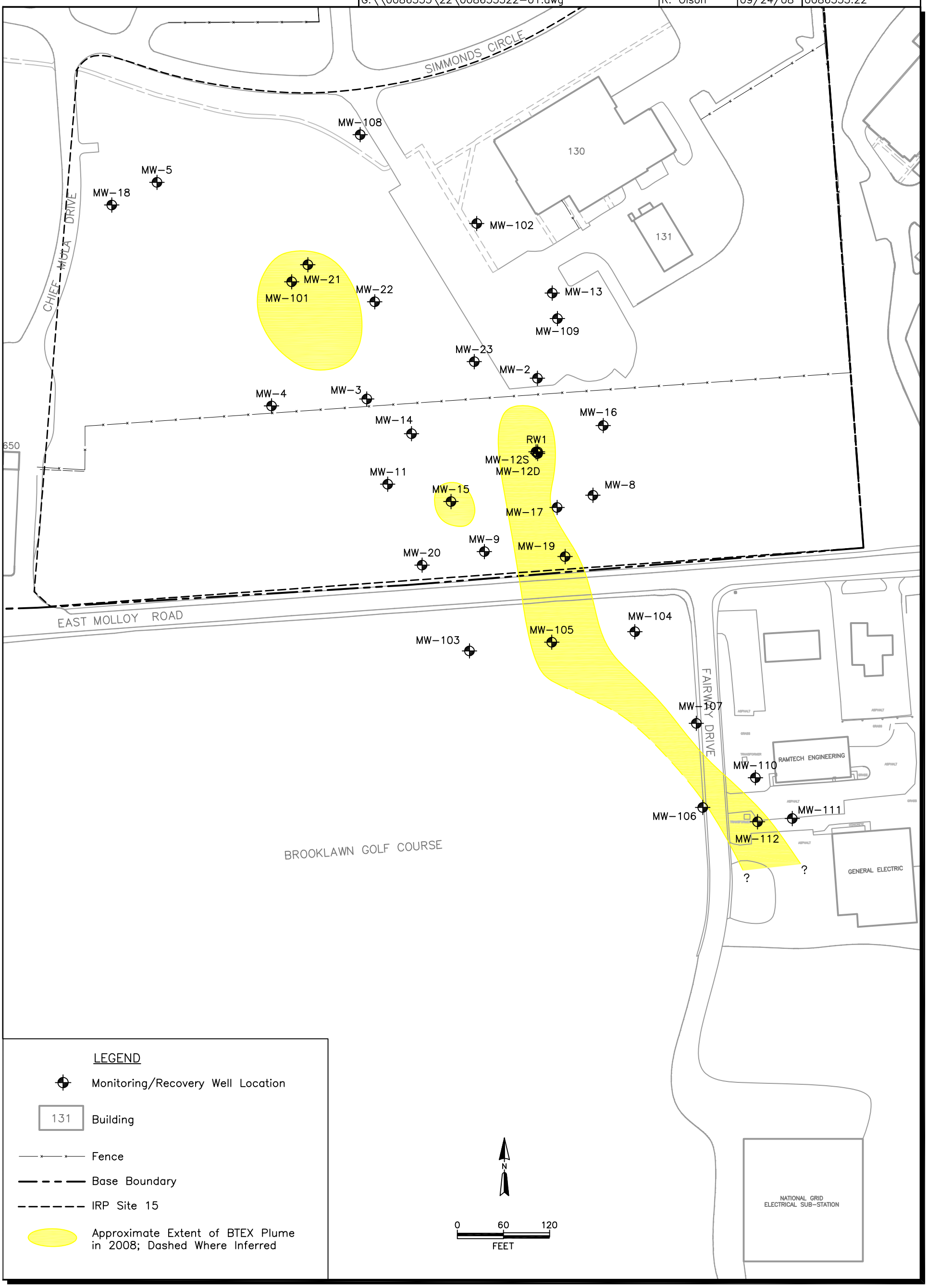


Figure 1-4

Estimated BTEX Extent - 2008

174th Fighter Wing

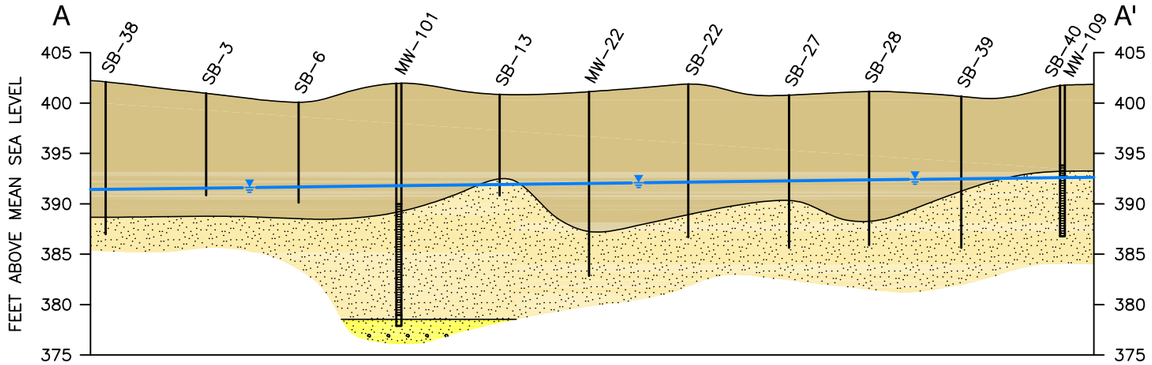
Hancock Air National Guard

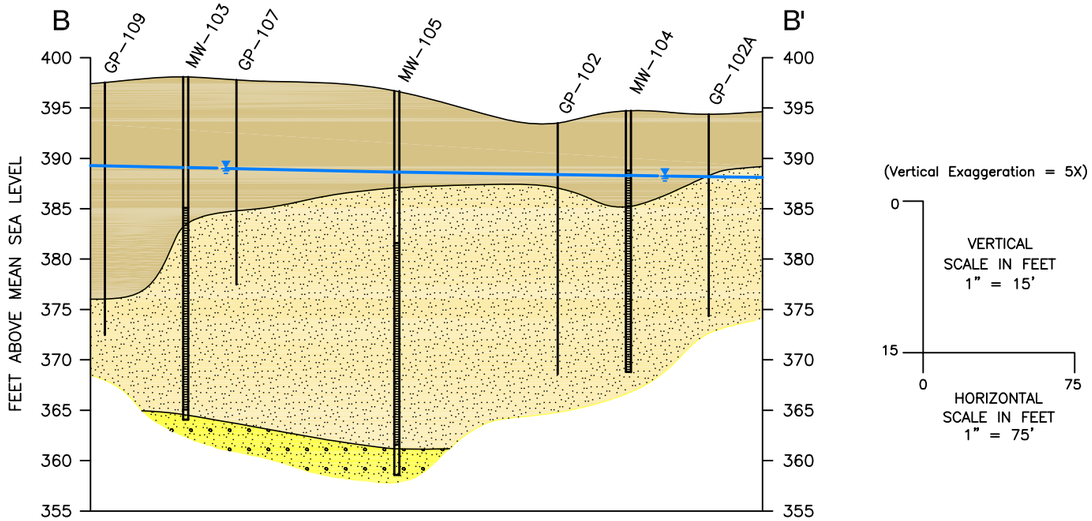
Syracuse, New York

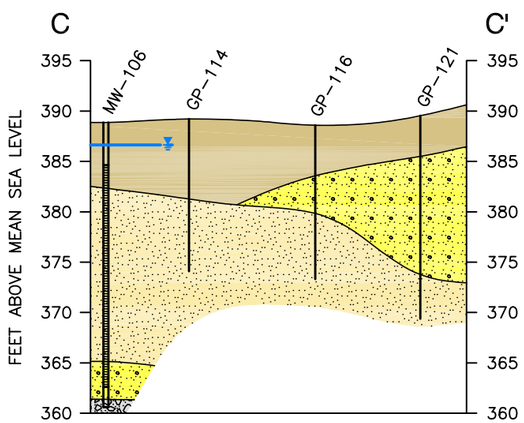
ERM *09/08*

Drawn By: R. Olson | Date: 09/25/08 | Project No. 0086335.22

CAD File: G:\0086335\22\008633522-02.dwg







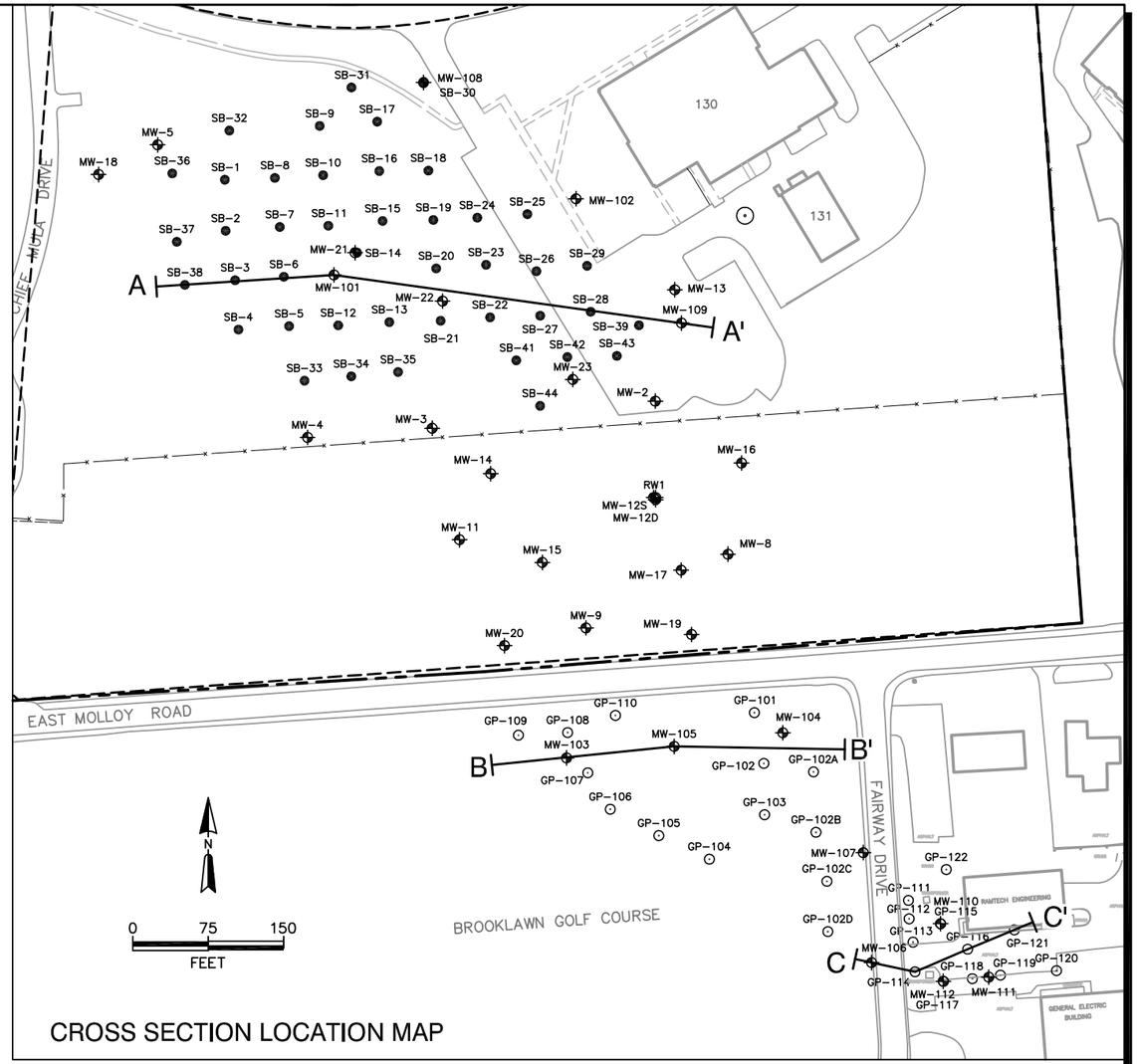
(Vertical Exaggeration = 5X)

LITHOLOGY KEY

- Silt Unit
- Fine Sand and Silt Unit
- Fine to Medium Grained Sand Unit
- Glacial Till Unit

LEGEND

- Groundwater Elevation (February 2008)
- Monitoring Well Screen Interval



CROSS SECTION LOCATION MAP

LEGEND

- Monitoring/Recovery Well Location
- Soil Boring Location
- Direct Push Sample Location
- 131 Building
- Fence
- Base Boundary
- IRP Site 15
- A A' Cross Section Line

Figure 1-5

Cross Sections A-A', B-B', and C-C'
174th Fighter Wing
Hancock Air National Guard
Syracuse, New York

ERM 09/08

CAD File:	Drawn By:	Date:	Project No.
G:\\0086335\21\008633521-06.dwg	R. Olson	09/03/08	0086335.21

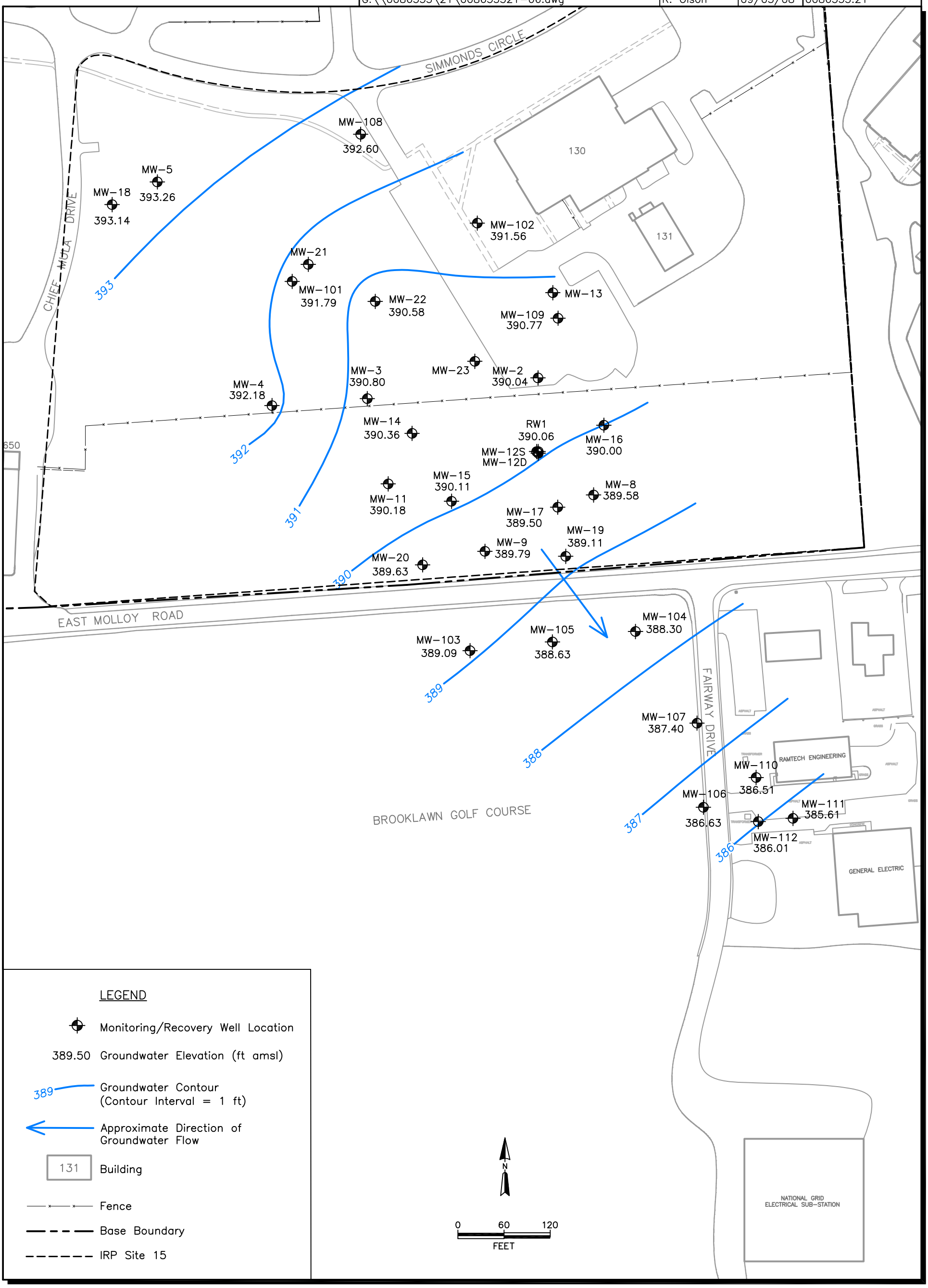
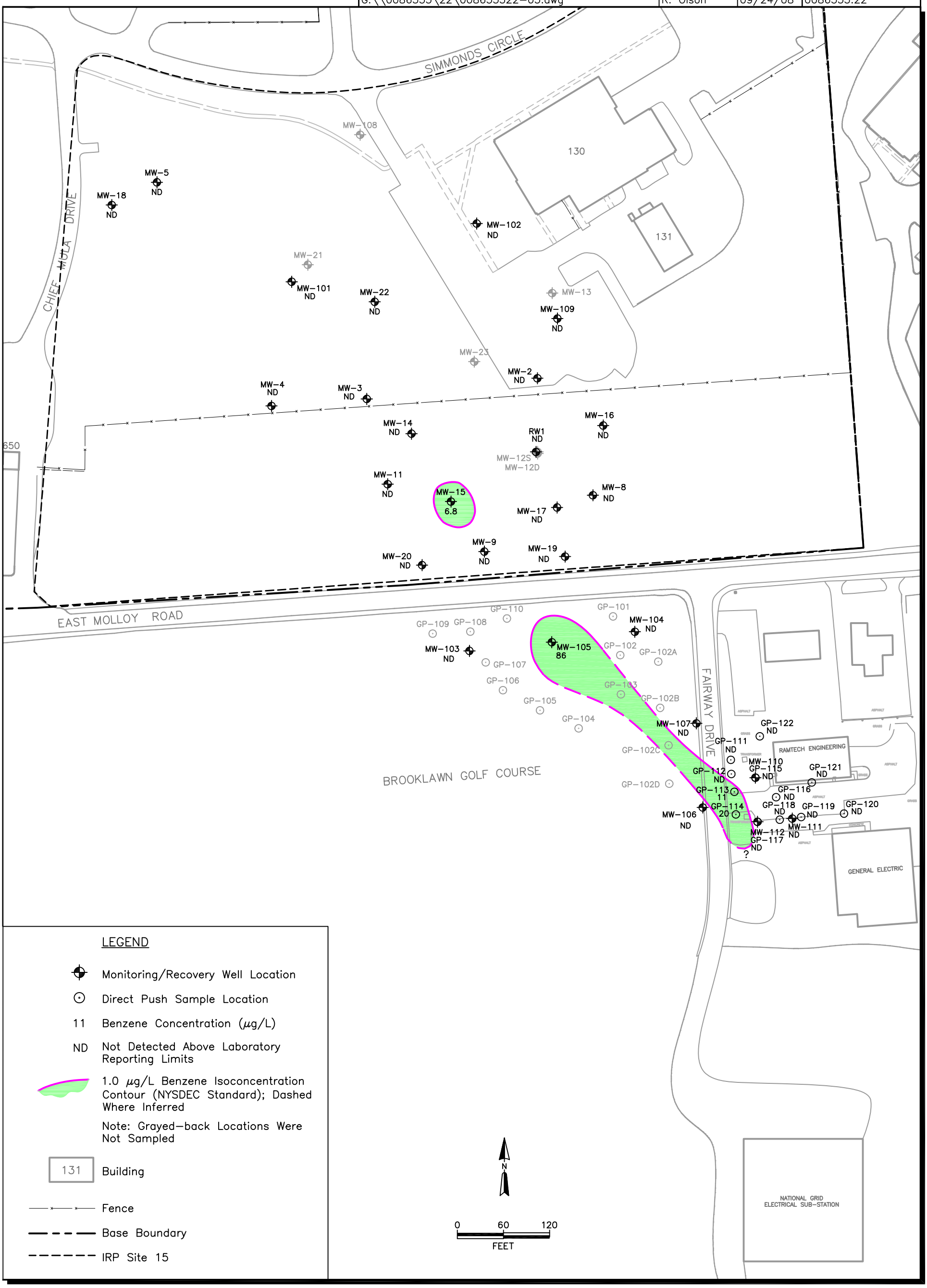


Figure 1-6
Static Groundwater Contour Map
174th Fighter Wing
Hancock Air National Guard
Syracuse, New York

ERM 09/08

CAD File:	Drawn By:	Date:	Project No.
G:\\0086335\22\008633522-03.dwg	R. Olson	09/24/08	0086335.22



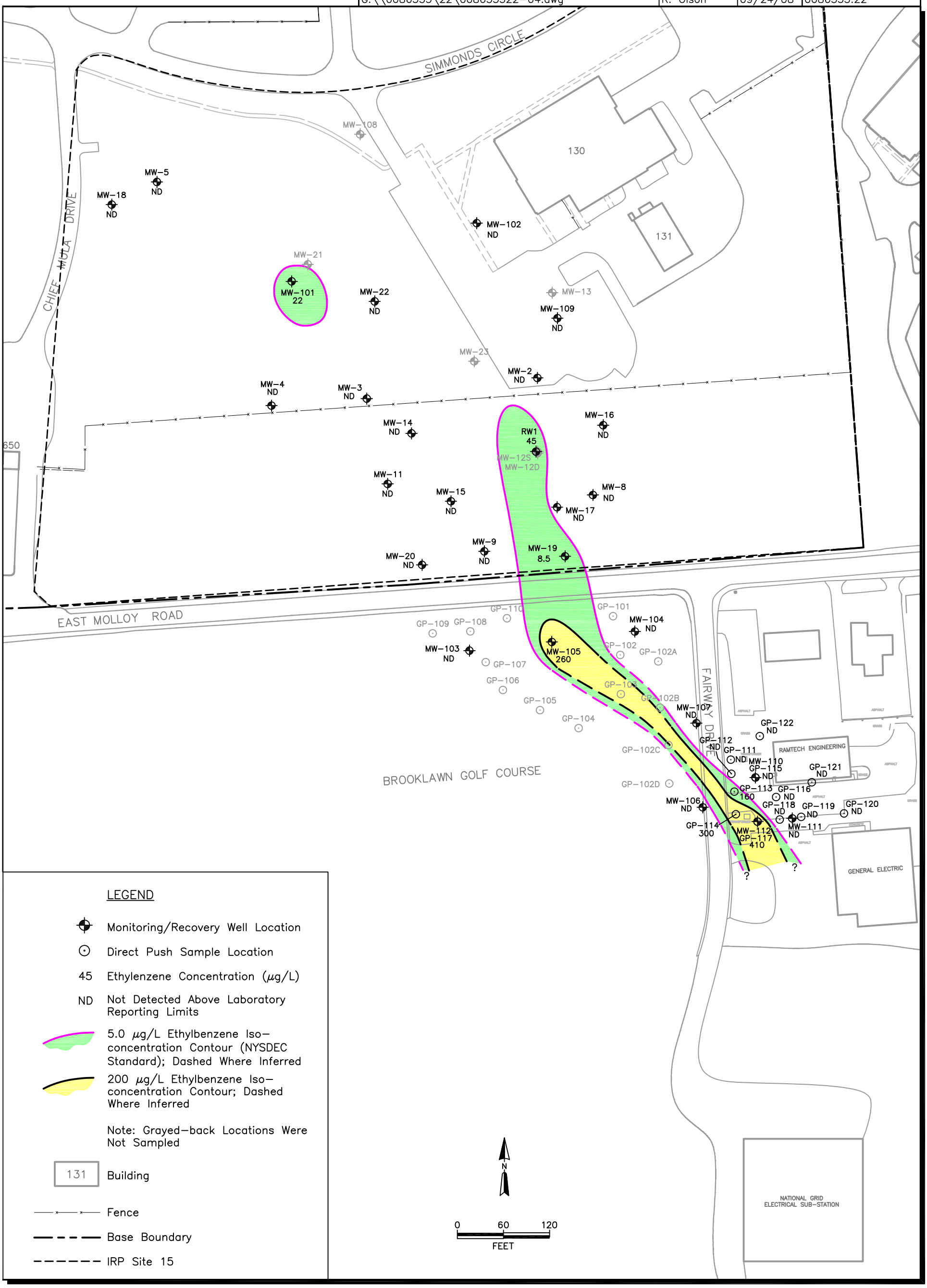
LEGEND

- Monitoring/Recovery Well Location
- Direct Push Sample Location
- 11 Benzene Concentration (μg/L)
- ND Not Detected Above Laboratory Reporting Limits
- 1.0 μg/L Benzene Isoconcentration Contour (NYSDEC Standard); Dashed Where Inferred
- Note: Grayed-back Locations Were Not Sampled
- 131 Building
- Fence
- Base Boundary
- IRP Site 15

Figure 1-7
Groundwater Isoconcentration Map
Benzene - February 2008
174th Fighter Wing
Hancock Air National Guard
Syracuse, New York

ERM 09/08

CAD File:	Drawn By:	Date:	Project No.
G:\\0086335\22\008633522-04.dwg	R. Olson	09/24/08	0086335.22



LEGEND

- Monitoring/Recovery Well Location
- Direct Push Sample Location
- 45 Ethylenzene Concentration ($\mu g/L$)
- ND Not Detected Above Laboratory Reporting Limits
- 5.0 $\mu g/L$ Ethylbenzene Iso-concentration Contour (NYSDEC Standard); Dashed Where Inferred
- 200 $\mu g/L$ Ethylbenzene Iso-concentration Contour; Dashed Where Inferred

Note: Grayed-back Locations Were Not Sampled

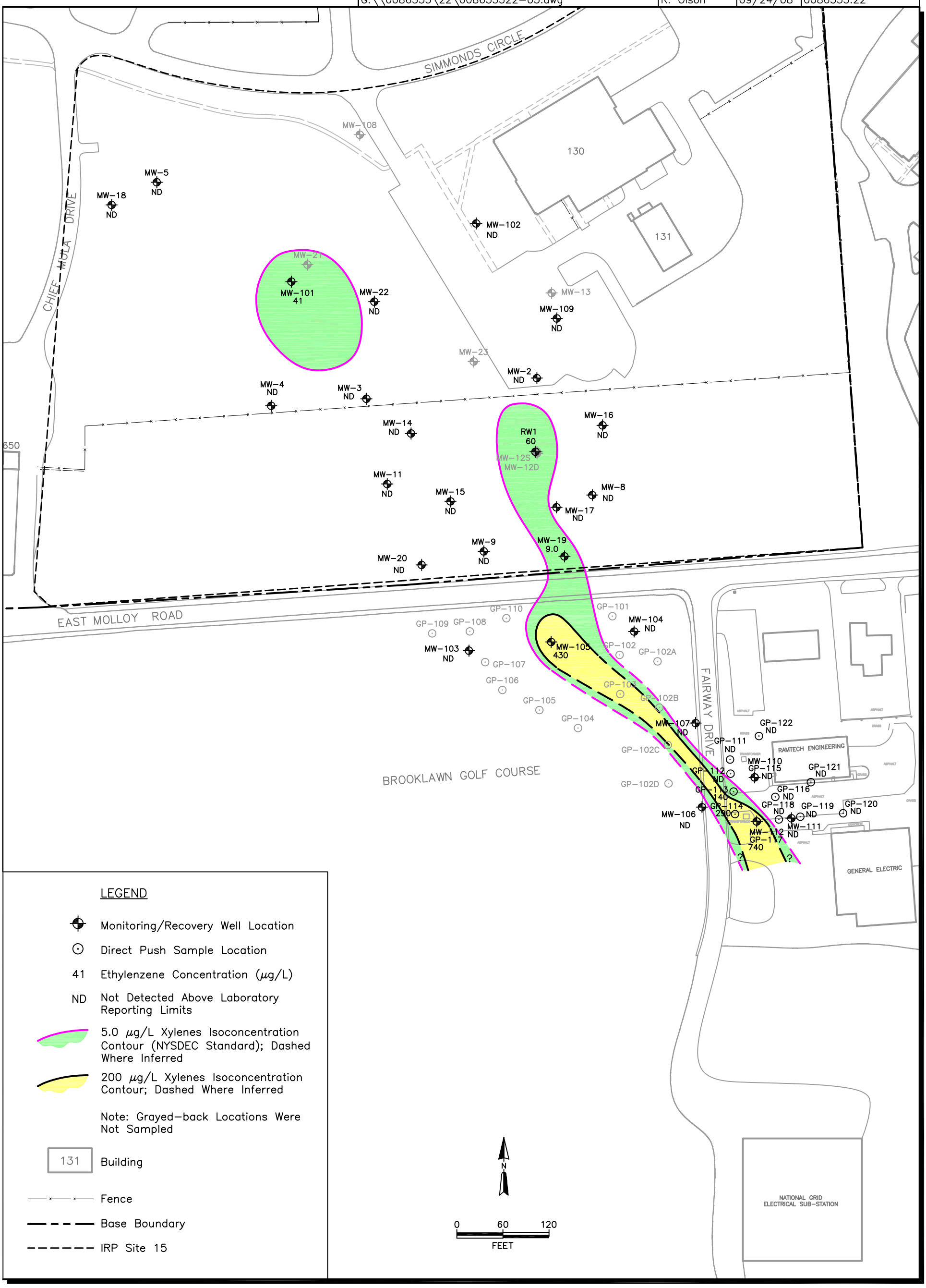
- 131 Building
- Fence
- Base Boundary
- IRP Site 15

Figure 1-8

Groundwater Isoconcentration Map
Ethylbenzene - February 2008
174th Fighter Wing
Hancock Air National Guard
Syracuse, New York

ERM 09/08

CAD File:	Drawn By:	Date:	Project No.
G:\\0086335\22\008633522-05.dwg	R. Olson	09/24/08	0086335.22



LEGEND

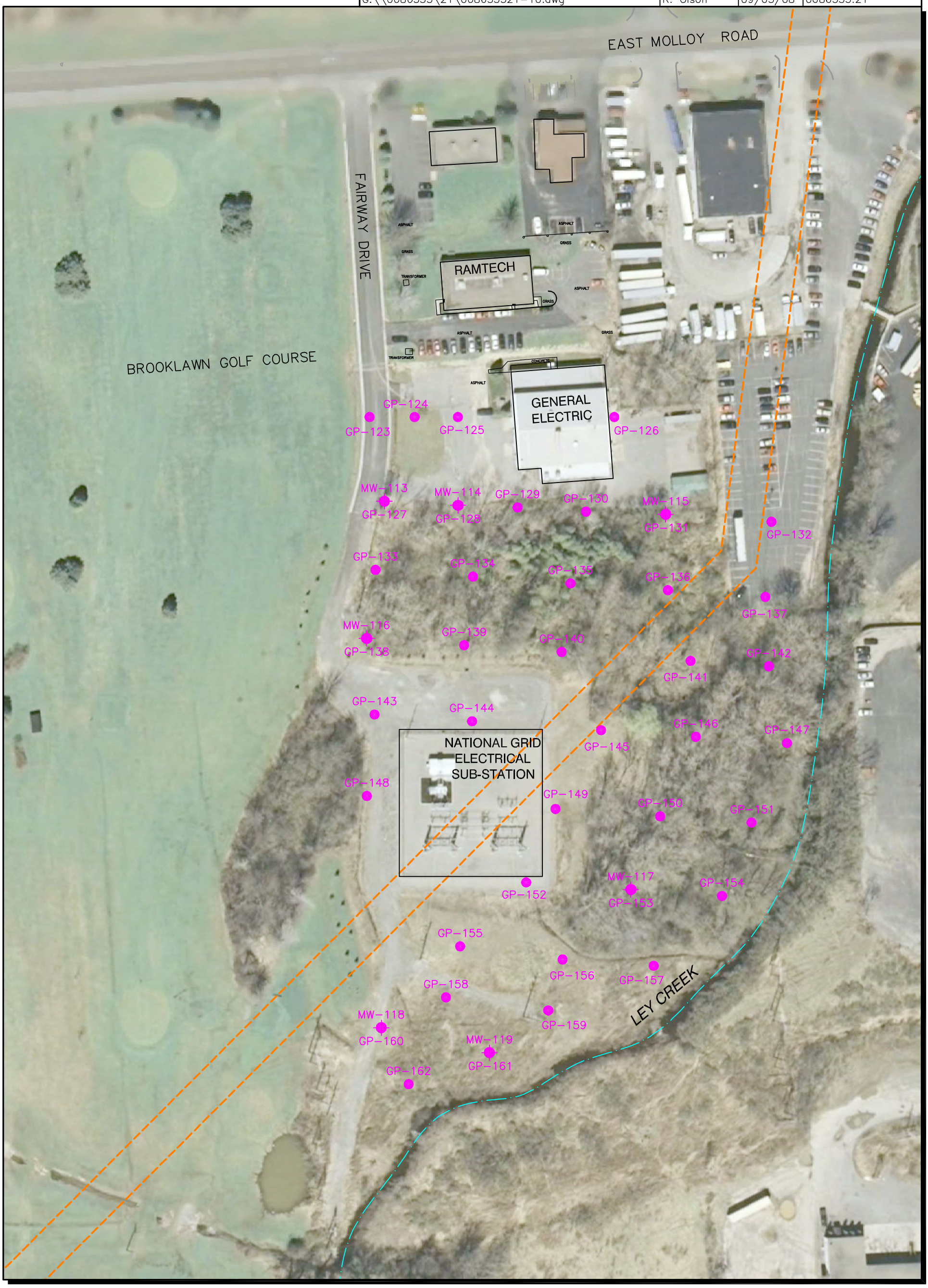
- Monitoring/Recovery Well Location
- Direct Push Sample Location
- 41 Ethylenzene Concentration (μg/L)
- ND Not Detected Above Laboratory Reporting Limits
- 5.0 μg/L Xylenes Isoconcentration Contour (NYSDEC Standard); Dashed Where Inferred
- 200 μg/L Xylenes Isoconcentration Contour; Dashed Where Inferred
- Note: Grayed-back Locations Were Not Sampled
- 131 Building
- Fence
- Base Boundary
- IRP Site 15

Figure 1-9

Groundwater Isoconcentration Map
Xylenes - February 2008
174th Fighter Wing
Hancock Air National Guard
Syracuse, New York

ERM 09/08

CAD File:	Drawn By:	Date:	Project No.
G:\\0086335\21\008633521-10.dwg	R. Olson	09/03/08	0086335.21



LEGEND

Onondaga County Utility Easement

Proposed Boring Location

Proposed Monitoring Well Location

Aerial Photo Source: © 2007 Google Earth Pro Ver 4.2.0205.5730

N

0 50 100

FEET

Figure 2-1

Proposed Boring Locations
174th Fighter Wing
Hancock Air National Guard
Syracuse, New York

ERM 09/08

CAD File:	Drawn By:	Date:	Project No.
G:\\0086335\21\008633521-11.dwg	R. Olson	09/03/08	0086335.21

LEGEND

Proposed ISCO Pilot Test Areas

Proposed Injection Location

Aerial Photo Source: © 2007 Google Earth Pro Ver 4.2.0205.5730

Fence

Base Boundary

IRP Site 15

N

0 30 60

FEET

Figure 2-2

Proposed Pilot Test Location

174th Fighter Wing

Hancock Air National Guard

Syracuse, New York

ERM 09/08

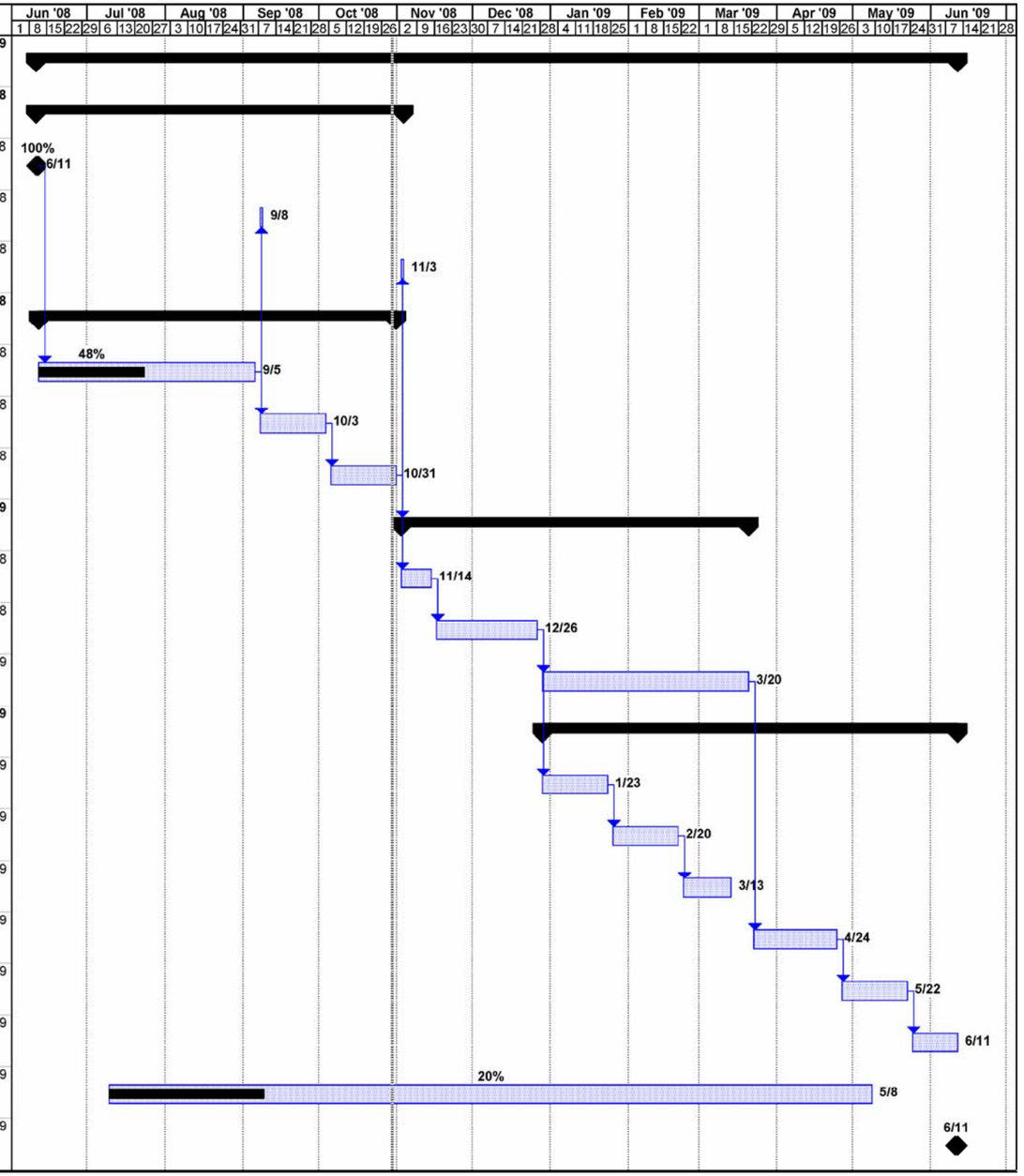
Project No. 0086335.21

Date: 10/30/08

Drawn By: R. Olson

CAD File: G:\0086335\21\00863521-18.dwg

ID	Task Name	Duration	Start	Finish
1	**Hancock ANG - Supplemental RI/FFS**	**262 days**	**Wed 6/11/08**	**Thu 6/11/09**
2	**Task 1 - Meetings**	**104 days**	**Wed 6/11/08**	**Mon 11/3/08**
3	Notice To Proceed	1 day	Wed 6/11/08	Wed 6/11/08
4	Task 1A1: Kickoff Meeting	1 day	Mon 9/8/08	Mon 9/8/08
5	Task 1A2: Regulatory Meeting	1 day	Mon 11/3/08	Mon 11/3/08
6	**Task 2 - Work Plan**	**102 days**	**Thu 6/12/08**	**Fri 10/31/08**
7	Task 2A - Draft Work Plan and ANG Review	62 days	Thu 6/12/08	Fri 9/5/08
8	Task 2B - Draft Final Work Plan and ANG/NYSDEC Review	20 days	Mon 9/8/08	Fri 10/3/08
9	Task 2C - Final Work Plan and NYSDEC Approval	20 days	Mon 10/6/08	Fri 10/31/08
10	**Task 3 - Field Work**	**100 days**	**Mon 11/3/08**	**Fri 3/20/09**
11	Task 3-1 - Preparations/Mobilization	10 days	Mon 11/3/08	Fri 11/14/08
12	Task 3A - Supplemental RI Field Work	30 days	Mon 11/17/08	Fri 12/26/08
13	Task 3B- Groundwater Pilot Study	60 days	Mon 12/29/08	Fri 3/20/09
14	**Task 4 - Technical Memorandum**	**119 days**	**Mon 12/29/08**	**Thu 6/11/09**
15	Task 4A - Draft Technical Memorandum and ANG Review	20 days	Mon 12/29/08	Fri 1/23/09
16	Task 4B - Draft Final TM and NYSDEC Approval	20 days	Mon 1/26/09	Fri 2/20/09
17	Task 4C - Final TM and NYSDEC Review	15 days	Mon 2/23/09	Fri 3/13/09
18	Task 4D - Draft Focused Feasibility Study (FFS)	25 days	Mon 3/23/09	Fri 4/24/09
19	Task 4D1 - Draft Final FFS	20 days	Mon 4/27/09	Fri 5/22/09
20	Task 4D2 - Final FFS	14 days	Mon 5/25/09	Thu 6/11/09
21	**Task 5 - Monthly Status Reports**	217 days	Thu 7/10/08	Fri 5/8/09
22	POP End Date	1 day	Thu 6/11/09	Thu 6/11/09



Task | Summary | Rolled Up Progress | Split | Deadline

Progress | Rolled Up Task | External Tasks | Rolled Up Split

Milestone | Rolled Up Milestone | Project Summary | External Milestone

Figure 5-1

Hancock ANGB Site 15 Project Schedule
174th Fighter Wing
Hancock Air National Guard
Syracuse, New York

TABLES

DRAFT

TABLE 1-1

Summary of Off-site Direct Push Investigation Data - Soil
174th Fighter Wing
New York Air National Guard
Hancock Air National Guard Base
Syracuse, New York

Boring ID	GP-114	GP-115	GP-117	GP-121	GP-122	NYSDEC RSCO
Sample Matrix	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	NA
Completion Depth Bgs (ft bgs)	15	20	15	20	15	NA
Depth of Saturated Soil (ft bgs)	6	5.5	5	6	5	NA
Depth of Sand Contact (ft bgs)	8	15.5	8	16	8	NA
Peak VOC Concentration Based on Field Screen (ppm)	6.7	0.0	11.8	0.0	0.0	NA
Depth of Peak Field screening Concentration (ft bgs)	12.5	NA	15	NA	NA	NA
Sample Depth (ft bgs)	12-13	14.5-15	14.5-15	18-18.5	8-8.5	NA
Sample Date/ Time	1/28/08 13:45	1/29/08 12:00	1/29/08 10:20	1/30/08 8:55	1/30/08 9:50	NA
VOCs (ug/Kg)						
BENZENE	----	----	----	----	----	60
ETHYLBENZENE	8.8	----	30	----	----	1,000
TOLUENE	----	----	----	----	----	700
XYLENE	8.4	----	49	----	----	1,600
MTBE	----	----	----	----	----	930
FIELD OBSERVATIONS	Odor	----	Odor	----	----	----

Notes:

ug/Kg = micrograms per kilogram

VOCs - volatile organic compounds determined by USEPA Method 8260

NYSDEC RSCO - NYSDEC Part 375- 6.8 (b) recommended soil clean up objective for the protection of groundwater

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

Odor = "Petroleum-like" odor

NS - no standard

NA - not applicable

J = Estimated detection at a concentration above the method detection limit but below the reporting limit

DRAFT

TABLE 1-2

Summary of Off-site Direct Push Investigation Data - Groundwater
174th Fighter Wing
New York Air National Guard
Hancock Air National Guard Base
Syracuse, New York

Boring ID	GB-111	GB-112	GB-113	GB-114	GB-116	GB-119	NYSDEC Standards
Sample Matrix	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	NA
Completion Depth Bgs (ft bgs)	15	15	15	15	15	15	NA
Depth of Saturated Soil (ft bgs)	5.5	6	6	6	3.5	6	NA
Depth of Sand Contact (ft bgs)	6.5	6.5	8	8	9	7.5	NA
Peak VOC Concentration Based on Field Screen (ppm)	0.0	0.0	3.9	6.7	0.0	0.0	NA
Depth of Peak Field screening Concentration (ft bgs)	NA	NA	11.5	12.5	NA	NA	NA
SP-16 Screen Interval (ft bgs)	8-12	7-11	8-12	10-14	9-13	9-13	NA
Sample Date/ Time	1/28/08 0:00	1/28/08 11:55	1/28/08 0:00	1/28/08 0:00	1/28/08 0:00	1/28/08 0:00	NA
VOCs (ug/L)							
BENZENE	----	----	**11**	**20**	----	----	1
ETHYLBENZENE	----	----	**160**	**300**	----	----	5
TOLUENE	----	----	----	----	----	----	5
XYLENE	----	----	**140**	**290**	----	----	5
MTBE	----	----	----	----	----	----	10
FIELD OBSERVATIONS	----	----	Odor	Odor	----	----	----

Notes:

ug/L = micrograms 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 groundwater standard is from NYSDEC's TAGM 4046

- Grey background indicates exceedance of the NYSDEC Standard or Guidance Value

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

Odor = "Petroleum-like" odor

NS - no standard

NA - not applicable

J = Estimated detection at a concentration above the method detection limit but below the reporting limit

DRAFT

TABLE 1-3

Summary of Groundwater Elevation Data - February 2008
174th Fighter Wing
New York Air National Guard
Hancock Air National Guard Base
Syracuse, New York

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
4-Feb-2008	390.04	390.80	392.18	393.26	389.58	389.79	390.18	390.36	390.11	390.00	389.50	393.41	389.11	389.63	390.58	390.06

Well ID	MW-101	MW-102	MW-103	MW-104	MW-105	MW-106	MW-107	MW-108	MW-109	MW-110	MW-111	MW-112
Top of Casing	401.58	400.70	397.74	394.43	396.38	388.54	391.85	401.73	400.00	389.77	388.05	388.33
Date												
11-Apr-2005	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
28-Sep-2005	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
6-Nov-2006	392.08	391.60	388.95	388.22	388.57	386.48	387.15	NM	NM	NM	NM	NM
4-Feb-2008	391.79	391.56	389.09	388.30	388.63	386.63	387.41	392.60	390.77	386.51	385.61	386.01

Notes:

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

NM - Not measured.

TABLE 1-4

Summary of Groundwater Analytical Data - February 2008
174th Fighter Wing
New York Air National Guard
Hancock Air National Guard Base
Syracuse, New York

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	MW-101	MW-102	MW-103	MW-104	MW-105	MW-106	MW-107	MW-108	MW-109	MW-110	MW-111	MW-112	NYSDEC STANDARDS
VOCs (ug/L)																													
BENZENE	----	----	----	----	----	----	----	----	6.8	----	----	----	----	----	----	----	----	----	----	----	86	----	----	----	----	----	----	----	1
ETHYLBENZENE	----	----	----	----	----	----	----	----	----	----	----	----	8.5	----	----	45	22	----	----	----	260	----	----	----	----	----	----	410	5
TOLUENE	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	5
XYLENE	----	----	----	----	----	----	----	----	----	----	----	----	9	----	----	60	41	----	----	----	430	----	----	----	----	----	----	740	5
MTBE	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	10
NATURAL ATTENUATION PARAMETERS (mg/l)																													
NITRATE	0.86	0.33	0.18	1.3	1.2	0.91	0.34J	0.26	0.8J	0.48J	3.3	0.52	0.28	1.4J	1.9	0.18	0.47	0.42	0.32	0.3	0.29	0.12	2.6	0.39	0.66	----	----	----	NA
SULFATE	98	6.0	3.7	8.0	8.7	6.1	72J	66.0	28J	63J	27	6.0	25.0	11.0	16.0	6.7	35	52	36	4.5	5.6	42	12	41	70	41	65	19	NA
ALKALINITY	190	120	40	140	88	32	370	350	410	400	260	92	410	67	170	250	300	390	340	54	420	340	100	400	410	370	350	370	NA
TOTAL HARDNESS	820J	57J	37J	180J	96J	26J	440J	400J	460J	530J	260J	99J	350J	83J	160J	280J	420J	520J	360J	22J	320J	410J	120J	510J	460J	450J	410J	380J	NA
AMMONIA	0.046	----	----	----	----	0.14	----	----	0.041	----	----	----	----	----	----	0.44	----	----	----	0.34	----	----	----	----	----	----	----	----	NA
METHANE	0.0076	----	----	----	0.0024	----	0.052	0.14	0.93	----	----	----	0.99	----	0.017	4.4	0.55	0.016	0.90	----	7.8	0.07	----	0.018	0.28	0.048	0.044	7.2	NA
PARAMETERS MEASURED IN THE FIELD																													
FERROUS IRON	0.8	0	0	0	0.8	1.1	2.5	1.4	2.2	0.2	0	0	2	0	0	1.3	1.6	0.4	0.9	0.0	1.1	0.0	0.0	1.6	0.0	0.4	0.0	1.3	NA
pH	6.96	6.3	7.16	7.04	6.29	6.64	7.29	7.13	7.16	6.67	6.75	7.07	6.37	6.47	6.57	6.90	7.82	6.93	7.12	6.99	6.97	7.35	6.88	6.92	6.95	7.14	7.23	7.25	NA
DISSOLVED OXYGEN	2.28	7.99	0.64	7.70	6.21	10.09	0.23	0.20	0.31	1.30	6.29	1.06	0.88	0.26	0.16	0.13	0.50	0.72	0.33	12.38	0.38	0.19	7.57	0.39	0.04	0.11	0.10	0.42	NA
OXIDATION REDUCTION POTENTIAL	123.9	146.6	186.9	41.6	41	109.9	-93.1	-50.2	-99.1	153.8	53.9	181.1	23.7	207.5	174.9	-248.8	-35.2	46.3	-48.9	112.3	-66.1	-58.7	99.8	27.6	162.5	0.4	14.7	-110.2	NA
CONDUCTIVITY	6.794	0.106	0.067	0.377	0.172	0.137	1.056	0.567	0.630	1.052	0.522	0.143	1.260	0.143	0.155	0.666	0.731	1.459	1.776	0.034	0.567	0.558	0.490	1.033	1.269	0.970	0.725	0.599	NA
FIELD OBSERVATIONS	----	----	----	----	----	----	----	Dye Visible	----	Dye Visible	----	----	----	----	Odor	Odor/sheen	----	----	----	----	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 groundwater standard is from NYSDEC's TAGM 4046
- Grey background indicates exceedance of the NYSDEC Standard or Guidance Value
J = Estimated detection at a concentration above the method detection limit but below the reporting limit
---- = 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
Dye Visible - food grade dye were present in the purge water at a concentration visible to eye, the dye is associated with the on going Fluorescent Dye-Tracing Study at the site.