SUPPLEMENTAL DELINEATION INVESTIGATION AND SOIL VAPOR EXTRACTION PILOT STUDY WORK PLAN FOR SS-017 BUILDING 2774 PLATTSBURGH AIR FORCE BASE PLATTSBURGH, NEW YORK

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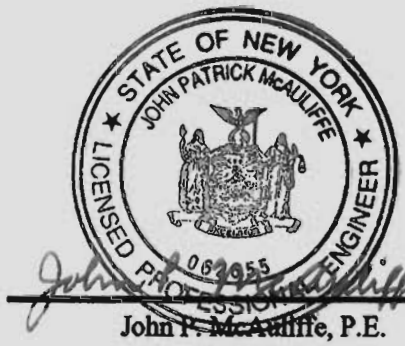

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May 29, 1996

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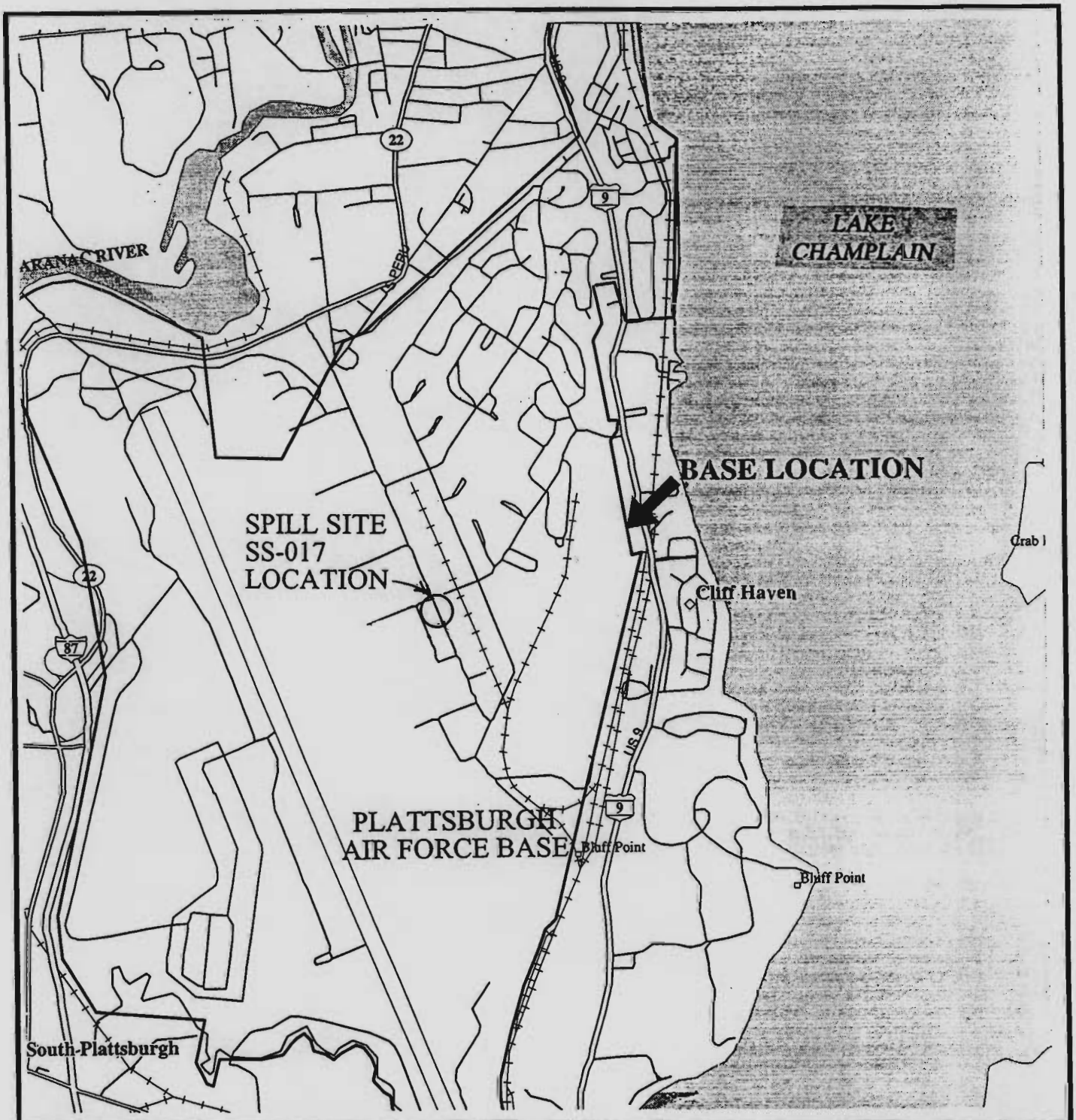
1.0 INTRODUCTION

This supplemental site investigation work plan presents the scope of work necessary to delineate the extent of contamination and design the remediation system for the vadose zone soils at Spill Site SS-017, Plattsburgh Air Force Base (PAFB), New York (Figure 1). The purpose of this delineation investigation is to gain site specific information so that a full-scale soil vapor extraction (SVE) system can be designed and installed to remediate the vadose zone soils. The scope of work will include the collection of up to 50 soil vapor samples for on-site gas chromatograph (GC) analysis, and up to 25 soil samples for laboratory analysis of volatile and semi-volatile organic compounds. The samples will be collected via a Geoprobe®-type unit from soils above the groundwater table at the site. Following completion of the site delineation activities, a pilot study will be conducted consisting of a 48-hour SVE test and a 5-day *in situ* respiration test.



LATITUDE: N44°39'49"
LONGITUDE: W73°27'45"

N

NEW YORK

QUADRANGLE LOCATION

Scale 1:31,250 (at center)

2000 Feet

1000 Meters

DATE: 10/10/95 (SEH)
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FIGURE 1

PLATTSBURGH AIR FORCE BASE
PLATTSBURGH, NEW YORK

SITE LOCATION MAP

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2.0 SITE BACKGROUND

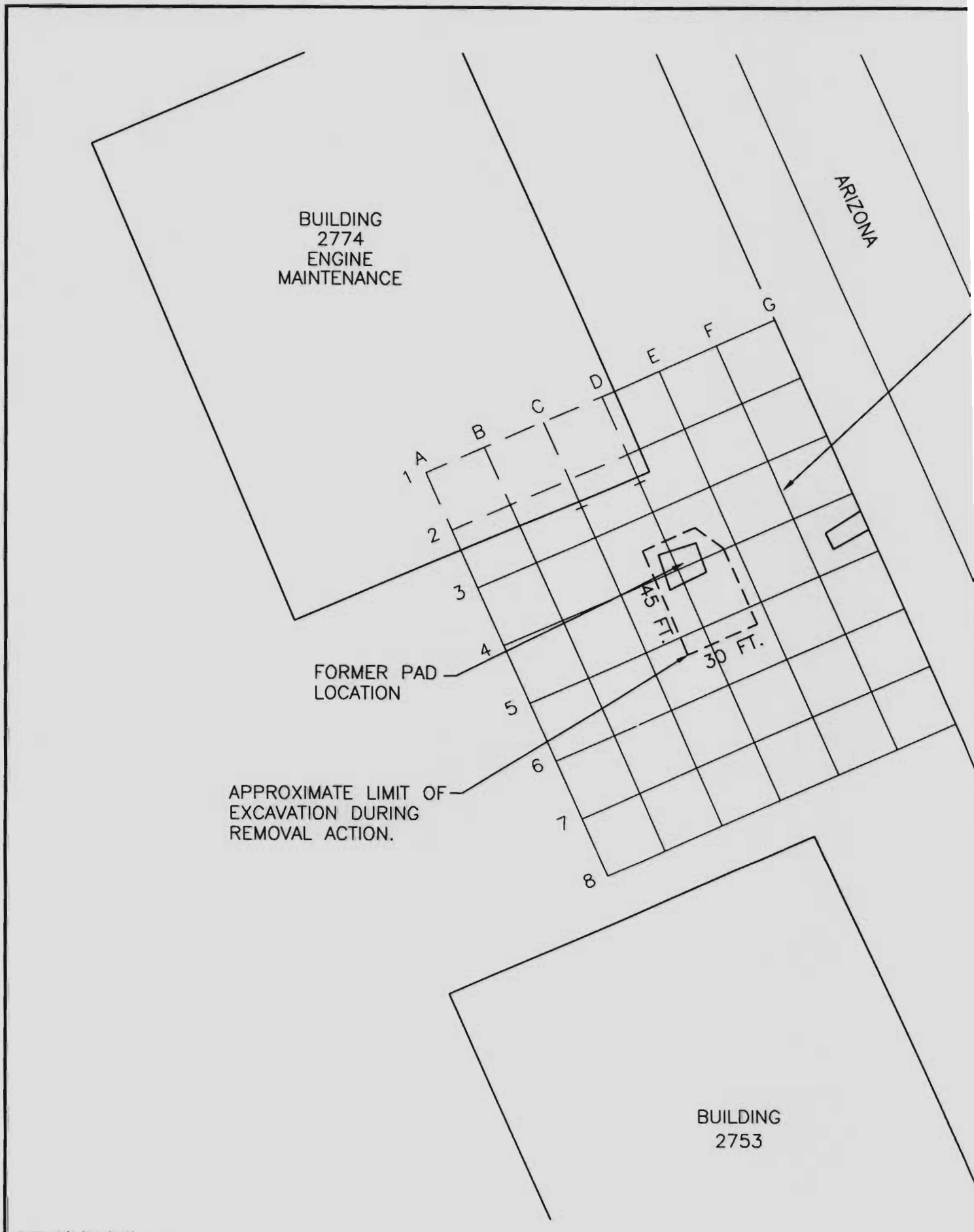
Spill Site SS-017 is located in the northern portion of the industrial area of PAFB that formerly supported flightline operations. The area to be delineated is bordered by Building 2774 on the north, Building 2753 on the south, and by Arizona Avenue on the east (Figure 2).

The soils encountered at site SS-017 are reportedly poorly graded fine sands to approximately 24 feet below the ground surface (July 1989). The depth to groundwater at the site ranges from four to eight feet below the ground surface with a horizontal gradient of 0.013 foot per foot. Direction of the shallow groundwater flow is east-southeast.

Previous reports on Site SS-017 indicate that drums of waste and new product including carbon remover solvent, PD-680 cleaning solvent (mineral spirits), engine oil and hydraulic fluid had accumulated on a 15- by 15-foot concrete slab in the area. Waste drums were filled using funnels and new product was obtained from drums fitted with spigots and stored on racks. As many as 15 to 20 drums were reportedly stored in this area at one time. On April 16, 1985 during a routine inspection, the New York State Department of Environmental Conservation (NYSDEC) collected two grab surface soil samples adjacent to the concrete slab for laboratory analyses. The NYSDEC subsequently reported levels of elevated volatile organic compounds (VOCs), most notably total dichlorobenzenes ranging from below detection limits to 9,800,000 parts per billion (ppb). In response to this information, PAFB performed two additional soil investigations: one on October 21, 1985 and the other on November 18, 1986. Both sampling events detected elevated levels of VOCs. One potential source was reportedly a full 55-gallon drum of dichlorobenzene stored in the accumulation area, which was found empty when opened for use.

Based on data from the two investigations, PAFB conducted a Removal Action at the site in the Fall of 1992. During this action, approximately 200 cubic yards of contaminated soil beneath the concrete slab was excavated and incinerated at an off-site permitted treatment, storage or disposal (TSD) facility. The concrete pad was landfilled at another permitted TSD. Soils were excavated from a 30- by 45-foot area (Figure 2) to a maximum depth of four feet below the ground surface (bgs), which was the depth of the groundwater table during the removal action. Monitoring of soils in the excavation at the 4-foot depth with a photoionization detector (PID) indicated significant residual contamination below the bottom of the excavation.

Therefore, based on previous investigation results and the 1992 Removal Action, a supplemental delineation investigation will be conducted to determine the vertical and horizontal extent of chlorinated hydrocarbon contamination in the soil surrounding the former drum storage pad. In addition, a soil vapor extraction pilot study will be performed to obtain engineering design parameters for implementing site-wide *in situ* remediation of the residual soil contamination. Based on the soil type (moderately permeable sands) and the moderate to highly volatile nature of contamination (xylenes and dichlorobenzenes), soil vapor extraction is expected to be effective at remediation of the vadose zone soils.



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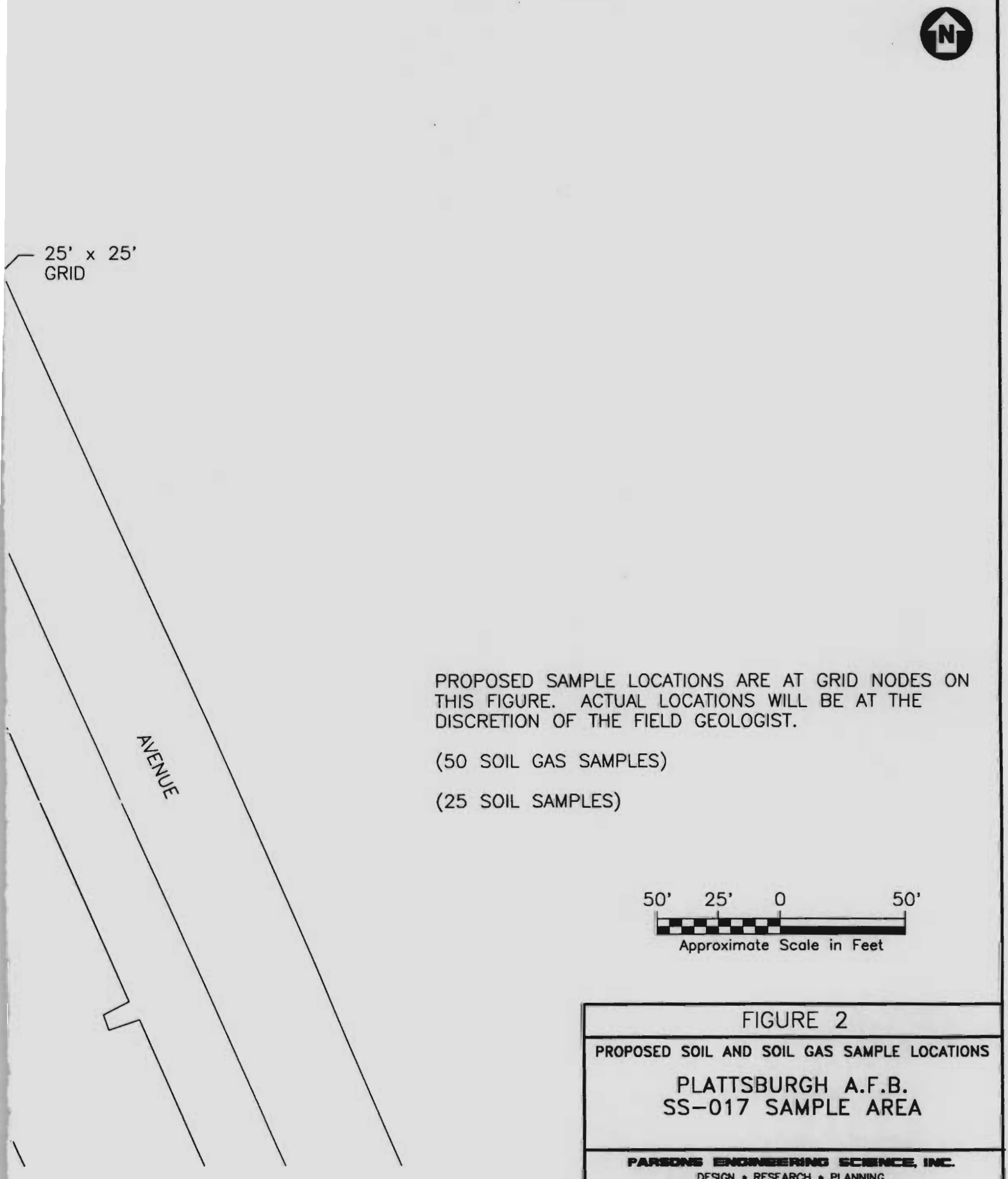

FIGURE 2

PROPOSED SOIL AND SOIL GAS SAMPLE LOCATIONS

PLATTSBURGH A.F.B.
SS-017 SAMPLE AREA

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3.0 SUPPLEMENTAL DELINEATION INVESTIGATION

The supplemental delineation investigation will consist of a 3-day Geoprobe®-type investigation of Site SS-017 to collect and analyze up to 50 soil gas and 25 soil samples. The proposed sample locations are shown on Figure 2. The proposed locations are based on previous site investigation data and were developed to define the areal extent as well as vertical extent of soil contamination. The majority of the sample locations lie outside the 30- by 45-foot excavation area of the Removal Action (Figure 2). As the previously excavated area is an area of known contamination and is a highly probable location for a vapor extraction well, the four samples within this area will be utilized to confirm the level of contamination. The majority of the sample locations are positioned outside the excavated area and are spaced to define the limits of horizontal contamination.

Soil gas samples will be collected by driving a stainless steel sample probe to a depth of six feet and withdrawing soil gas into tedlar bags. The soil gas samples will be analyzed with an on-site gas chromatograph to provide for immediate turn around. The samples will be analyzed for volatile organic compounds (VOCs) including benzene, toluene, ethylbenzene, and xylenes (BTEX), and for selected semi-volatile organic compounds (SVOCs) including total dichlorobenzenes. Soil gas samples will be collected from up to 50 sample locations and will be used to help determine soil sample locations as well as estimate the areal extent of contamination. Details of sampling and analytical methodologies will follow the 1992 Malcolm Pirnie document, Basewide Sampling and Analysis Plan. Additional information regarding soil gas survey methodology is included in Appendix A.

Soil samples will be collected from up to 25 locations and will be based on the results of the soil gas survey. In general, soil samples will be collected from up to 25 locations with the highest levels of contamination as indicated by the soil vapor survey. However, some soil samples may also be collected from apparently clean locations (i.e. no detectable contamination in the soil vapor samples) to document the areal extent of contamination and areas free of contamination.

Two soil samples will be collected from each of the 25 selected locations. The two samples from each boring will consist of 48-inch long samples collected from the 0- to 4-foot depth interval and from the 4- to 8-foot depth interval. Groundwater is expected to be encountered at approximately eight feet bgs, and no samples will be collected from below the groundwater table. All soil samples will be screened with a PID to determine which 25 will be retained for laboratory analysis. Additional information regarding the soil sampling methodology is included in Appendix B.

The soil and soil gas samples will be analyzed for VOCs and SVOCs. Soil samples will be analyzed via EPA SW 846 Method 8270 for semi-volatile organic compounds and Method 8021 for volatile organic compounds. Soil gas samples will be analyzed for VOCs and selected SVOCs via a portable gas chromatograph, and for O_2 and CO_2 via field instruments.

4.0 SOIL VAPOR EXTRACTION PILOT STUDY

4.1 PILOT STUDY OBJECTIVES

The purpose of conducting the pilot study is to gain site specific information for the design of a full-scale soil vapor extraction system. The objectives of the pilot study are threefold. The first objective is to conduct an air permeability test to determine the pneumatic radius of influence of a vapor extraction well in the vadose zone that is representative of site-wide application. Data collected during this portion of the test will allow for a determination of well spacing for a full-scale system. The second objective is to measure the anticipated VOC removal rate to determine the type and size of off-gas treatment system required. The third objective is to conduct an *in situ* respiration test to determine if bioventing (air injection) will be effective at remediating residual hydrocarbons in the vadose zone, biologically. The air permeability test and *in situ* respiration test will be conducted in accordance with the document "Test Plan and Technical Protocol for a Field Treatability Test for Bioventing" (Air Force Center for Environmental Excellence, May 1992).

4.2 HORIZONTAL PILOT TEST WELL AND MONITORING POINTS

Based on previous site investigation data, a pilot horizontal vapor extraction well (VEW) will tentatively be installed near the former concrete pad location at Building 2774 and will be used for conducting the pilot studies. The exact location will be determined by assessment of the data from the supplemental delineation investigation. In general, the pilot well will be installed in the area of highest vadose zone contamination. However, factors including depth to groundwater, physical access, and possible higher or lower permeability soil layers may affect the final pilot test location.

The well will be constructed of a 20-foot long section of 4-inch diameter factory slotted PVC well screen with 0.04-inch slots. The well will be placed at a depth of five feet bgs and will be surrounded by pea gravel to preclude infiltration of native material into the well screen. A 10-mil sheet of polyethylene sheeting will be placed above the pea gravel and a six inch layer of bentonite placed on top of the polyethylene sheet to seal the well and prevent short-circuiting of air above the well screen. The well screen will be connected to a 2-inch diameter PVC riser pipe which will extend to the ground surface and connect the pilot test blower to the extraction well. Figures 3 and 4 present the pilot study vent well cross section and profile, respectively.

Soils excavated and not replaced during the pilot test well installation will be placed in the landfarm operation constructed to treat other hydrocarbon impacted soils encountered during various remedial activities at the base.

The blower exhaust will be connected to two 200-pound vapor phase granular activated carbon (GAC) adsorbers for removal of hydrocarbons prior to emission to the atmosphere. A schematic diagram of the pilot test vacuum blower system is presented on Figure 5. The exhaust stream from the blower, and after each GAC adsorber will be monitored with field instruments and an on-site GC for BTEX and dichlorobenzenes every hour to determine loading rates and anticipated breakthrough time of the contaminants. If breakthrough (i.e. individual BTEX compounds or dichlorobenzenes above 1 part per million) is encountered during the pilot test, the test will be temporarily shutdown until another GAC adsorber can be installed.

Up to six temporary vapor monitoring points will also be installed in the vicinity of the extraction well. The temporary points will be installed following assessment of data from the supplemental delineation investigation. The points will be installed at distances ranging from five to 40 feet from the pilot test well. In general, the points will be installed in Geoprobe® sample holes near the extraction well, or by hand driving temporary monitoring points if Geoprobe® sample holes are not at appropriate locations. The vapor monitoring points will be constructed of 3-inch long by $^1/_2$-inch diameter polyethylene well points attached to $^1/_4$-inch polyethylene tubing which will extend to the ground surface. Based on the depth to groundwater during the time of the study, the monitoring points will be installed in nested pairs at depths of 2 feet, and 4 to 5 feet bgs to allow for vertical monitoring of soil gas during the pilot study. The points will be constructed with sand filter packs and be sealed from the atmosphere with bentonite.

4.3 *IN SITU* RESPIRATION TEST

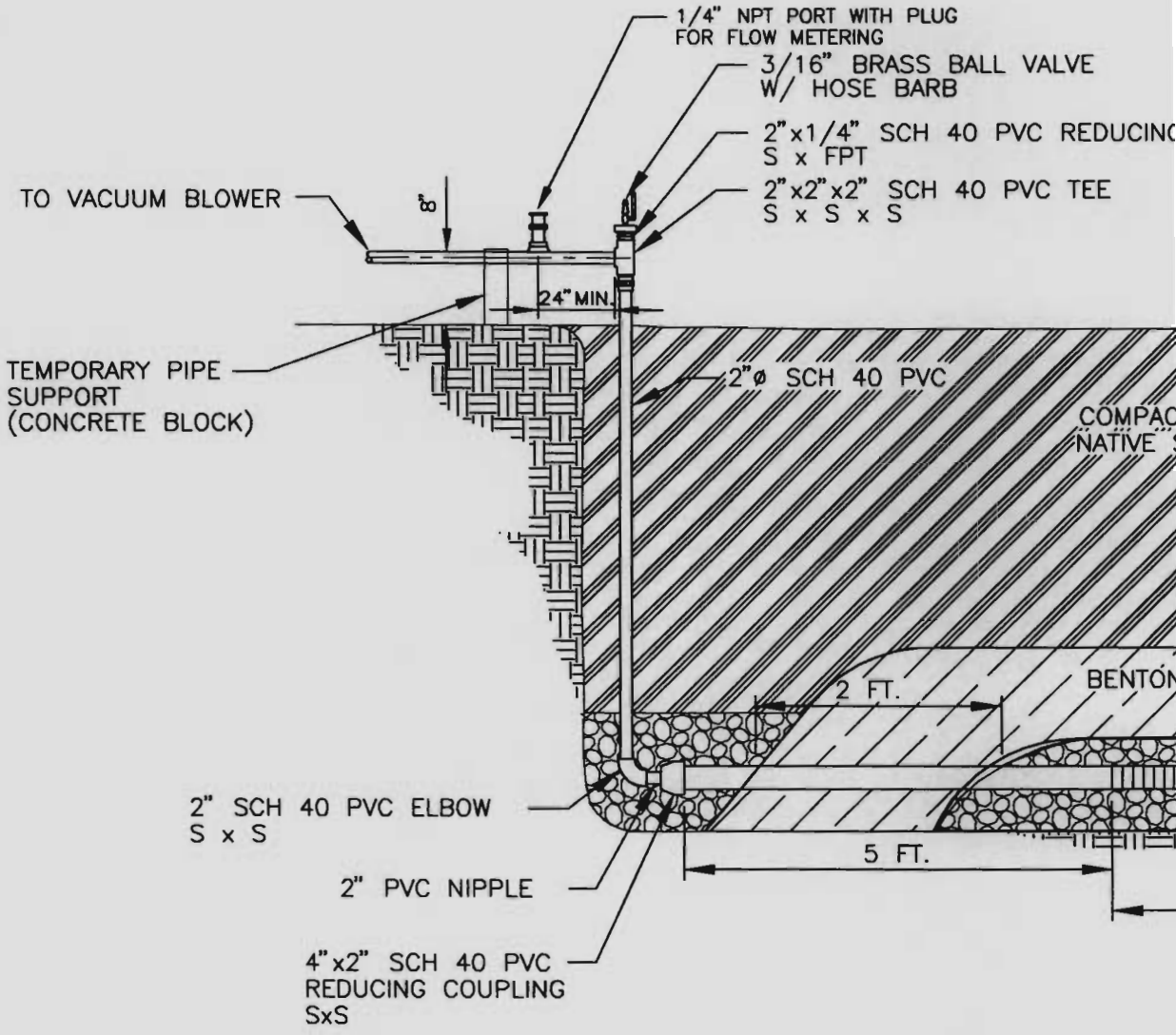
Following installation of the pilot test well and prior to the air permeability test, an *in situ* respiration test will be conducted. The *in situ* respiration test will be conducted using the newly installed VEW and vapor monitoring points. Prior to conducting the pilot test, initial carbon dioxide and oxygen levels at the VEW and monitoring points will be monitored and recorded. These data will be used to establish baseline conditions for the test and to evaluate changes which occur during the test. Respiration tests will be performed at the four monitoring points with the highest apparent hydrocarbon contamination at the site. Atmospheric air will be injected at a rate of one cubic foot per minute into each monitoring point depth interval containing low levels (<2%) of oxygen. A 20- to 24-hour air injection period will be used to oxygenate local contaminated soil around the monitoring points. At the end of the air injection period, the air supply will be cut off, and oxygen and carbon dioxide levels will be monitored for four days or until the oxygen level falls below 5%, whichever is earlier. The decline in oxygen and increase in carbon dioxide concentrations over time will be used to estimate rates of bacterial degradation of hydrocarbon residuals.

Both oxygen and carbon dioxide will be monitored with a specialized gas analyzer. This instrument includes an infra-red detector for carbon dioxide and an electrochemical cell for oxygen analysis and is capable of measuring both compounds to within an accuracy of 0.2 percent.

4.4 AIR PERMEABILITY TEST

The SVE pilot test will be performed at the site to estimate VOC removal rates and radial influence of the VEW. These objectives will be accomplished by monitoring soil vapor constituent concentrations and pressures at the extraction well and temporary monitoring points. This test will be performed in two steps at two different vacuums, approximately 15 and 45 inches of water, by varying the air extraction rate from the VEW. By conducting the SVE test at varying flow rates (low pressure and high pressure) the range of VOC extraction rates and effect of vacuum on the radius of influence from the VEW can be determined.

During each step, the VEW and monitoring points will be monitored for vacuum, air flow and temperature, O_2/CO_2 and VOCs at regular intervals as defined in Table 1. The air flow, temperature and VOC concentrations will provide preliminary estimates of VOC removal rates. VOCs will be monitored using field instruments and laboratory analysis as defined on Table 1.



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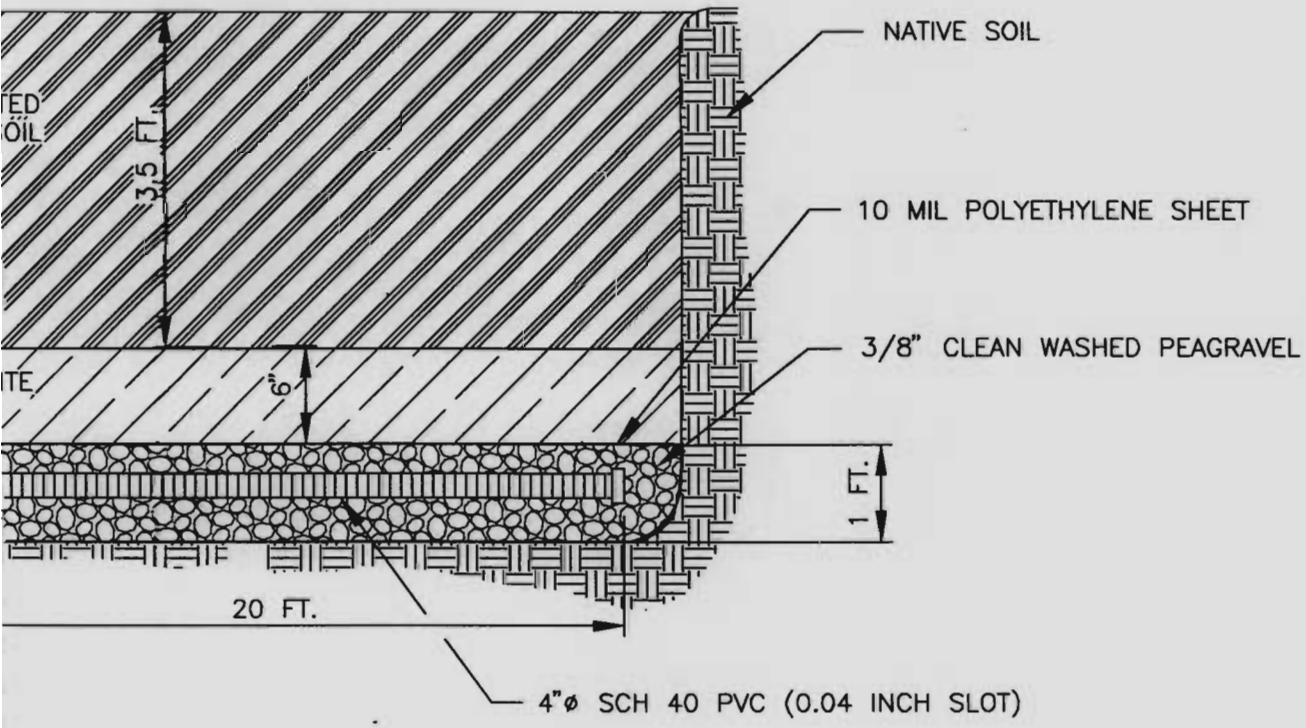

FIGURE 3

PLATTSBURGH AFB, NEW YORK

TRENCH CROSS SECTION FOR
SOIL VAPOR EXTRACTION PILOT TEST
SPILL SITE SS-017

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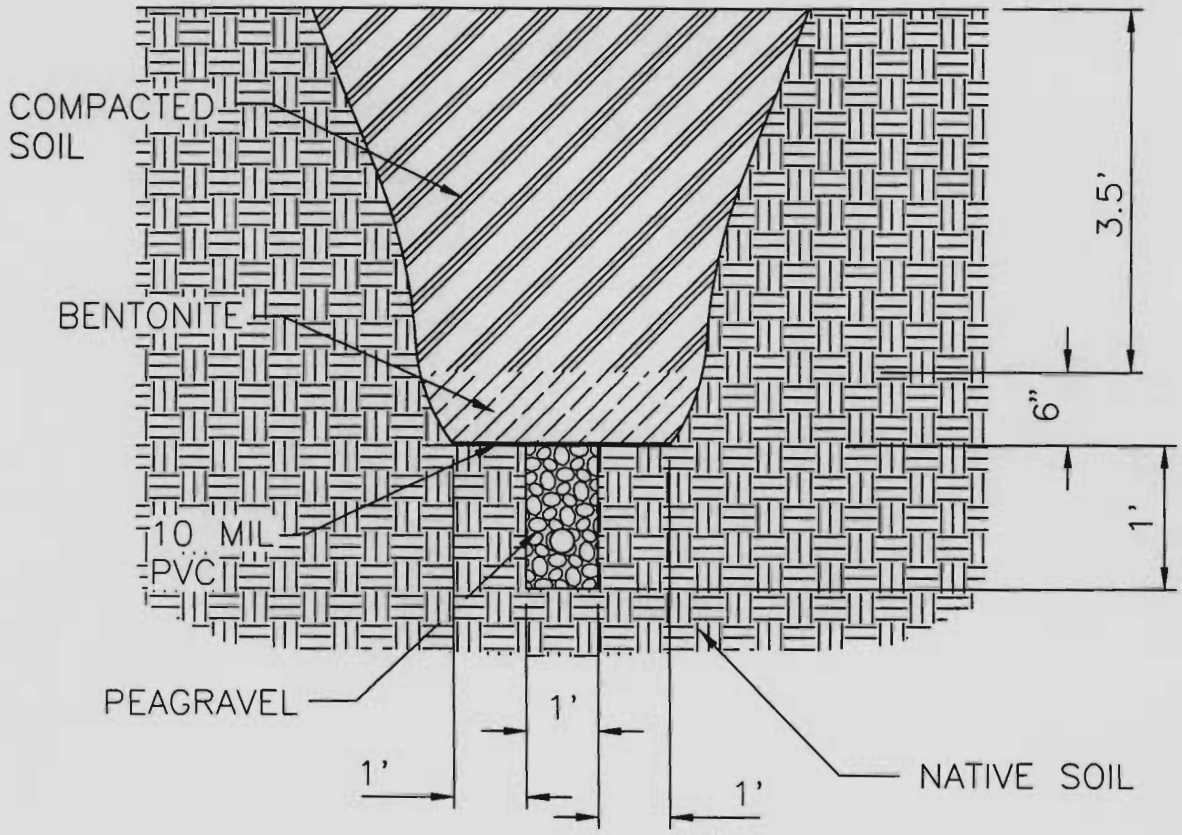

FIGURE 4

PLATTSBURGH AFB, NEW YORK

TRENCH PROFILE FOR SOIL VAPOR EXTRACTION PILOT TEST AT SPILL SITE SS-017

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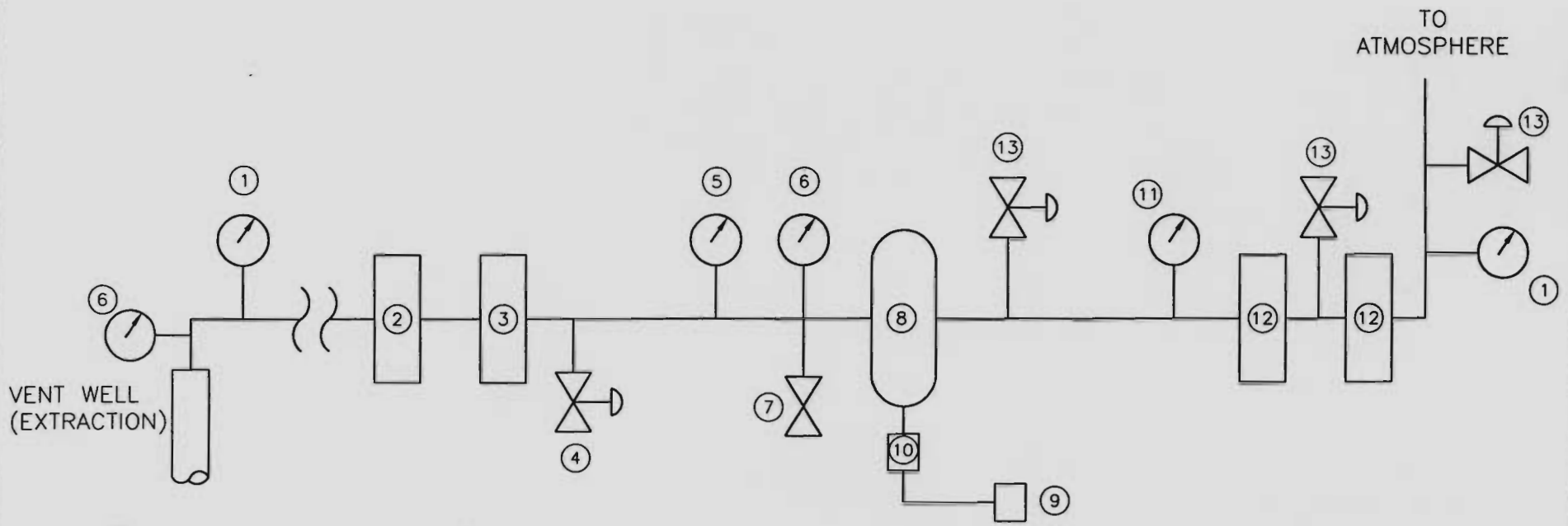

1. AIR VELOCITY MEASUREMENT PORT
2. MOISTURE SEPARATOR
3. IN-LINE AIR FILTER
4. MANUAL VACUUM RELIEF (BLEED) VALVE- 1 1/2" BALL
5. THERMOMETER (FAHRENHEIT)
6. VACUUM GAUGE (INCHES OF H_2O)
7. AUTOMATIC VACUUM RELIEF VALVE- SET @ 5 INCHES MERCURY
8. BLOWER- REGENERATIVE 145 SCFM @ 3450 RPM
9. STARTER- 230 v/ 27 amp/ SINGLE PHASE/ H1036 HEATER (10.8 amp)
10. DRIVE MOTOR 2.5 HP/ 3450 RPM @ 60 Hz/ 230 v/ SINGLE PHASE/ 15 amp
11. PRESSURE GAUGE- INCHES OF H_2O
12. 200 POUND VAPOR PHASE GRANULAR ACTIVATED CARBON ABSORBER
13. VAPOR SAMPLE PORT

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FIGURE 5

PLATTSBURGH AFB, NEW YORK
SCHEMATIC OF VACUUM BLOWER SYSTEM FOR SOIL VAPOR EXTRACTION PILOT TEST
SPILL SITE SS-017

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TABLE 1
VAPOR EXTRACTION PILOT TEST
MONITORING AND SAMPLING SCHEDULE
SPILL SITE SS-017
PLATTSBURGH AFB, NEW YORK

Location/Parameter	Method	Frequency
Field		
Air Temperature	Thermometer	Once per day
Barometric Pressure	Barometer	Once per day
Weather Conditions	--	Once per day
Vapor Extraction Well (VEW)		
Vacuum	Magnehelic Gages	Every minute for 30 minutes, then variable for 4 to 8 hours
O_2/CO_2	GasTechTor 3252OX	Every 60 minutes
Air Flow	Thermal Anemometer	Every 30 minutes
Temperature	Thermometer	Every 30 minutes
Soil Vapor Sample	Field Analysis(1)	Every 60 minutes
Vapor Monitoring Points (VMPs)		
Vacuum	Magnehelic Gages	Every minute for 30 minutes then every 5 to 10 minutes for the duration of the test
O_2/CO_2	GasTechTor 3252OX	Every 60 minutes
Soil Vapor Sample	Field Analysis(1)	Every 60 minutes
Stack Effluent		
Air Flow	Thermal Anemometer	Every 30 minutes
Temperature	Thermometer	Every 30 minutes
Blower Exhaust Vapor Sample	On-Site GC	Every hour
After Each GAC Adsorber	On-Site GC	Every hour

(1) PID.

APPENDIX A
STANDARD OPERATING PROCEDURES FOR SOIL GAS SURVEYS

APPENDIX A
STANDARD OPERATING PROCEDURES FOR SOIL GAS SURVEYS

The following methods will be used to conduct soil gas surveys.

Equipment and Supplies

- ·Portable Gas Chromatograph
- ·Soil gas survey equipment
- ·Surveying transit and stadia rod
- ·Generator
- ·Steam cleaner
- ·PID
- ·Survey equipment
- ·Tedlar bags
- ·Tygon tubing
- ·Calibration gas
- ·Ultra zero air
- ·Syringes
- ·Field computer
- ·Field book and project plans
- ·Metal detector
- ·Decon supplies
- ·Personal protective equipment in accordance with the HSP

Soil Gas Survey Method

The soil gas survey (SGS) will be conducted across SS-017 in order to more accurately define the limits of soil contamination. SGS samples will be collected at locations shown on Figure 2. The objectives of the survey are to provide a better understanding of the nature and extent of soil contamination.

Field Procedures

Up to 50 samples will be collected and analyzed in the field with a portable gas chromatograph. All field samples will be analyzed within one hour of collection.

Sample Collection

SGS samples will be collected using the following procedures:

- A hollow, vented, stainless steel probe attached to a length of hollow stainless steel pipe will be driven into the soil with Geoprobe® (see Appendix B) to approximately five feet below grade. In areas where probe penetration is difficult, samples will be collected at no less than two feet below grade. The Geoprobe® sample probe is constructed with a flexible Teflon® seal at the top of the probe vent to exclude ambient air infiltrations into the soil gas sample.
- Following installation, the probe will be connected to a one cubic foot per minute vacuum pump using Tygon tubing, and purged for approximately 15 seconds to remove ambient air from the system.

STANDARD OPERATING PROCEDURES FOR SOIL GAS SURVEYS

- The probe and tubing will be connected to a one-liter Tedlar bag contained in a vacuum chamber. The Tedlar bags are constructed of an analytically clean, nonporous polymer designed for high-purity gas sampling. Each bag is equipped with a cut-off valve for connection to the sample collection apparatus, and a septum for sample withdrawal.
- The vacuum pump will be connected to the chamber, the chamber sealed, and the vacuum pump started.
- The vacuum pump will create a vacuum inside the sealed chamber, which in turn, will create a vacuum on the outside of the Tedlar bag within it, causing the bag to fill.
- After the Tedlar bag is filled, the vacuum pump will be shut off, the sample chamber will be opened and the Tedlar bag valve will be closed. The Tedlar bag will subsequently be removed from the sample train and labeled with the sample point location, date and time of collection.
- All samples will be analyzed by gas chromatography using a portable gas chromatograph. The samples will be analyzed within one hour of collection in accordance with the protocol presented in the following section.
- Following the collection of a soil vapor sample, the sample train will be disconnected from the probe and purged with a vacuum pump for several minutes to remove residual soil vapors from the sample train. Subsequently, the collection probes will be removed from the subsurface with a truck jack
- The sample train will be cleaned daily or more often if necessary by washing with Alconox detergent, rinsing with potable and distilled water, and air drying. The collection probes will be decontaminated by steam-cleaning, and the tygon tubing will be replaced between samples.
- The designated field team member will record information including soil vapor sampling location, location offset (if applicable), time, depth of probe penetration, and descriptions of any problems encountered during sample collection, in the field book.
- All sample locations will be surveyed and plotted on a site map.

Gas Chromatography

The soil vapor samples will be analyzed in the field with a Portable Gas Chromatograph (GC). The GC is equipped with a photoionization detector (PID) containing a 10.6 electron volt (eV) bulb, a 9-meter capillary column (CPSIL-19CB), a 1-meter precolumn/backflush system, and an isothermal oven. The PID is capable of detecting fuel hydrocarbons and chlorinated solvents at concentrations down to 10 parts per billion (ppb).

The PID uses an ultraviolet (UV) light source which is directed into a small chamber through which pure air, inert gas, or soil vapor sample passes. Photoionization will occur if the gas stream passing through the chamber contains constituents which have ionization potentials less than 10.6 eV. Pure air and inert gases, like nitrogen or helium, require UV energy greater than 11.0 eV before they can be ionized, which categorizes them as ideal carrier gases. An electric potential of approximately 300 volts is maintained between two electrodes inside the chamber. This allows generation of an electric current by the ionized gases which in turn is used to measure the concentration of ionizable gases present.

STANDARD OPERATING PROCEDURES FOR SOIL GAS SURVEYS

Samples are injected into the GC, through the sampling ports, and into the carrier gas flow. Compounds within the sample are separated as the gas stream passes through the capillary column which is packed with an absorptive powder or adhesive coating that is designed to separate compounds based on their chemical structure. Volatile organic compounds are retained on these coatings for specific periods of time (retention times) which are related to each compound's chemical structure. The PID detects each compound with an ionization potential of up to 10.6 eV as it flows through the detector chamber with the carrier gas, and records the time interval for the compound to flow through the column. The compounds are then identified and quantified by the GC's computer by comparing the retention times of each compound detected to the retention times of known compounds in the instrument calibration standard. Calibration standards are stored in an internal library.

GC Calibration

The GC will be calibrated daily with a commercially-prepared standard gas containing known concentrations of contaminants of concern for the site. Calibrations will occur at the start of the day, at mid-day, and at the end of day for each day of the survey. If necessary, additional calibrations will be performed. All calibration data will be stored in the GC library to serve as a reference for identification and qualification of compounds detected in the samples. Following the initial daily calibration, a 3-point calibration will be conducted to check the accuracy of the GC at three different calibrant concentrations. A copy of the calibration runs will be attached to the appropriate page in the field book.

Soil Gas Sample Analysis

Soil vapor samples will be analyzed using the following procedures:

- Soil vapor samples will be withdrawn from the Tedlar bags with an air-tight syringe within one hour of collection, and then injected into the sampling port of the portable PID/GC.
- Concentrations and identification of specific compounds will be generated by the GC, based on the calibration data and the internal library. The internal library is based on retention times for calibration standards.
- The internal instrument temperature will be noted after each sample run. If the temperature fluctuates greater than 4 degrees Celsius from the temperature recorded during the last calibration, the instrument will be recalibrated.
- The designated field geologist or chemist will record information including soil vapor sampling location, sample concentration, time, and describe any problems encountered during sample analysis in the field book. A copy of the sample run will be attached to the appropriate page in the field book.

Soil Gas Sampling QA/QC

Quality assurance and quality control for the survey will include analyses of instrument blanks, syringe blanks, sample train decontamination blanks and duplicate samples.

- Instrument blanks will contain high purity (ultra zero air) carrier gas which will be circulated through the instrument sampling loop. The instrument blanks will be used to determine instrument stability and monitor possible residual column contamination.

- Syringe blanks will consist of ultra zero air injected into the sample port to monitor syringe decontamination.
- Sample train blanks will consist of ambient air sample injections drawn through the sampling apparatus. These blanks will monitor possible residual contamination of the sample train and indicate ambient air conditions. QA/QC samples (instrument blanks, syringe blanks, sample train blanks) will be taken at routine intervals throughout each day.
- Duplicate samples will be run every tenth sample.

APPENDIX B
STANDARD OPERATING PROCEDURE FOR SUBSURFACE SAMPLING-GEOPROBE METHOD

APPENDIX B
STANDARD OPERATING PROCEDURE FOR SUBSURFACE SAMPLING-GEOPROBE METHOD

The following methods will be used to conduct Geoprobe® subsurface sampling.

Equipment and Supplies

- ·Geoprobe® system
- ·Surveying transit and stadia rod
- ·Field book and project plans
- ·Personal protective equipment in accordance with the site HSP
- ·Metal detector
- ·Marker stakes, flagging, and paint
- · Soil sample containers
- · Tape measure
- · Decon supplies
- · PID
- ·Camera
- · Tape
- · Sample bottles
- ·Coolers and ice
- ·Shipping supplies

Geoprobe® Sampling Method

The Geoprobe® Systems, Inc. sampling system (or a similar system) consists of a sample probe attached to a 1-inch outside-diameter rod that is driven into the subsurface under 15,000 pounds of pressure using a truck-mounted hydraulic driver. Different media may be sampled by attaching an appropriate sampling probe to the drive-rod.

Subsurface soil samples will be collected as follows:

- Subsurface soil samples will be collected from a particular depth using a 24-inch-long core sampler, equipped with a retractable point. The samples will be collected by driving the sampler to the top of the desired sampling depth, retracting the protective tip of the sample probe remotely through the driving rod, and then driving the exposed core sampler 24 inches deeper into the subsurface. The core sampler is then extracted from the subsurface and the sample recovered. The sample is then removed from the protective polyethylene core liner and placed into the appropriate sample containers. The polyethylene core liner is replaced between sample collections.
- Soil samples retrieved from the geoprobe borehole will be visually described for: 1) percent recovery, 2) soil type, 3) color, 4) moisture content, 5) texture, 6) grain size and shape, 7) consistency, 8) visible evidence of staining, and 9) any other observations. The descriptions will be in accordance with the Unified Soil Classification System (USCS).
- Soil samples will be screened for the evolution of organic vapors with a photoionization detector (PID) using the following procedure:

A representative portion of the soil sample will be placed in an sample jar which will be filled to approximately half full. The container will be labeled with the boring number and interval sampled. The cap will be screwed on tightly.

The sample will be transported to a heated enclosure (i.e. sample truck or field laboratory at approximately 68°F), and allowed to warm for a minimum of 10 minutes. The sample jar lid will be unscrewed and the tip of the PID will be inserted under the cap to measure the headspace for organic vapors.

- With the exception of borings to be completed as temporary monitoring points, all Geoprobe® borings will be sealed with bentonite or cement/bentonite grout following completion.
- Soil remaining from sample collection activities will be contained in a 55-gallon drum.
- All subsurface tools and the back portion of the hydraulic driver will be decontaminated between each boring.
- The designated field geologist will log borehole geology and headspace measurements in the field book and the Drilling Record.
- Geoprobe® borings to be completed as temporary monitoring points will be constructed with 3-inch long by 1/2-inch diameter polyethylene well points connected to 1/4-inch polyethylene tubing which will extend for at least 2 feet beyond the ground surface. Clean graded 6-9 or No. 2 silica sand will be placed in the boring to the desired level. The polyethylene point will then be installed in the boring and covered with 6 inches of the silica sand. Granular bentonite or bentonite pellets will then be placed above the sand pack to a depth of at least one foot and hydrated in place with potable water. The boring will then be grouted to the surface with a neat bentonite grout mixture.
- All sample locations will be surveyed and plotted on a site map.

Soil Sampling

- Samples will be collected from up to 25 Geoprobe® locations at the discretion of the field geologist.
- Samples for VOC analyses will be collected directly from the sampler, placed into appropriate containers, and compacted in order to minimize head space and pore space. The remaining sample volume will be placed into a stainless steel bowl, homogenized, and placed in appropriate containers for the other analyses.
- The sample containers will be labeled, placed in a laboratory supplied cooler, packed on ice (to maintain a temperature of 4°C), and shipped overnight to the laboratory for analysis.
- Chain-of-custody procedures will be followed as outlined in the 1992 Malcolm Pirnie document.
- The sample locations, descriptions, and depths will be recorded in the field book.