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July 26, 1999

Mr. Ramanand Pergadia, P.E.
NYSDEC
21 South Putt Corners Road
New Paltz, NY 12561-1696

Subject: Monitoring Well Installation and Soil and Groundwater Sampling Workplan
Hangar D, Bay 1, Westchester County Airport, Harrison, NY
XDD Project No. 28-034

Dear Mr. Pergadia:

Attached, please find three copies of a revised workplan for your review. The workplan includes details of proposed soil and groundwater sampling and additional monitoring well installations in and around the hangar facility at the Westchester County Airport.

Should you have any questions regarding the contents of this submittal or on the project as a whole, please feel free to contact Greg Hill of Mobil at 609-737-4940.

Sincerely,
XDD, LLC

Stephen Magee
Project Engineer

SM/ket

Please comment & send approval as noted on attached copies of this submission

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WORKPLAN

FOR

MONITOR WELL INSTALLATION AND SOIL AND GROUNDWATER SAMPLING

HANGAR D BAY 1

WESTCHESTER COUNTY AIRPORT
TOWN OF HARRISON, NEW YORK

Prepared for:

Mobil Oil Corporation
Princeton, NJ

Prepared by:

XDD, LLC
Portsmouth, New Hampshire

July 23, 1999

1.0 OVERVIEW

During a September 24, 1998 meeting at the Albany offices of the New York Department of Environmental Conservation (NYDEC) between Mobil, XDD and NYDEC representatives, several action items were identified that were required to be completed prior to making a decision on the appropriate remedial action for the site.

The following action items were identified from the September 24th meeting:

- Installation of two additional monitoring wells. One to be installed upgradient of the suspected source and one to be installed outside of the hanger to the north of MW3.
- Development and sampling of both wells for target (chlorinated) VOC's.
- Discrete level soil sample collection from one location in the known hot spot area and analyses of the soil samples for target VOCs.
- Brief report on the results of the soil and groundwater sampling analyses and interpretation of the results with respect to the appropriate remedial action for the Site.

A work plan dated March 8, 1999 was developed and submitted to NYDEC to provide details on the actions required from the September 24th meeting. During a follow up call between representatives of Mobil, XDD and the NY DEC on June 17, 1999 three additional changes were suggested with regard to the March 8, 1999 workplan. These changes are as follows:

- Install and sample 1 or 2 bedrock wells (function of bedrock fracture pattern relative to shallow groundwater flow direction) approximately 30 to 50 feet downgradient of MW2.
- Revise the site figure to show the proposed upgradient well.
- Revise turbidity monitoring criteria in the groundwater sampling SOP.

These additional suggestions have been included in this revised work plan. In addition to the NYDEC requested changes, Mobil proposes to sample the four existing wells (MW1 through MW4) for target VOCs to further evaluate the natural attenuation processes ongoing at the site.

2.0 OBJECTIVES OF MONITOR WELL INSTALLATION AND COLLECTION OF SOIL AND GROUNDWATER SAMPLES

The objectives of the additional monitoring well installations and soil and groundwater sampling are:

- Investigate the possible presence of an upgradient VOC source that may be impacting groundwater under the former Mobil hangar (specifically in the vicinity of MW-1).
- Obtain, if applicable, background (i.e., non-impacted) water quality data.
- Evaluate possible impacted groundwater flow from the source area towards the East.
- Evaluate whether the source of VOCs in the soil within the "hot spot" area have been reduced, through the action of SVE and natural attenuation, to levels generally representative of the level of VOCs measured in the soil gas and groundwater in that area.
- Evaluate the degree of VOC impact in shallow bedrock downgradient of the apparent source area, and
- Collect an additional round of ground water samples to further evaluate ongoing natural attenuation processes at the site.

3.0 SCOPE OF WORK

A. Additional Monitor Well Installations

1.) Overburden Monitoring Wells

Two additional groundwater monitor wells (proposed MW5 and MW6) will be installed in the overburden soils at the Site. Bedrock is expected to exist in the range of approximately 10 feet to 16 feet below grade (BG). In the event that bedrock is not encountered up to 20 feet BG, the well will be installed with screen from 20 feet BG to 5 feet above the water table level at that location (water table is at approximately 12 feet). Monitor wells will be constructed of 2-inch diameter PVC screen and riser and installed using standard hollow stem auger drilling methods. Soil samples will be collected continuously from grade to the bedrock interface (or end of boring) using split spoon sampling techniques. Soil samples will be screened visually and with a PID for VOCs using the jar headspace method. Wells will be screened from the bedrock surface (or end of boring) to five feet above the water table level. A minimum of a 1-foot bentonite seal

will be installed above the screened interval. Wells will be finished above grade with locking flushmount road boxes. Figure 1 shows a typical proposed monitor well installation detail. A site plan showing the proposed monitor well locations is provided as Figure 2.

The first monitor well (MW-5) will be installed upgradient of MW-1 approximately 50 feet from the front of the airport hangar building. The purpose of this well will be to investigate the presence of any upgradient source of VOCs that may be impacting the groundwater quality below the former Mobil hangar and to obtain if applicable, background water quality data.

The second monitor well (MW-6) will be installed outside the hangar building approximately 95 feet to the north of MW-3. The purpose of this well is to evaluate the potential existence of a groundwater flow component in an easterly direction across the Site.

Immediately after installation both wells will be developed using a submersible pump until discharge from the wells is visually clear. Development water will be drummed and stored on site for later disposal by Mobil.

2.) Bedrock Monitoring Well

A review of a bedrock fracture map of the site and local area demonstrate that the bedrock fracture pattern correlates strongly with the shallow groundwater flow pattern at the site. The relevant bedrock fracture is highlighted on both the USGS Glenville Quadrangle map and the bedrock fracture map provided in Appendix A. Therefore, only one bedrock well is required to adequately monitor the bedrock aquifer. Both the bedrock fracture map and a portion of the local USGS map are included as Appendix A.

As discussed in the June 17th conference call, the bedrock well will be installed inside the hangar building approximately 30 to 50 feet downgradient of MW2. The proposed well is labeled as MW7 on the attached Figure 2.

The proposed 2-inch diameter bedrock well will be installed to approximately 15 to 20 feet below the depth where bedrock is encountered. The well will be installed with a casing set approximately 3 to 5 feet into the bedrock and will be open from that point to the bottom of the boring. The well will be finished above grade with a locking flushmount road box.

Immediately after installation, the well will be developed using a submersible pump until discharge from the well is visually clear. Developed water will be drummed and stored on site for later disposal by Mobil.

B. Monitoring Well Sampling

Groundwater samples will be collected from existing monitoring wells MW1 through MW4 and new monitor wells MW-5, MW-6 and MW-7. MW-5, MW-6 and MW-7 will be sampled at least one week after installation and development of the wells. Standard low flow sampling techniques will be used to collect the groundwater samples. A SOP for the low flow sampling technique to be used is included as Appendix B.

The samples will be shipped overnight on ice to Lancaster Laboratories in Lancaster, PA for analysis using EPA Method 8010/8020.

C. Soil Sample Collection

Soil samples will be collected and analyzed for target VOCs and total petroleum hydrocarbons (TPH) from one boring in the area of the former hot spot located inside the hanger in the vicinity of MW-2. Samples will be collected from just below the concrete slab to the bedrock surface at approximately two-foot intervals.

Sampling Procedure

Samples will be collected using standard split spoon sampling techniques. Spoons will be brought to the surface by the driller and placed on a sheet of plastic and opened. Once opened a sample will be collected using a stainless steel trowel and immediately placed in containers provided by the laboratory. The container will be filled as much as possible. The container will immediately be placed in a cooler with ice. The ice will be sealed in plastic bags. Coolers will contain enough ice to maintain sample temperatures at less than 4 degrees Celsius. Samples will be shipped via overnight carrier to Lancaster Laboratories in Lancaster, PA for analysis using EPA method 8260.

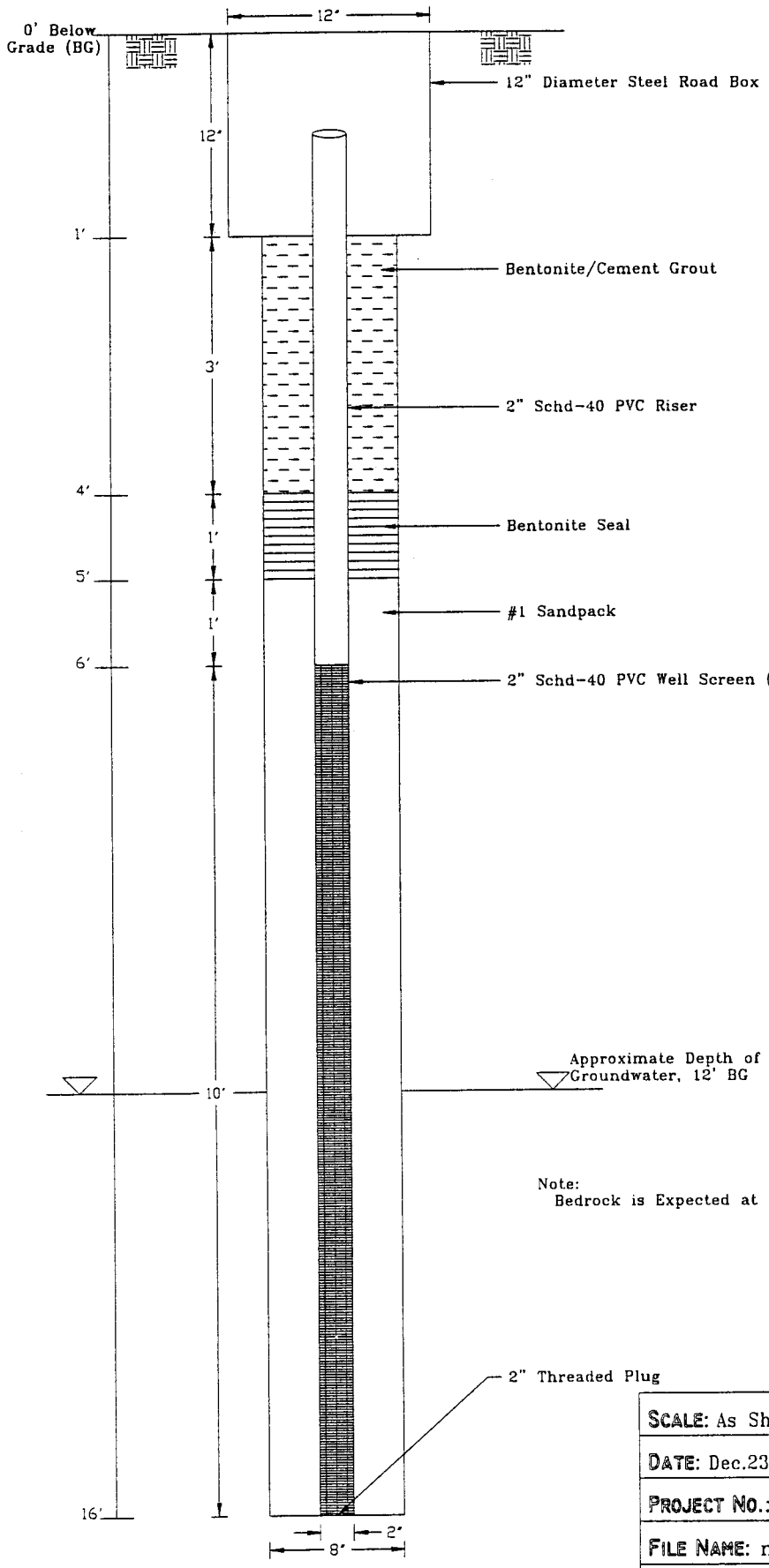
Equipment Decontamination

The sampling device will be decontaminated between each use by washing with clean potable water and laboratory-grade detergent and then triple rinsing with de-ionized water. During the washing phase, the sampling device will be scrubbed with a brush to remove all soil that may have accumulated.

D. Brief Report

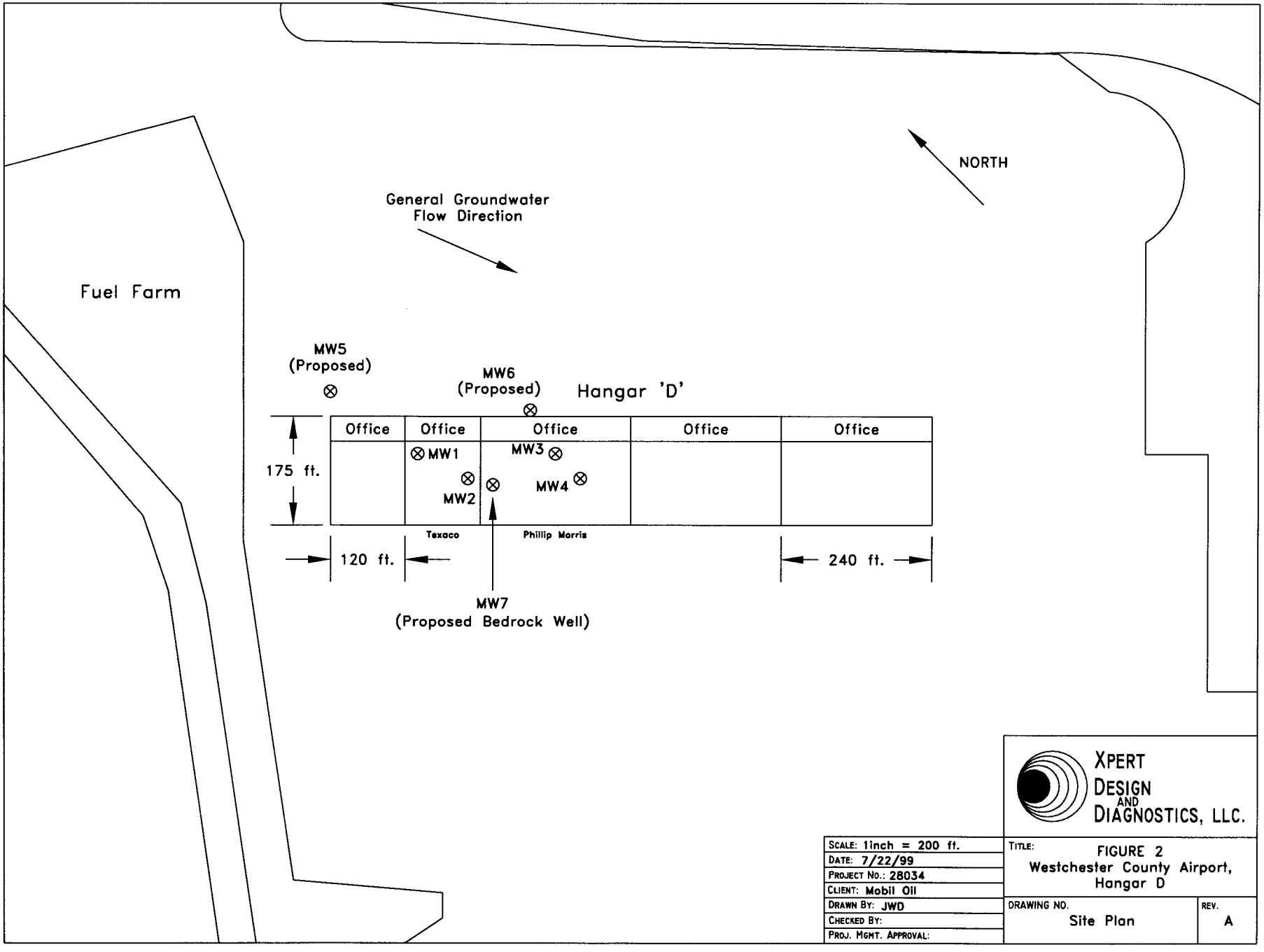
A brief report will be prepared that will present the locations, methods and analyses results for the ground water quality and soil samples. An analysis and interpretation of the data with respect to the NYDEC concerns will be presented. The impact of the sampling results on the currently proposed remedial action (Natural Attenuation Monitoring) will be addressed.

Figures



Note:
Bedrock is Expected at Between 10 and 16 Feet Below Grade (BG)

SCALE: As Shown	FIGURE: 1
DATE: Dec.23, 98	TITLE: Typical Monitoring Well Construction
PROJECT NO.: 28029	CLIENT: Mobil Oil Corporation Harrison, New York
FILE NAME: mw	XPERT DESIGN AND DIAGNOSTICS, LLC.
DRAWN BY: JMP	
CHECKED BY:	



XPERT DESIGN AND DIAGNOSTICS, LLC.

SCALE: 1inch = 200 ft.	TITLE: FIGURE 2 Westchester County Airport, Hangar D
DATE: 7/22/99	
PROJECT NO.: 28034	
CLIENT: Mobil Oil	
DRAWN BY: JWD	DRAWING NO. Site Plan — REV. A
CHECKED BY:	
PROJ. MGMT. APPROVAL:	

Appendix A

LOWER PALEOZOIC AND/OR PRECAMBRIAN

CORTLAND COMPLEX

Xban	BIOTITE AUGITE NORITE
Xd	DIORITE WITH HORNBLENDE AND/OR BIOTITE
Xhn	HORNBLENDE NORITE
Xopx	OLIVINE PYROXENITE
Xpx	PYROXENITE

CROTON FALLS COMPLEX

Xgb	GABBRO TO HORNBLENDE DIORITE, WITH MINOR PYROXENITE

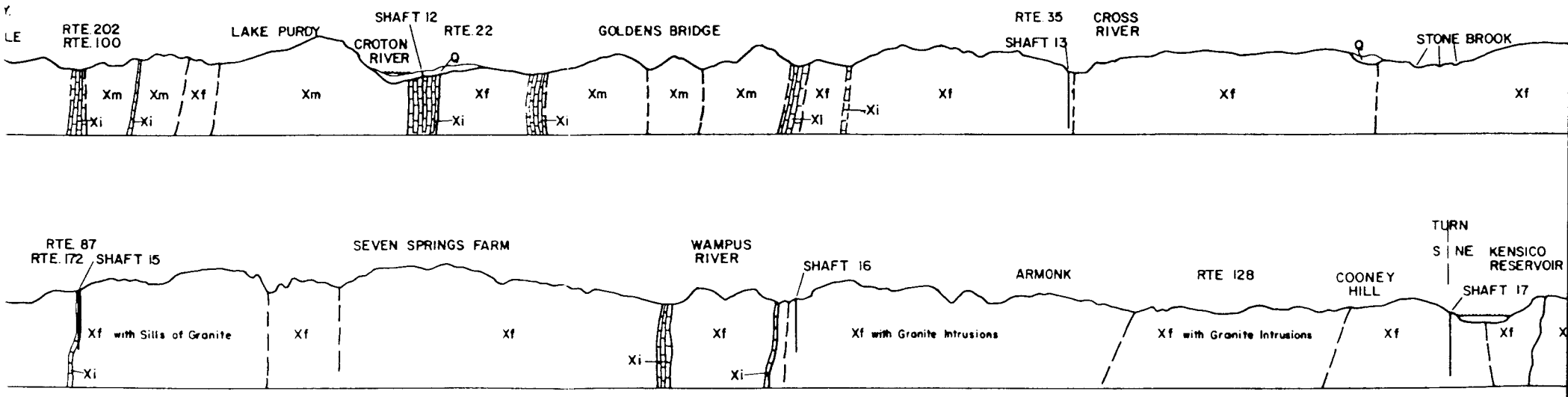
NEW YORK CITY GROUP (IN CHRONOLOGICAL ORDER)

Xm	MANHATTAN FORMATION; SCHISTOSE GNEISS WITH LOCAL INTERLAYERS OF AMPHIBOLITE AND MARBLE
Xi	INWOOD MARBLE; LOCALLY WITH QUARTZITE AT BASE
Xf	FORDHAM GNEISS, BIOTITE-QUARTZ PLAGIOCLASE PARAGNEISS, AMPHIBOLITE, MIGMATITE; SUBORDINATE MICA SCHIST, MARBLE

(RELATIVE AGES UNCERTAIN)

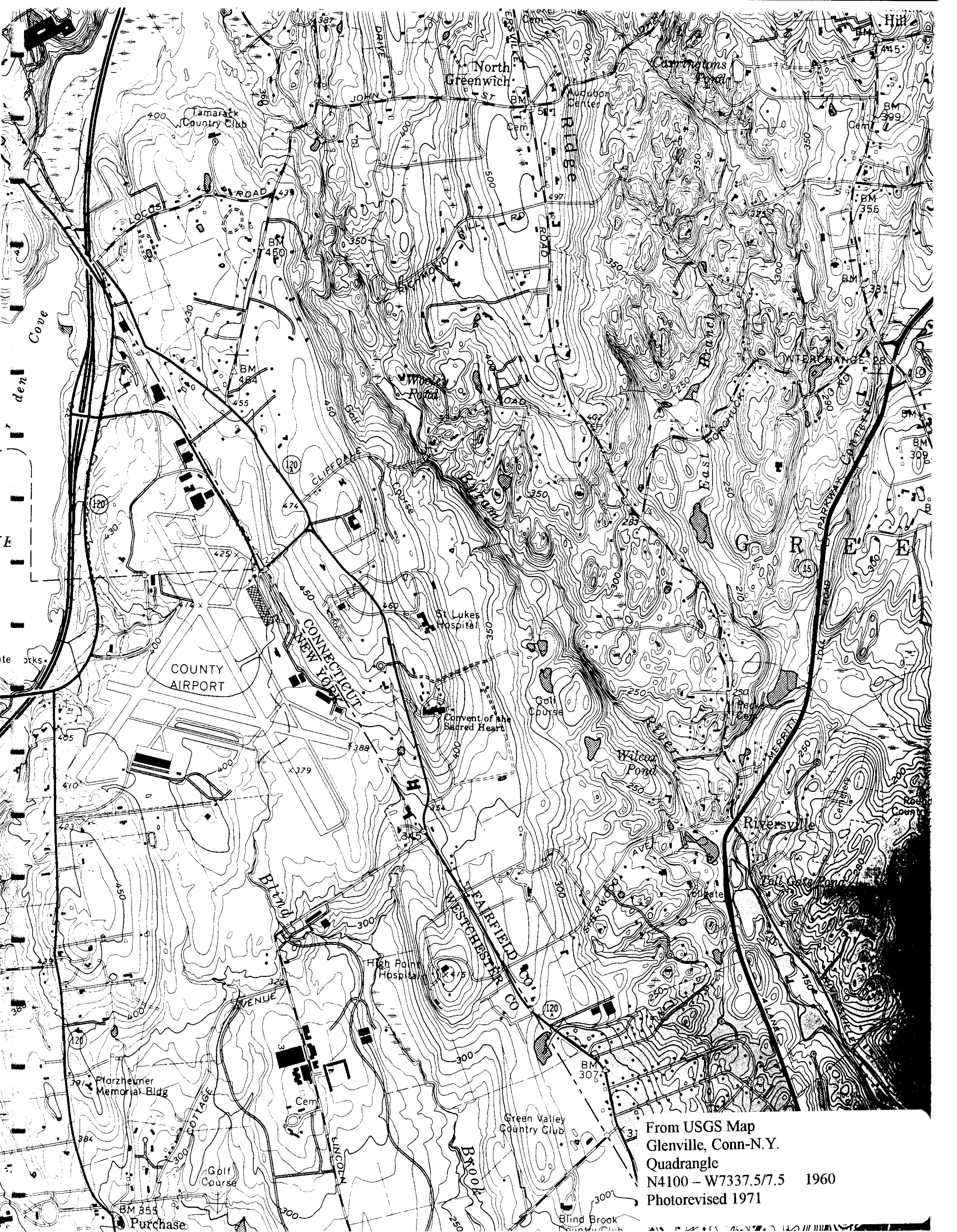
Xmg	MICROCLINE GRANITE
Xb	BEDFORD GNEISS
Xbg	BIOTITE GRANITIC GNEISS
Xp	POUND RIDGE GNEISS COMPLEX
Xpk	PEEKSKILL GRANITE
Xs	SISCOWIT GRANITIC GNEISS COMPLEX
Xy	YONKERS GRANITIC GNEISS

County of Westchester, N.Y.
Bedrock Geology and Fracture Systems
By Geraghty & Miller, Inc.
August 1977



GEOLOGIC CROSS SECTION ALONG THE DELAWARE AQUEDUCT FROM PUTNAM COUNTY TO KENSICO RESERVOIR
(SOURCE: FLUHR, 1941)

SSW



From USGS Map
Glenville, Conn-N.Y.
Quadrangle
N4100 – W7337.5/7.5 1960
Photorevised 1971

Appendix B

XPERT DESIGN AND DIAGNOSTICS, LLC (XDD)

STANDARD QA/QC OPERATING PROCEDURES (SOP)

PROCEDURES FOR OBTAINING GROUNDWATER SAMPLES FROM MONITORING WELLS USING LOW FLOW SAMPLING TECHNIQUES

XDD SOP NO.: GWSAMP

REVISION DATE: 1/6/99

This procedure was written to document the procedure for obtaining groundwater samples under low flow / low stress conditions with a non-dedicated bladder pump system.

Sampling Equipment

The following is a list of standard equipment which would be necessary for groundwater monitoring.

1. Documentation

- Field folders (maps, sampling and site health and safety plan)
- Logbook
- Pen and permanent marker
- Field data sheets
- Sample labels
- Parameter request forms
- Chain-of-custody forms

2. Personal Equipment

- Disposable or rubber gloves
- Equipment required by Site Safety Plan
- Ruler or small tape measure
- Hand sprayers
- Paper towels
- Plastic garbage bags
- Bucket
- pH paper
- Scissors

3. Sampling Equipment

- Water level measurement devices
- Groundwater pumps with tubing and power source
- Sample containers for field parameters
- pH meter with probe and calibration solutions
- Turbidity Meter
- Specific conductivity meter, thermometer, and calibration solution
- Filter apparatus
- Coolers with ice packs or ice

4. Decontamination Equipment

- Non-phosphate detergent
- Nitric acid solution
- Methanol solution
- Deionized water
- Tap water

5. Site-Specific Equipment

- Keys to site facility
- Keys to well locks
- Sample containers for lab parameters
- Sample preservatives

Procedure Check-List for Groundwater Sampling

1. The well will be unlocked.

2. Any air monitoring required by the Site Safety Plan will be conducted.

3. The static water level will be measured and recorded.

4. A monitoring well condition check-list will be completed on a field data sheet.

5. Water level measuring equipment will be decontaminated.

6. A piece of plastic tarpaulin will be placed on the ground around the well and purging equipment will be set up.

7. Well purging will be conducted.

8. Equipment required to collect samples will be assembled on the plastic covering.

9. Samples will be collected in a sequence specified in the "Parameter Sampling Order."

10. Field parameter monitoring will be conducted as required by the sampling plan.

11. Sample collection information will be recorded on the field data sheet.

12. Samples will be filtered if necessary.

13. Samples will be preserved as necessary with laboratory-provided reagents, and coolers will be filled with ice or ice packs to maintain sample temperature at 4 C.

14. The well will be closed and locked.

15. Purging and sampling equipment will be decontaminated if necessary.

Water Level Measurement

Measurement of the depth to water will be made at all sampling locations prior to any purging. The determination of the depth to water will be made using an electric water level indicator with an accuracy of 0.01 ft, which is marked in 0.01 ft divisions.

All measurements will be made relative to an established reference point on the well. This point will be established in relation to a National Geodetic Vertical Datum (NGVD). This measurement will be taken from the top of the protective steel casing (TPS). This measuring point will be specified and brought into the field for reference during each event.

Regardless of the type of measuring device used, it will be thoroughly decontaminated between wells. Paper towels, saturated with a methanol solution, will be used to wipe off the device as it is retrieved from the well. The device will then be rinsed with D.I. water and stored in a clean area such as a sealed plastic bag until it is used again.

All water level measurements will be completed in one sampling day per sampling event.

Purging and Sampling

If the pump is previously installed in the monitoring well, the tubing and pump bladder itself must first be purged of standing water. The determination of this purge volume is as follows:

tubing radius =r= .0104'
volume of tubing = r^2 x length of tubing = V in ft^3
ft^3 x 28.316 = liters
volume of pump bladder = 0.5678 liters (manufacturers specifications)
volume of tubing + volume of pump bladder = total volume of stagnant water to be purged

Following the evacuation of all water in the pump and tubing, sampling will proceed and indicator parameter measurement of temperature, pH, turbidity, specific conductance (SC), dissolved oxygen and redox potential will be conducted every three to five minutes (EPA methods 170.1, 150.1, 120.1 and 180.1 respectively). The pumping rate and water levels will also be monitored and recorded during indicator parameter measurements. Sampling will be conducted at a low flow rate where stabilization of field parameters can be effectively demonstrated. Flow rates will be dependent upon well construction and aquifer conditions. Anticipated flow rates will range from 200 ml/minute to 1 liter/minute but will probably not exceed 500 ml/minute. If measurable drawdown is occurring, then flow rates will be reduced to where there is minimal and stable drawdown. Measurements will continue until three consecutive measurements of dissolved oxygen, pH and SC are within $\pm 10\%$ of each other. A turbidity level of 5 NTU or less is desirable, but not mandatory. No well will ever be pumped dry.

Sampling will begin once the indicator parameters stabilize. Samples will be collected in order of decreasing volatility. An example of the sampling order for some common parameters is as follows:

1. Volatile organics (VOA)
2. Purgeable organic carbon (POC)
3. Purgeable organic halogens (POX)
4. Total organic halogens (TOX)
5. Total organic carbon (TOC)
6. Semi-volatile organics (SVOA)
7. Total metals
8. Dissolved metals
9. Phenols
10. Cyanide
11. Sulfate and chloride
12. Turbidity
13. Nitrate and ammonia
14. Radionuclides

During the collection of samples for volatile and semi-volatile organics analysis, the stream of water from the bladder pump discharge tube will be directed toward the inside wall of the sample container, to minimize the aeration that occurs due to turbulence in the sample container. Once a VOA vial has been sealed, it will be inverted and gently tapped against the wrist of the sample collector. If any bubbles are observed, the vial will be reopened and the sample discarded. A new sample will then be collected. This process will be repeated until a sample with no air bubbles is obtained.

The operating principal of the bladder pump system is as follows:

The bladder pump system contains the following components; A propane-powered air compressor, a battery-powered pump controller, a manifold block well head assembly, air and discharge lines (composition) and bladder pumps with screen intake extensions. The propane-powered compressor is utilized to avoid contamination from constituents of gasoline. The controller regulates total flow of compressed air to the pump assemblies located in each well. The manifold system is a connecting block, in-line from the controller to the pump assembly. The manifold system will allow one, two, or three wells to be pumped simultaneously. Should only one well be pumped at a

time, the other two connections are capped with pressure-tight end caps. Individual pressure regulators are placed in line after the manifold to adjust the flow of each well. The bladder pump cycle operates with two different phases. During the fill phase of the cycle the space between the outside of the teflon bladder and the inside diameter of the stainless steel pump is relaxed. Where water pressure at the pump intake exceeds the air pressure in this space, water fills the bladder. During the pump phase of the cycle the space between the teflon bladder and the pump body is pressurized by the air compressor causing the bladder to collapse, the intake valves close, and the water is forced out through an upper check valve into the sample line. The pressure induced by the air compressor is then vented to the atmosphere (above the well head) and the fill cycle begins again.

The tubing bundle connected to the pump has three components: an air line with fittings to the pump and the controller, a sample line, and a support cable.