Huntingdon
Consulting Engineers & Environmental Scientists

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RECOVERY WELL INSTALLATION
ADJACENT TO THE POL FACILITY
WATERVLIET ARSENAL
WATERVLIET, NEW YORK

PREPARED FOR:
WATERVLIET ARSENAL
WATERVLIET, NEW YORK

PREPARED BY:
EMPIRE SOILS INVESTIGATIONS, INC.
BALLSTON SPA, NEW YORK
ESI FILE NO.: ATA-92-206
AUGUST 1993

QUALITY ASSURANCE OFFICIAL
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EMPIRE SOILS INVESTIGATIONS, INC.

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BRYAN MASTIN
HUNTINGDON ANALYTICAL SERVICES

Bryan Mastin (BL)

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RECOVERY WELL INSTALLATION
ADJACENT TO THE POL FACILITY
WATERVLIET ARSENAL
WATERVLIET, NEW YORK
WVA CONTRACT NO. DAAA22-93-C-0012

1.0 INTRODUCTION

Empire Soils Investigations, Inc. (Empire Soils) was contracted by the Watervliet Arsenal to install a recovery well and water table depression pump within the area located immediately east of the POL Facility at the Watervliet Arsenal, Watervliet, New York. Work performed by Empire Soils on this project was completed under the auspices of WVA Contract No. DAAA22-93-C-0012, Modification P00003. The following report is a compilation of the procedures and findings of the work completed.

2.0 SCOPE OF WORK

The work performed by Empire Soils as requested by the Watervliet Arsenal involved the installation of a recovery well and water table depression pump system to hydraulically control the migration of non aqueous phase liquid (NAPL) petroleum product on the water table beneath the site. The necessity of the recovery well and the water table depression system were prompted by the discovery of a crack within an underground diesel fuel supply line located immediately east of the southeast gate of the POL Facility on May 13, 1993.

Under the scope of services, the following limited tasks were to be performed:

- Drill and install a recovery well to a depth of approximately 10 to 15 feet below the surface of the water table. The well was to be constructed of Schedule 40 PVC well casing and screen with a 4-inch inside diameter. The drilling and well installation were to be completed under the supervision of a hydrogeologist from Empire Soils.
- Install a 4-inch diameter ½ hp (230 volt) 10 gpm submersible pump for extraction of groundwater within the well. Additionally, a liquid level controller (high-low) was to be installed within the well for regulating the water level within the well.
- Install a gate valve, flowmeter, and sampling port within the pump discharge line.

3.0 METHODOLOGY

3.1 Recovery Well Installation

On June 17, 1993 Empire Soils' personnel and equipment were on site to perform the drilling and installation of a recovery well within the area immediately east of the POL Facility (Building 116). The location of the recovery well (RW-2) is depicted on the "Site Plan" (Drawing No. 2) presented in Appendix A. Additionally, monitoring wells SP-15 and SP-16, which were installed during the Chromic Acid Waste Line Hydrogeologic Investigation completed in May and June 1993, are depicted on the "Site Plan" between Buildings 115 and 114.

The drilling of the recovery well was completed via air-rotary drilling techniques utilizing a truck-mounted Driltech drill rig due to the presence of shallow competent bedrock. The borehole was

advanced "open hole" (without casing) from ground surface to the termination depth of 27 feet utilizing a nominal 8-inch percussion bit. Upon reaching the termination depth of the borehole, the recovery well was installed within the "open hole" and constructed of 4-inch inside diameter Schedule 40 PVC well screen and riser pipe. A filter pack consisting of #0 Morie silica filter sand was placed from the bottom of the borehole to approximately 2.5 feet above the top of the screened section. A bentonite pellet seal hydrated with potable water, was placed immediately above the sand pack. The remaining annular space was filled with drill cuttings. A protective curb box was installed over the well, flush with existing grades. Refer to Monitoring Well Diagram presented in Appendix B for details of the well construction.

3.2 Decontamination

All drilling equipment (ie. drill rig, drill bit and rods) were decontaminated prior to commencing the drilling and upon exiting the site. Decontamination included the cleaning of the equipment with a high pressure - high temperature portable steam cleaner, utilizing potable water from the Watervliet Arsenal Wastewater Treatment Plant (Building 36). Decontamination operations were performed within the tanker trailer sumps located along the east side of the Wastewater Treatment plant. The decontamination wash water was disposed of within the acid waste manhole located between the WVA Wastewater Treatment Plant and the sludge drying beds.

3.3 Water Table Depression System

On June 21, 1993, Empire Soils personnel installed a ½ hp 230 volt submersible pump (Morris Model No. 10S05-9) rated for a flow rate of 10 gpm and a BW Liquid Level Controller (High-Low) to regulate the water level within the well. The submersible pump was installed at the bottom of the well (27.0 feet depth) with the pump intake at a depth of approximately 25.5 feet below ground surface. The BW high water level probe was installed at a depth of 20.5 feet and the low water level probe at a depth of 22.0 feet below ground surface. The submersible pump and liquid level controller were connected by Empire Soils to a temporary electric service provided by the Watervliet Arsenal adjacent to the recovery well. The discharge line from the pump was run across the ground to a storm drain located within the POL Facility. The effluent from the pump into the storm drain discharged to an oil/water separator within the POL Facility prior to entering the Watervliet Arsenal's storm water network. Additionally, a gate valve, flowmeter, and a sampling spigot were installed in-line on the pump discharge line by Empire Soils adjacent to the well head.

4.0 FINDINGS OF INVESTIGATION

4.1 Subsurface Conditions

The area investigated by the test boring encountered granular fill material from ground surface to approximately the three (3) foot depth. This granular fill material consisted of graded sands

and gravels with lesser amounts of silt. The granular fill material at this location was underlain by shale bedrock.

Inspection of outcrops of shale bedrock within the vicinity of the recovery well location by a hydrogeologist from our staff revealed that the shale was severely fractured. Measurements of the bedrock structure (bedding and jointing) exhibited a northerly trend (strike due north to north 10 degrees east) and dip to the east at angles varying from 70 to 85 degrees.

According to the New York State Geological Survey publication entitled, "Generalized Bedrock Geology of Albany County, New York" (New York State Museum/Geological Survey County Map Series No. 1; R.H. Fickies 1982) the project site is mapped as being underlain by Snake Hill Shale. The Snake Hill Shale consists of a medium to dark-gray, silty micaceous, pyritic shale with occasional thin interbeds of siltstone, fine grained calcareous mudstone and fine grained sandstone that are intensely folded and well cleaved.

4.2 Groundwater Conditions

Water level data collected from the recovery well indicates that the groundwater exists within the fractured shale bedrock at this location. The aquifer investigated within the area under study is an unconfined or water table aquifer, within which the groundwater flow direction generally conforms with that of the topography. Flow within the bedrock is primarily controlled by its joint and fracture lineations. Recharge to the aquifer is

primarily through infiltration of precipitation in unpaved portions of the Watervliet Arsenal and adjacent areas.

Water level readings within the recovery well were collected on June 18 and 30, 1993 utilizing an electric interface tape. On each of these dates measurable thicknesses of free-phase petroleum were observed floating on the groundwater. It is noted that the liquid level readings collected on June 30, 1993 were obtained while the water table depression system was operating within the recovery well. The following is a tabulation of the water and free-phase product level readings and the thickness of product.

Date	Depth to Product (ft.)	Depth to Water (ft.)	Product Thickness (ft.)
6/18	10.19'	10.24'	0.05'
6/30	12.65'	21.00'	8.35'

Note: Measuring point is top of PVC well casing. The liquid level readings collected on 6/30/93 while the water table depression system was operating.

Based upon data collected during the Chromic Acid Waste Line Hydrogeologic Investigation completed by Empire Soils dated August 1993 and other previous studies completed by Empire Soils, overall flow of groundwater is from northwest to southeast beneath the project area, with the aquifer discharging to the Hudson River. Based upon field permeability testing performed at monitoring wells SP-15 and SP-16 and the approximate water table gradients between wells SP-15 and SP-16 completed during the Chromic Acid Waste Line

Hydrogeologic Investigation, the groundwater flow velocities within the aquifer were estimated to be on the order 12 to 14 feet/year.

4.3 Analytical Results and Product Recovery Operations

Upon encountering free-phase petroleum floating on the surface of the groundwater within the recovery well (RW-2) on June 18, 1993, Empire Soils was hired by the Watervliet Arsenal, under a separate contract (WVA Purchase Order No. DAAA22-93-M-1932), to initiate recovery of the free-phase petroleum and to collect a sample of the petroleum product for identification. Empire Soils installed a passive skimmer unit (2" Petro Trap by Enviro Products) within the recovery well on June 22, 1993 to collect the free-phase petroleum. The skimmer unit was installed such that the intake was within the interval between the high and low liquid level probes (20.5 to 22.0 foot depth) in the recovery well. The reservoir for the skimmer unit has a capacity of 0.7 liters and was periodically drained of petroleum by WVA personnel into 55 gallon drums. As the frequency of draining the skimmer unit was relatively short (approximately 30 minutes), Empire Soils recommended that an active product recovery unit (a dual pump system consisting of a water table depression pump and a product pump both controlled by the same control panel) be utilized for recovery of the petroleum product from within the well. West Central Environmental, Inc. (WCE) of Watervliet, New York was contracted by the Watervliet Arsenal to install a dual pump system, and installed such a system (Clean Earth Technologies, Inc. Spillbuster Sr. model) within the

recovery well (RW-2) on July 7, 1993. Prior to installing the dual pump system WCE removed all components of the existing system within the recovery well. The effluent from the product pump of the dual pump system discharged directly into a 550 gallon capacity storage tank adjacent to the wellhead, and the effluent from the water table depression pump was processed through a GAC (Granular Activated Carbon) unit prior to discharging to the storm drain within the POL Facility. As of August 13, 1993, a total of approximately 30 gallons had been recovered; approximately 15 gallons was recovered by the passive skimmer system and 15 gallons by the dual pump system.

On June 30, 1993 Empire Soils collected a sample of the recovered petroleum product and forwarded it to Huntingdon Analytical Services in Middleport, New York for laboratory analysis by NYSDOH Method 310-13 (Petroleum Identification Scan). The results of the laboratory analysis indicated that the petroleum product was No. 2 Fuel Oil. A copy of the analytical report is presented in Appendix C.

5.0 Summary of Findings

Based upon the data collected by Empire Soils during this study and previous studies within the project area the following findings are presented:

- The aquifer beneath the site consists of an unconfined consolidated (bedrock) aquifer. The aquifer exists under water table conditions within the fractured shale bedrock.

- Groundwater flow is from northwest to southeast beneath the site. Groundwater flow velocities within the project area were calculated to be on the order of approximately 12 to 14 feet/year.

- Measurable free-phase petroleum product has been observed within the recovery well. The petroleum product was identified as No. 2 Fuel Oil.

- A water table depression pump was installed on June 21, 1993 within the recovery well to hydraulically control the migration of the free-phase petroleum plume beneath the site.

- Initially a passive skimmer system was installed on June 22, 1993 within the recovery well to recover the petroleum product and was replaced with a dual pump system on July 7, 1993. As of August 13, 1993 the dual pump system is still in operation and a total of approximately 30 gallons has been recovered.

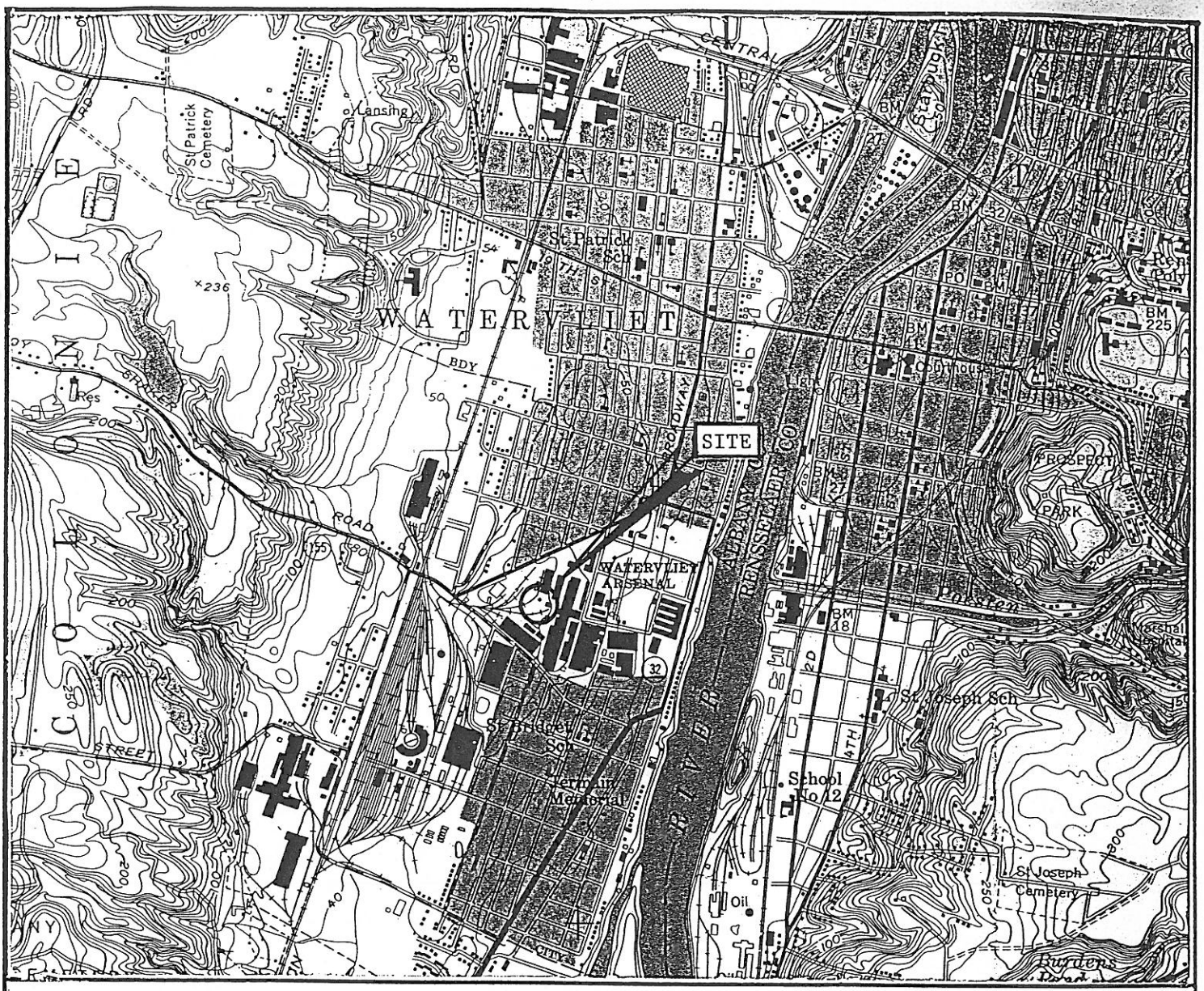
6.0 CLOSURE

This report presents the findings of the recovery well installation performed in the area of the POL Facility (Building 116) at the Watervliet Arsenal, Watervliet, New York. The services provided by Empire Soils Investigations, Inc., to the Watervliet Arsenal were completed in accordance with Watervliet Arsenal's Contract No. DAAA-22-93-C-0012 Modification P00003.

The information presented herein is based upon the investigations completed to date by Empire Soils Investigations, Inc. The opinion of the environmental conditions existing within the project site represents the condition believed to exist at the time of our investigation. No other warranties, expressed or implied are made.

APPENDIX A

DRAWINGS



N

SCALE 1:24 000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET

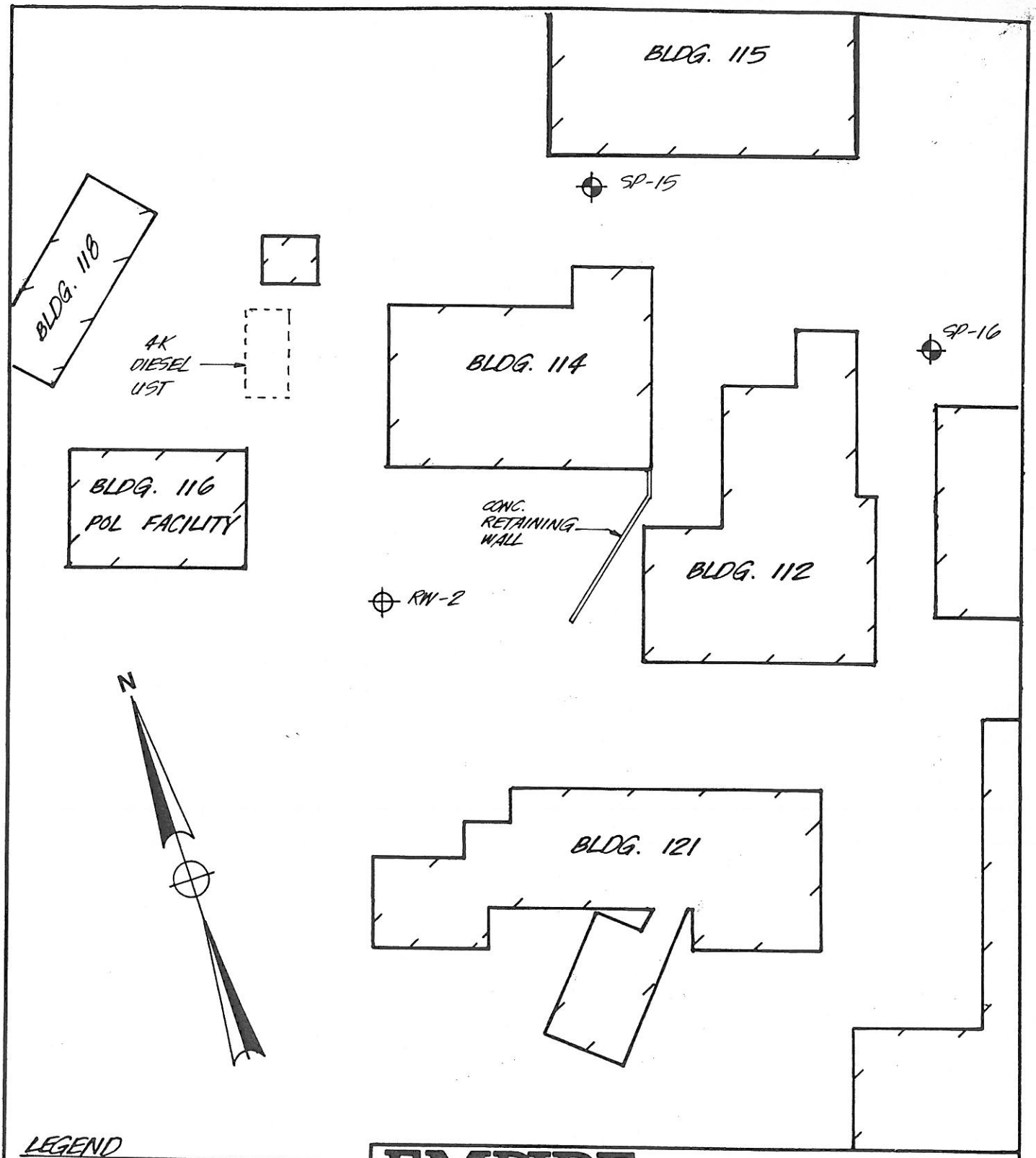
DATUM IS MEAN SEA LEVEL

EMPIRE SOILS INVESTIGATIONS INC.

SITE LOCATION MAP

RECOVERY WELL INSTALLATION
POL FACILITY
WATERVLIET ARSENAL
WATERVLIET , NEW YORK

DR. BY:	SCALE: AS SHOWN	PROJ. NO.: ATA-92-206
REV'D. BY:	DATE: 8/93	DRWG. NO.: 1



LEGEND

RW-2 — 4" RECOVERY WELL INSTALLED BY EMPIRE SOILS ON 6/17/93

SP-15 — 4" STAINLESS STEEL MONITORING WELL INSTALLED BY EMPIRE SOILS ON 6/16/93

EMPIRE SOILS INVESTIGATIONS INC

SITE PLAN

RECOVERY WELL INSTALLATION
ADJACENT TO POL FACILITY
WATERVLIET ARSENAL
WATERVLIET, NEW YORK

DR.BY: JV	SCALE: 1" = 50'	PROJ. NO. ATA-92-206	
CK'D.BY:	DATE: 8/93	DRWG NO. 2	

SENECA BLUEPRINT CO. INC

APPENDIX B

SUBSURFACE LOGS & WELL DIAGRAM

DATE

STARTED 6-17-93

FINISHED 6-17-93

SHEET 1 OF 1

EMPIRE
SOILS INVESTIGATIONS

SUBSURFACE LOG

HOLE NO. RW-2

SURF. ELEV 70.83'

G.W. DEPTH See Note #1

PROJECT Recovery Well Installation
Bldg. 114 (POL Facility)

LOCATION Watervliet Arsenal
Watervliet, New York

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	PID (ppm)	SOIL OR ROCK CLASSIFICATION	NOTES
							Brown fine to coarse SAND, little gravel, trace silt (Moist)	Note #1: Groundwater @ 11.4' below ground surface approx. 1.5 hours after completing drilling operations and before installing well. Visible product on well probe. Note #2: Installed 4" PVC well at a depth of 27.0'. For details of well construction see the attached well diagram.
							+\- 3.0'	
							Gray Shale	
5								
10								
15								
20							– cuttings become damp @ +\- 20.0'	
25								
							Boring Terminated @ 27.0'	
30								
35								
40								

N = NO. BLOWS TO DRIVE ____ SPOON ____" WITH A ____ LB. PIN WT. FALLING ____" PER BLOW

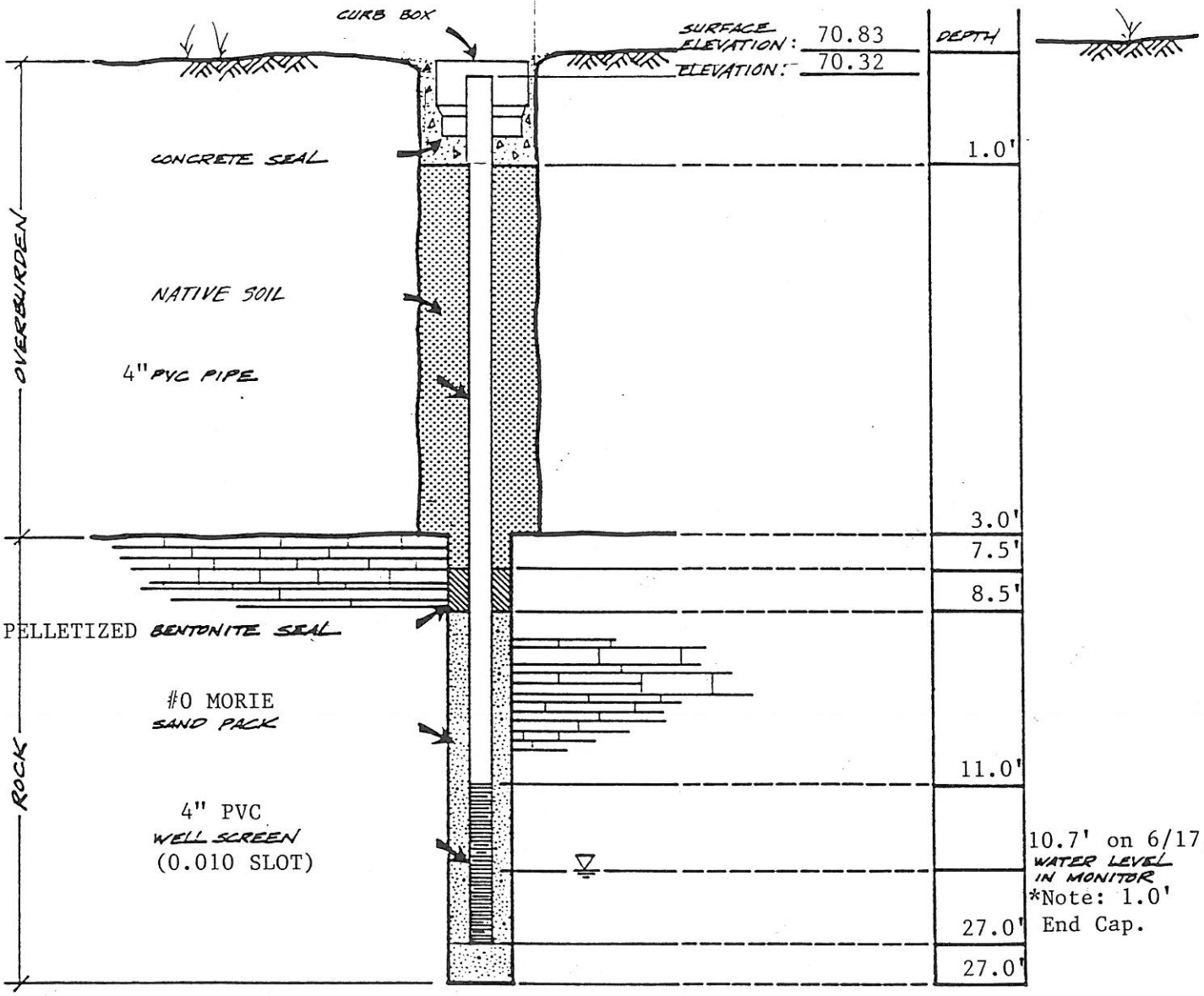
CLASSIFICATION: Visual by Geologist

DRILLER: Craig Connell

DRILL RIG TYPE : Drill Tech

METHOD OF INVESTIGATION Air-Rotary 8" Percussion Bit

DATUM: MSL



WELL No.

RW-2

EMPIRE SOILS INVESTIGATIONS INC

SUBSURFACE INVESTIGATION PLAN

MONITORING WELL DETAILS

RECOVERY WELL INSTALLATION
POL FACILITY, WATERVLIET ARSENAL
WATERVLIET, NEW YORK

DR. BY	SCALE: N.T.S.	PROJ. NO. ATA-92-206
CK'D BY	DATE: 7/93	DRWG NO.

APPENDIX C

ANALYTICAL REPORT FOR PETROLEUM PRODUCT

Huntingdon

Consulting Engineers Environmental Scientists

Empire Soils Investigations, Inc., Division
5 Knabner Road
Box 2199
Ballston Spa, New York 12020
(518)899-7491
Fax: (518)899-7496

TRANSMITTAL

Date: 8/30/93

NAME: Watervliet Arsenal

ADDRESS: Environmental Quality Division - Bldg. 120
Watervliet, New York 12189-4050

ATTENTION OF: Mr. James Sherman

RE: POL Facility Rec. Well and Prop. Gas Transmission Line

JOB NO.: ATA-92-206

WE ARE SENDING YOU:

	( ) Herewith	( ) Under Separate Cover
(X) Report	( ) Subsurface Logs	( ) Brochures
( ) Drawings	( ) Samples	( )

No. Copies	Title or Description
10	Recovery Well Installation @ POL Facility
5	Soil Characterization Study - Gas Transmission Line

THESE ARE: (X) FOR YOUR INFORMATION (X) PER YOUR REQUEST ( ) OTHER

REMARKS:

If there are any questions, don't hesitate to call.

SENT BY:

(X) FIRST CLASS MAIL
( ) FEDERAL EXPRESS
( ) MESSENGER
( ) CERTIFIED MAIL # _____
( ) _____

VERY TRULY YOURS,
EMPIRE SOILS INVESTIGATIONS, INC.

James Vincent

ENVIRONMENTAL ANALYTICAL REPORT

REPORT NUMBER: 93-0959

PREPARED FOR:

EMPIRE SOILS INVESTIGATIONS, INC.
P.O. BOX 2199
BALLSTON SPA, NEW YORK 12020

RE: ATA-92-206; WATERVLIET ARSENAL

PREPARED BY:

HUNTINGDON ANALYTICAL SERVICES
DIVISION OF EMPIRE SOILS INVESTIGATIONS, INC.
P.O. BOX 250
MIDDLEPORT, NEW YORK 14105
TELEPHONE: 716/735-3400; FAX: 716/735-3653

JULY 22, 1993

Huntingdon
Analytical Laboratory
Analytical Services Division

HUNTINGDON ANALYTICAL SERVICES
ELAP #10833
ENVIRONMENTAL REPORT

REPORT NUMBER: 93-0959

STATEMENT OF WORK PERFORMED

I HEREBY DECLARE THAT THE WORK WAS PERFORMED UNDER MY SUPERVISION ACCORDING TO THE PROCEDURES OUTLINED BY THE FOLLOWING REFERENCES AND THAT THIS REPORT PROVIDES A CORRECT AND FAITHFUL RECORD OF THE RESULTS OBTAINED.

- 40 CFR PART 136, "GUIDELINES ESTABLISHING TEST PROCEDURES FOR THE ANALYSIS OF POLLUTANTS UNDER THE CLEAN WATER ACT", OCTOBER 26, 1984 (FEDERAL REGISTER) U. S. ENVIRONMENTAL PROTECTION AGENCY.

- U.S. ENVIRONMENTAL PROTECTION AGENCY, "TEST METHODS OF EVALUATING SOLID WASTE - PHYSICAL/CHEMICAL METHODS", OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE, SW-846, 2ND EDITION AND 3RD EDITION.

THIS REPORT CONTAINS ANALYTICAL DATA BASED ON OUR EXAMINATION OF THE SAMPLE(S) PRESENTED TO US. THIS REPORT CONTAINS (EXCEPT WHERE EXPLICITLY STATED) A COMPLETE ACCOUNT OF THE ANALYSES REQUESTED TO BE PERFORMED ON THE SAMPLE(S). INFORMATION WHICH WAS NOT REQUESTED TO BE REPORTED IS NOT INCLUDED.

ANDREW P. CLIFTON JULY 22, 1993
ENVIRONMENTAL LABORATORY DIRECTOR

REPORT CODE LEGEND:

<DL	= LESS THAN DETECTION LIMIT
ND	= NOT DETECTED
NA	= NOT APPLICABLE
INP	= INFORMATION NOT PROVIDED
MB	= METHOD BLANK

Huntingdon Analytical Laboratory
Analytical Services Division

HUNTINGDON ANALYTICAL SERVICES

METHOD MODIFIED DOH 310-13
PETROLEUM PRODUCTS

SAMPLE IDENTIFICATION	001	METHOD BLANK	
HAS SAMPLE #930959	01	--	
ANALYTE	RESULT ug/g	RESULT ug/g	MDL ug/g
GASOLINE ----------	ND	ND	ND
KEROSENE ----------	<200,000	<10,000	<10,000
FUEL OILS ----------	990,000*	<10,000	<10,000
LUBE OIL ----------	ND	ND	ND
DATE EXTRACTED:	7-13-93	7-13-93	
DATE ANALYZED:	7-15-93	7-15-93	

ND = NONE DETECTED

*Quantitated as #2 fuel oil.

EMPIRE SOILS INVESTIGATIONS, INC.

HUNTINGDON ANALYTICAL SERVICES

CHAIN OF CUSTODY RECORD AND ANALYTICAL REQUEST FORM

Page of

EMPIRE SOILS INVESTIGATIONS
PO BOX 2199
BALLSTON SPA, NEW YORK 12020

Client Name:
Address:
Contact: Kirk Moline
Phone: (518) 899-7491

Project No.: ATA-92-206
Project Site/Name: POL FACILITY Watervliet Arsenal
Sampler's Signature:

HAS Quote #
P.O. #
HAS Ref. No.: 93-0959

Sample I.D.	Date	Time	Comp or Grab	Sample Location	HAS Seq. #	Matrix	No. of Cont.	Container Size & Type: 500ml Amber						Analysis Requested/Remar
001	6/30/93	3 15 PM	GRAB	RW-2	01	PRODUCT	1	X						PETROLEUM Identification Scan

Relinquished by:	Date/Time:	Received by:	Relinquished by:	Date/Time:	Received by:
	6/30/93 6 45 PM				
Relinquished by:	Date/Time:	Received by:	Relinquished by:	Date/Time:	Received by:
Relinquished by:	Date/Time:	Received for Lab by:	Date/Time:	Remarks: Normal TAT (2-3 week WE THINK ITS No 2 FUEL OIL	