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Administrative Record
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OPERABLE UNIT #2 (OFFSITE) CONTINUING INVESTIGATION
OPERABLE UNIT #1 (ONSITE) REMEDIAL DESIGN

PROJECT WORK PLANS

WORK ASSIGNMENT D003825-19

SCOBELL CHEMICAL SITE
TOWN OF BRIGHTON (T)

SITE NO. 8-28-076
MONROE (C), NY

Prepared for:
NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
50 Wolf Road, Albany, New York

John P. Cahill, Commissioner

DIVISION OF ENVIRONMENTAL REMEDIATION

URS Greiner Woodward Clyde, Inc.
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Final
October 1999

G3038A

FINAL

WORK PLAN, QUALITY ASSURANCE PROJECT PLAN, AND FIELD SAMPLING PLAN
FOR
OPERABLE UNIT #2 (OFFSITE) CONTINUING INVESTIGATION AND OPERABLE UNIT #1 (ONSITE) REMEDIAL DESIGN

SCOBELL CHEMICAL SITE
TOWN OF BRIGHTON, NEW YORK

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF ENVIRONMENTAL REMEDIATION
WORK ASSIGNMENT D003825-19

PREPARED BY

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PART C FIELD SAMPLING PLAN C-1

ACRONYMS

ASP	Analytical Services Protocol
ASTM	American Society for Testing and Materials
CLP	Contract Laboratory Program
cm	centimeter
DCE	dichloroethene
DNAPL	dense nonaqueous-phase liquid
DQO	data quality objective
DUSR	Data Usability Summary Report
ELAP	Environmental Laboratory Approval Program
FSP	Field Sampling Plan
G	gravelly
GPS	global positioning system
HASP	Health and Safety Plan
HDPE	high density polyethylene
HSA	hollow stem auger
ID	inside diameter
IRM	Interim Remedial Measure
k	kilogram
L	liter
LCS	lower control limit
MB	method blank
MD	matrix duplicate
mg	milligram
MS	matrix spike
MSB	matrix spike blank
MSD	matrix spike duplicate
NAPL	nonaqueous-phase liquid
NIST	National Institute of Standards and Technology
NTU	nephelometric turbidity unit

ACROYNMS (Continued)

NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PID	photoionization detector
ppb	part per billion
ppm	part per million
psi	pound per square inch
QA	quality assurance
QAPjP	Quality Assurance Project Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RG&E	Rochester Gas and Electric
RI	remedial investigation
RPD	relative percent difference
RQD	rock quality designation
S	sandy
SCG	Standards, Criteria, and Guidance value
sec	second
SVOC	semivolatile organic compound
TAGM	Technical and Administrative Guidance Memorandum
TAL	target analyte list
TCA	trichloroethane
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
UFPO	Underground Facilities Protective Organization
URSGWC	URS Greiner Woodward Clyde

ACRONYMS (Continued)

USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

PART A

WORK PLAN

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INTRODUCTION

The main objectives of this work assignment are:

> To determine the extent of both the aqueous and the nonaqueous contamination present offsite as the result of migration from the onsite area through an additional offsite investigation. This work will include the installation of nine additional monitoring wells.
>
> To conduct a three-dimensional acoustic imaging survey off site as a part of the continuing investigation for Operable Unit #2, and onsite as a part of the predesign work for Operable Unit #1. The application of three-dimensional acoustic imaging technology at this site could provide valuable information for the design and placement of dense nonaqueous-phase liquid (DNAPL) recovery wells.
>
> To conduct a site survey and update the current site base map to include the sample points/areas investigated as a part of this work assignment.
>
> To prepare detailed plans and specifications for use in competitively bidding the construction of systems to implement the March 31, 1999 Record of Decision for the Operable Unit #1.

URS Greiner Woodward-Clyde (URSGWC) has prepared *Project Work Plans*, a *Health and Safety Plan* (HASP), and a *Project Management Work Plan/Budget Estimate* which will be used to complete the work for the continuing investigation and remedial design. These *Project Work Plan,* define the technical approach to the investigation, and are composed of three parts: the *Work Plan, Quality Assurance Project Plan* (QAPjP), and *Field Sampling Plan* (FSP).

Part A -	*Work Plan* - provides a brief site description and background data on the project and provides a description of individual tasks that will comprise the continuing investigation for Operable Unit #2.

Part B - *Quality Assurance Project Plan* (QAPjP) - provides the Quality Assurance/Quality Control programs which will ensure the quality of data and the ultimate defensibility of information produced during the continuing investigation for Operable Unit #2.

Part C - *Field Sampling Plan* (FSP) - provides detailed procedures and guidance for all field sampling/investigative programs.

The HASP provides site-specific guidelines and procedures to protect the health and safety of workers and nearby residents at this site. *The Project Management Work Plan/Budget Estimate* describes the major tasks and subtasks, delineates the chain of command, presents the work schedule, and estimates the budget. Both documents are bound separately, but submitted with the *Project Work Plan* for the NYSDEC's review.

In accordance with the proposed work assignment, three tasks are anticipated for the continuing investigation for Operable Unit #2. Task 1 includes conducting a background review and preparing work plans. Task 2 is the offsite investigation that involves: mobilization; monitoring well installation; monitoring well development, hydraulic conductivity testing, and groundwater sampling; site survey and mapping; sample analysis; data validation; summary report preparation; and investigation-derived waste (IDW) characterization and disposal. Task 3 includes both onsite and offsite three-dimensional acoustic imaging surveys, and reporting. The details of Tasks 1 through 3 are described in the following subsections. Task 4, the remedial design for Operable Unit #1, is described in the *Project Management Work Plan/Budget Estimate*.

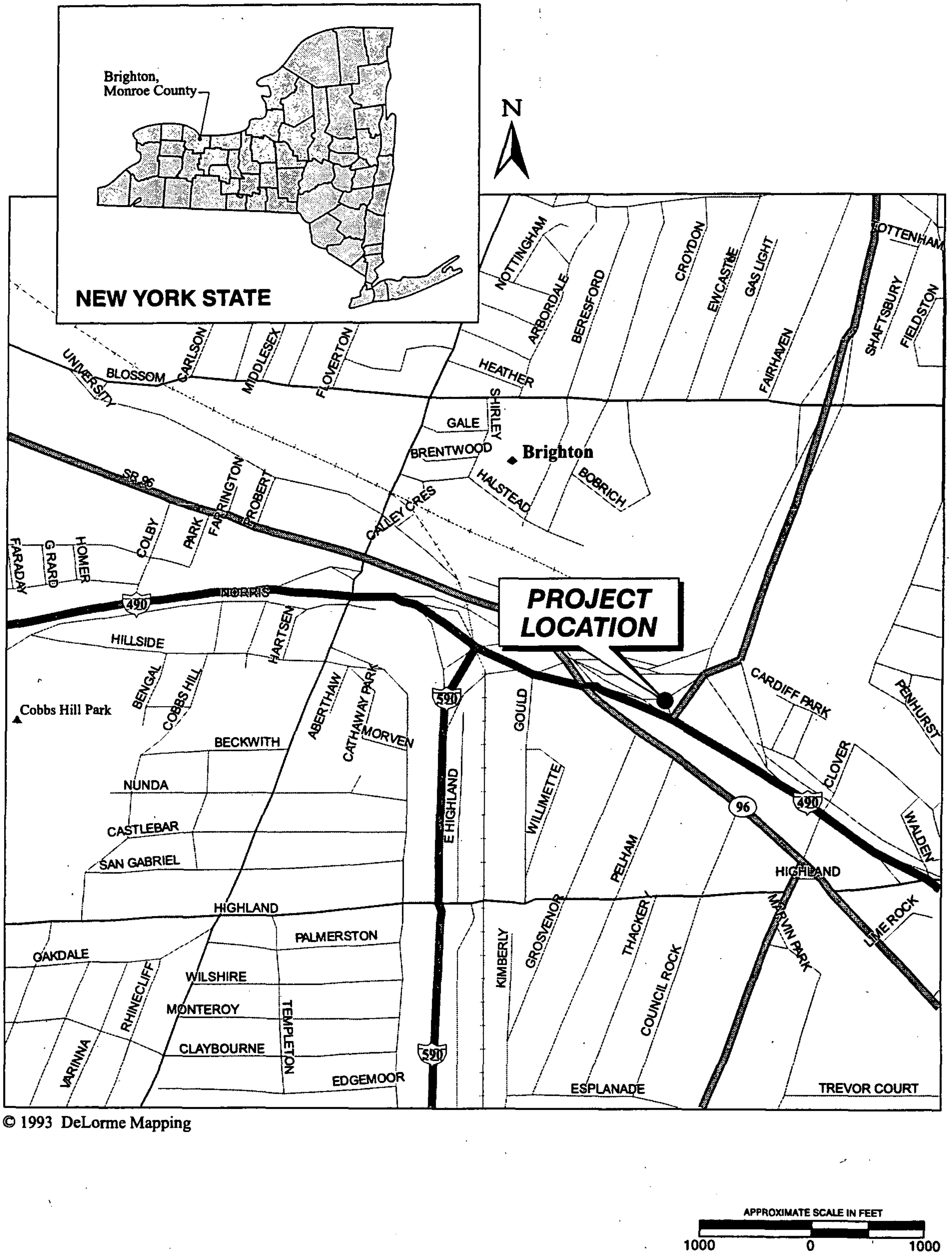
A1.0 TASK 1 - BACKGROUND REVIEW

Pertinent information made available by the NYSDEC for the site and site vicinity has been reviewed. Additional resource information will be collected and reviewed to further evaluate site conditions. Information sources available include visual observations from site visits, NYSDEC reports, aerial photographs, local water and sewer maps, climatological data, published/unpublished geology, soil, and hydrogeology reports, and reports produced by previous firms that have conducted investigations at and in the vicinity of the site. Additional background information will be reviewed as it becomes available. URSGWC and NYSDEC representatives conducted a site reconnaissance on August 18, 1999 to observe current site conditions.

Site Background

The Scobell Chemical Site is located at One Rockwood Place near the I-490/I-590 interchange in the Town of Brighton (on the boundary with the City of Rochester), Monroe County, New York (Figure A1-1). It is located in a highly urbanized area in the Town of Brighton, at the eastern boundary of the City or Rochester. Industrial and commercial properties are located directly to the west of the site. A major ConRail railroad line is directly north, and to the east and south is the I-490 and I-590 highway interchange. The site is presently owned by the NYSDOT. The Scobell Chemical Site is the location of a former chemical repackaging company that operated from the 1920s until 1986. Assorted chemicals were purchased by the company in bulk and repackaged into smaller containers for resale. The site had one main building, two smaller structures, and four aboveground storage tanks. The amount of and type of the materials handled is unclear, but significant subsurface soil contamination has been identified.

In 1986, the New York State Department of Transportation (NYSDOT) condemned the property to construct the Can of Worms highway intersection (the intersection of I-590 and I-490). In early 1988, the NYSDOT discovered extensive contamination at the Scobell site including abandoned drums, contaminated structures, and soil and bedrock contamination. Drums and containers containing halogenated volatile organic compounds (VOCs), pesticides/herbicides and



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URS Greiner Woodward Clyde	SITE LOCATION MAP	FIGURE A1-1

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toluene were found in the warehouse. The site was reported to contain deteriorated containers, discolored soils, and stained asphalt.

In 1988, the NYSDOT conducted an interim remedial measure (IRM) removal action. The IRM included decontamination and demolition of the structures; removal of containers, drums, and aboveground storage tanks; and excavation and disposal of contaminated soil and bedrock. Over half of the former footprint of the site was remediated by the IRM and is now a part of the highway interchange. For the remaining portion of the site, only the structures and aboveground tanks were removed; no soil remediation was reported other than capping the area with 9 to12 inches of clay. A fence was placed around the site. Significant subsurface soil contamination remains under the cap including toluene, trichloroethene, tetrachloroethene, 1,2-dichloroethene, chromium, and pesticides. A seep prevention system was installed along the exposed bedrock face to prevent water from running onto the highway. When the seep prevention system was temporarily shut down, no water was seeping from the bedrock face, so its use was discontinued in 1993.

In 1998 a site investigation was conducted, as documented in the February 1999 *Remedial Investigation Report* (RI), involved collecting samples of various media from both onsite and offsite areas. Two shallow bedrock wells (installed approximately 20 to 30 feet into the rock) were installed 400 to 500 feet north of the site's northern boundary. Dense nonaqueous phase liquid (DNAPL), predominantly trichloroethene, was found in one of the wells, while very high aqueous-phase concentrations were found in a groundwater sample collected from the other offsite bedrock well. The site was split into two operable units: Operable Unit #1 - the onsite area and Operable Unit #2 - the offsite area (Figure A1-2). Enough information was available for Operable Unit #1 to prepare the February 1999 *Feasibility Study Report*, as well as the March 1999 *Record of Decision* (ROD).

The conclusions of the RI indicated that additional information is needed to define the extent of the offsite contamination. The purpose of this work assignment is to collect the additional information needed to sufficiently characterize the extent of the offsite contamination present as the result of the contamination migrating from the onsite area, as well as to perform the remedial design for the onsite operable unit.

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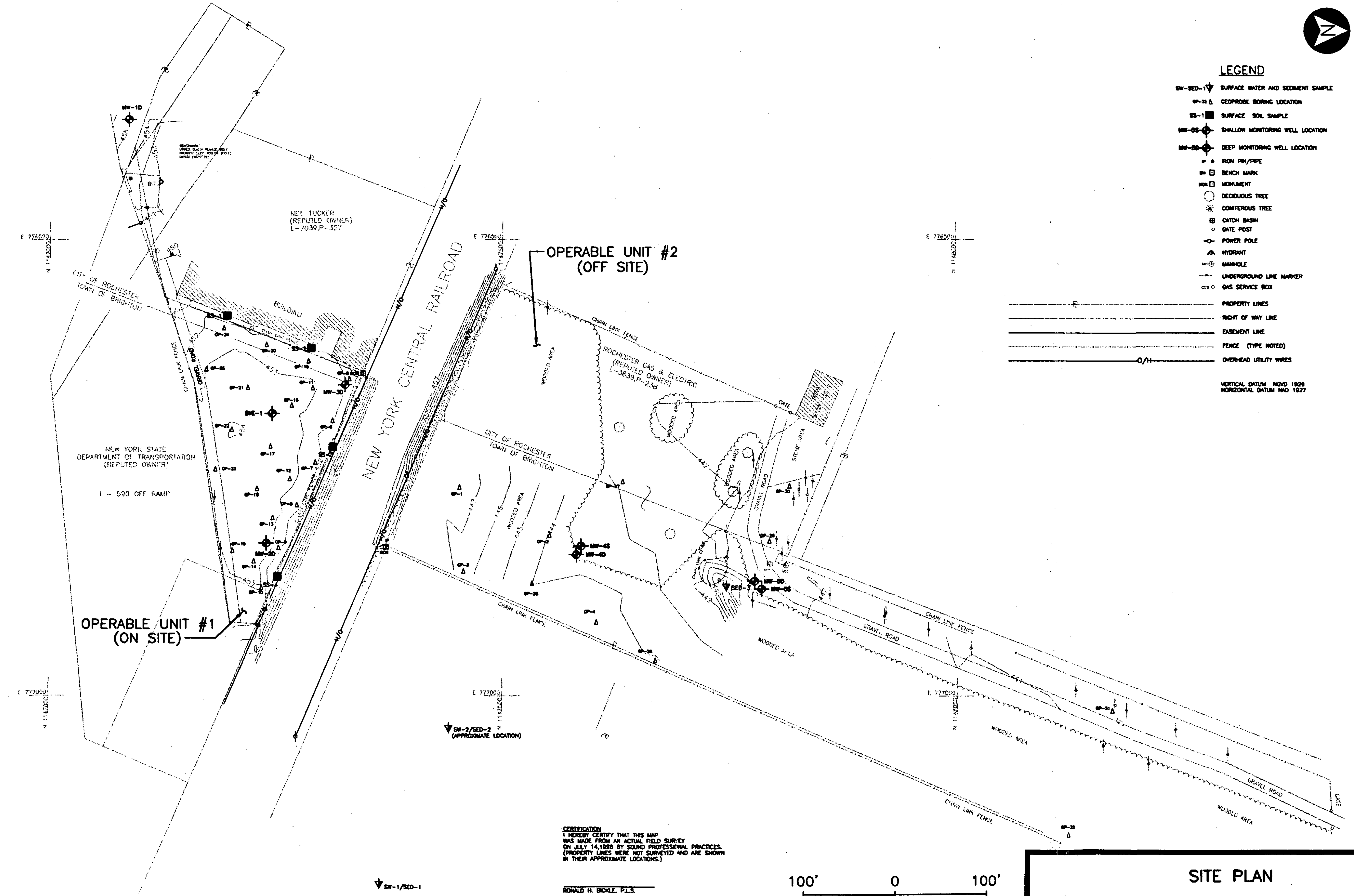

CERTIFICATION
I HEREBY CERTIFY THAT THIS MAP
WAS MADE FROM AN ACTUAL FIELD SURVEY
ON JULY 14,1998 BY SOUND PROFESSIONAL PRACTICES.
(PROPERTY LINES WERE NOT SURVEYED AND ARE SHOWN
IN THEIR APPROXIMATE LOCATIONS.)

RONALD H. BICKLE, P.L.S.

100' 0 100'

SCALE: 1"= 100'

SOURCE: PARSONS ENGINEERING SCIENCE, Inc. 9/22/98

SITE PLAN

URS Greiner Woodward Clyde

FIGURE A1-2

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A1.1 Previous Investigations

A1.1.1 Summary of the Site Investigation of Operable Unit #1

The site investigation of the onsite area included the following activities:

- An evaluation of the localized groundwater flow patterns (with the use of exploratory groundwater monitoring points) to determine groundwater flow direction from the contaminant source area.
- Characterization of the contaminant concentrations present in subsurface soils located in the northeast corner of the site (as a part of past work at the site by NYSDOT, most of the subsurface soils have been adequately characterized with the exception of this area).
- Field screening of subsurface soils to determine if light nonaqueous-phase liquid (LNAPL) and/or DNAPL was present.
- A site survey and preparation of a basemap.
- Installation of overburden and shallow bedrock groundwater monitoring wells to evaluate groundwater quality and determine the extent of any contaminant plume from this site.
- A determination of the impact on surface water/sediments.

A vapor extraction system pilot study.

The findings of the site investigation are presented in the February 1999 *Remedial Investigation Report*, as summarized below.

General

The main source of contamination at this site is most likely the result of spills that occurred due to past handling practices, over a long period of time. Volatile organic contamination is present at the site as dissolved constituents in the groundwater and apparently as free product which is more dense than water and has/is moving down into the aquifer (DNAPL). Some solvents remain in the onsite soil above the water table in the vicinity of the source area. This contamination exists as a residual that did not migrate to the base of the aquifer, but rather bound to individual soil particles as it passed through the unsaturated soil.

The site is underlain by approximately 10 feet of overburden consisting of (from the surface down): a silty clay cover (approximately 1 foot thick placed as a part of the 1988 IRM), approximately 4 to 5 feet of fill and disturbed soil consisting of cinders/brick/glass, and up to 7 feet of silt and clay with some sand. The bedrock present immediately below the overburden is a dolostone.

Groundwater at the site was encountered near the bedrock overburden interface. A thin zone of groundwater was found in the overburden and appears to flow to the south, towards the I-590 ramp. The overburden groundwater levels to the north are lower than those found onsite (following surface elevations which are approximately 5 feet lower on the north side of the railroad tracks, compared to the surface elevations on site). As a result, the possibility exists that there is some overburden groundwater which may flow from the northern edge of the site to the north. Bedrock groundwater elevations are approximately 10 feet below the surface of the bedrock onsite and at, or just below, the surface of the bedrock north of the site (MW-4D and MW-5D). Groundwater flow in the bedrock appears to flow to the northeast. Slug tests performed during the site investigation indicate average hydraulic conductivities at the overburden/bedrock interface of approximately 1.8×10^{-2} centimeters/second (cm/sec), and approximately 8.8×10^{-5} cm/sec in the shallow bedrock.

Bedrock Geology

During the 1998 site investigation field work, 11 small-diameter groundwater monitoring points (GP-1 through GP-4, and GP-26 through GP-32) were installed north of the on-site area along with two monitoring well pairs, each of which included an overburden well and a shallow bedrock well (MW-4S/-4D and MW-5S/-5D). Based on the available information, the unconsolidated material below the offsite area consists of sand and silt, with bedrock located at a depth of approximately 7 to 10 feet below ground surface.

The Oak Orchard formation directly underlies the surficial deposits at the site. The Oak Orchard is a dolostone that contains numerous vugs (hollows) lined with mineral crystals such as gypsum, calcite, dolomite, and sphalerite. It also contains fossil remains of corals and other invertebrate sea animals. These features provide the rock with a certain degree of porosity which tends to enhance groundwater flow.

The 65-foot-thick Penfield formation underlies the Oak Orchard. To the naked eye, this rock appears to be a dolostone, but laboratory inspection reveals that it contains a high percentage of sand. Near its base, the formation is actually a sandstone whose grains are cemented with dolomite. The Penfield is described by site investigators as a gray crystalline dolostone with lenses of cemented fossiliferous sand containing crinoid fragments [with] occasional stylolite development [and vugs]..." (Parsons, Site Investigation Summary Data Report, November 1998).

Based on the available information, the onsite unconsolidated soils are 4 to 9 feet deep. These soils are predominantly lacustrine silts and clays and glacial till, along with some areas of fill material. Water permeability at the overburden/bedrock interface is estimated to average approximately 1.8 x 10^{-2} cm/sec. Numerous perched water zones are found throughout the area and perched water also may be present at the site.

Extent of Soil Contamination - Onsite Area

As a part of the 1988 NYSDOT IRM, a clay cover was placed over the site. Since there was a cover over the area of previous activity at the site, there was no need to sample surface soil with the exception of the site perimeter (outside the limits of the cover). Four surface soil samples were taken from the perimeter of the site, two along the western border and two along the northern border of the site. Two pesticides (endrin and heptachlor epoxide) and certain metals (e.g., cadmium, chromium, lead, mercury, and zinc) were detected at elevated concentrations. The two samples along the western edge of the site had the highest contaminant concentrations [cadmium at 33.3 ppm compared to the Standards, Guidance, and Criteria value (SCG) of 10 parts per million (ppm); chromium at 164 ppm compared to an SCG of 50 ppm; lead at 668 ppm compared to an SCG of up to 500 ppm for the type of setting around this site; mercury at 0.94 ppm compared to an SCG of 0.1 ppm; zinc at 2,320 ppm compared to an SCG of 20 ppm)].

Subsurface soil contamination appears to be limited to onsite areas and is made up of predominantly volatile organic constituents. A total of 16 onsite subsurface soil samples were taken at eight locations during the RI to supplement the samples previously collected prior to the 1988 NYSDOT IRM. There is contamination present across the site, but the most significant concentrations are present in the central and western/northwestern sections of the site. During the RI, elevated concentrations of the following contaminants were found in onsite subsurface soil: trichloroethene (TCE) up to 200,000 parts per billion (ppb), tetrachloroethene (PCE) up to 46,000 ppb, 1,2-dichloroethene (1,2-DCE) up to 460 ppb, toluene up to 1,000,000 ppb, xylene up to 16,000 ppb, and 1,1,1-trichloroethane (1,1,1-TCA) up to 13,000 ppb.

In 1988 NYSDOT collected a number of soil samples which were analyzed mainly for VOCs. Some of these samples were analyzed for total metals (actual concentration of metals existing in the soil); some of these samples (the locations that did not necessarily correspond to the locations for total metals analysis) were analyzed for metals using the EP Toxicity analysis (a method of estimating the tendency for the soil to have metals contamination removed from the soil into the groundwater). Although the 1988 samples analyzed for total metals did not indicate high concentrations of metals, subsurface soil samples analyzed for EP Toxicity metals indicated the presence of concentrations in exceedance of regulatory levels. The samples collected during the site investigation (the locations of the samples collected during the site investigation were meant to supplement the samples taken during the 1988 NYSDOT sampling event, rather than duplicate) were analyzed for total metals and indicated some elevated concentrations. High metals concentrations were detected in subsurface soils near the central-western portion of the site. This contamination has not impacted overburden groundwater offsite or the shallow bedrock groundwater present on site.

Groundwater

Groundwater samples were taken from the overburden (soils present above the bedrock; bedrock at this site is located at a depth of approximately 10 feet) and from the shallow bedrock (bedrock wells were installed to a depth of approximately 20 feet into the rock, or approximately 30 feet below the ground surface). The highest concentrations in the overburden groundwater are present near the central-west to northwestern corner of the site (up to 300,000 ppb of toluene from SVE-1). Very high contaminant concentrations were found in the two groundwater samples taken from the shallow bedrock (MW-2D and MW-3D, located in the northeast and northwest corners of the site, respectively). DNAPL was encountered in the bottom of MW-3D when it was sampled.

The results of the groundwater samples taken from onsite monitoring points (both overburden and shallow bedrock) indicated the presence of chloroform (up to 180 ppb), ethylbenzene (up to 67 ppb), xylene (up to 320 ppb), TCE (up to 1,000,000 ppb), PCE (up to 1100 ppb), toluene (300,000 ppb), 1,2-DCE (up to 19,000 ppb), 1,1-DCE (up to 130 ppb), vinyl chloride (up to 1200 ppb), benzene (up to 76 ppb), cadmium (up to 10 ppb), chromium (up to 397 ppb), lead (up to 1140 ppb), mercury (up to 6.5 ppb), and zinc (up to 4,770 ppb).

Elevated metals concentrations were found only in the onsite overburden groundwater samples; elevated metals concentrations were not found in the onsite shallow bedrock groundwater or in the offsite overburden/shallow bedrock groundwater. Aqueous phase (dissolved in groundwater) contamination is present in the overburden aquifer while both aqueous- and nonaqueous phase (DNAPL) contamination is present in the shallow bedrock.

DNAPL

As mentioned above, DNAPL was found in MW-3D (northwest corner of the site) when it was sampled. The contamination present in the DNAPL sample included TCE (790,000,000 ppb), PCE (6,900,000 ppb), toluene (740,000 ppb), ethylbenzene (500,000 ppb), 1,2-DCE (270,000 ppb), xylene (240,000 ppb), and chloroform (66,000 ppb).

The findings of the site investigation indicated the presence of significant onsite volatile organic contamination in subsurface soil, overburden groundwater, and shallow bedrock groundwater (including the presence of DNAPL). In addition, the contamination has migrated to the north with significant contamination found in the downgradient bedrock wells (including DNAPL found in MW-4D).

A1.1.2 Summary of the Analytical Data Available for Operable Unit #2

Groundwater

During the initial phase of field work, four Geoprobe points were installed offsite, north of the railroad tracks. Overburden groundwater samples were taken from three of these Geoprobe points (GP-03 was dry) and the results indicated the presence of TCE as high as 1,200 ppb and the presence of 1,2-DCE as high as 3,400 ppb. Vinyl chloride was detected in two of the offsite Geoprobe points at concentrations as high as 9 ppb.

During the installation of groundwater monitoring wells, two well pairs (overburden/shallow bedrock well in each pair) were installed offsite to the north on Rochester Gas & Electric s (RG&E) property. Seven additional piezometers were also installed, to the top of bedrock, on RG&E s property. Five overburden groundwater samples were taken from the piezometers (GP-28 and -32 were dry) and two overburden groundwater samples were taken from monitoring wells. The results indicated elevated concentrations of 1,2-DCE (47 ppb to 3000 ppb), TCE (46 ppb to 730 ppb), and vinyl chloride (nondetect to 29 ppb).

The offsite shallow groundwater samples were collected in a corridor to the north-northeast of the site. The sample collected closest to the site (GP-1) was relatively clean; the only VOC detected above groundwater standards was TCE at 11 ppb (the SCG is 5 ppb). All of the groundwater samples collected along the western edge of the corridor (GP-27, -29, -30, and -31) indicated that all VOC concentrations were below SCGs. Three of the five monitoring points along the eastern edge of the corridor were dry (GP-3, -28, and -32); the other two (GP-4 and -26) did contain elevated VOC concentrations. The two monitoring points that are the most downgradient are located approximately 900 feet north-northeast of the site. The groundwater sample from the westernmost sampling point (GP-31) was "clean;" the groundwater sample from the easternmost sampling point (GP-32) was dry.

There are two shallow bedrock wells located downgradient of the site; MW-4D is located approximately 300 feet to the north-northeast of the site and MW-5D is located approximately 475 feet to the north-northeast of the site. The groundwater sample from MW-4D indicated very high concentrations of TCE (770,000 ppb), PCE (7,500 ppb), chloroform (7,300 ppb), and 1,2-DCE (1,900 ppb); the groundwater sample from MW-5D indicated very high concentrations of TCE (150,000 ppb), PCE (21,000 ppb), and 1,2-DCE (27,000 ppb).

DNAPL

When MW-4D was sampled DNAPL was encountered. A sample from MW-4D indicated that the DNAPL is made up of predominantly TCE (640,000,000 ppb) and PCE (43,000,000 ppb).

A2.0 TASK 2 - OFFSITE INVESTIGATION

The following sections generally describe the work that will be performed as part of the continuing investigation for Operable Unit #2 (offsite) at the Scobell Chemical Site.

A2.1 Mobilization

Mobilization of URSGWC personnel and equipment to the site is anticipated to occur in late September 1999 following approval of the Work Plan. The fenced onsite area will be used to provide secure equipment storage and a staging area for sampling activities. Drilling locations were selected based upon analysis of fracture traces and are positioned north, northeast, and south of the site. As a result, the decontamination area will be mobile and positioned adjacent to the active drilling area(s).

A2.2 Monitoring Well Installation

Four bedrock monitoring well pairs and one overburden monitoring well will be installed as part of the continuing investigation for Operable Unit #2 (offsite). Monitoring well locations were selected by the NYSDEC based upon an analysis of fracture traces. The wells are located where bedrock fractures intersect. These fractures may have acted as a mechanism for the migration of DNAPL from the site. The depth of the bedrock well pairs will be approximately 25 and 75 feet. One offsite overburden well also will be installed approximately 3 feet below the bedrock/overburden interface (approximately 13 feet). The groundwater wells will provide information on groundwater flow direction, information geology/site stratigraphy, and nature and extent of groundwater contamination. The proposed monitoring well locations are shown in Figures A2-1 and A2-1A.

Overburden drilling will be performed using hollow stem augers (HSAs). Rock drilling will be performed with wash rotary roller bit techniques for placing of the well casings. NX rock cores will be obtained throughout the entire rock column in each deep bedrock well, up to its terminal depth (approximately 75 feet below ground surface). The targeted depth of the deep

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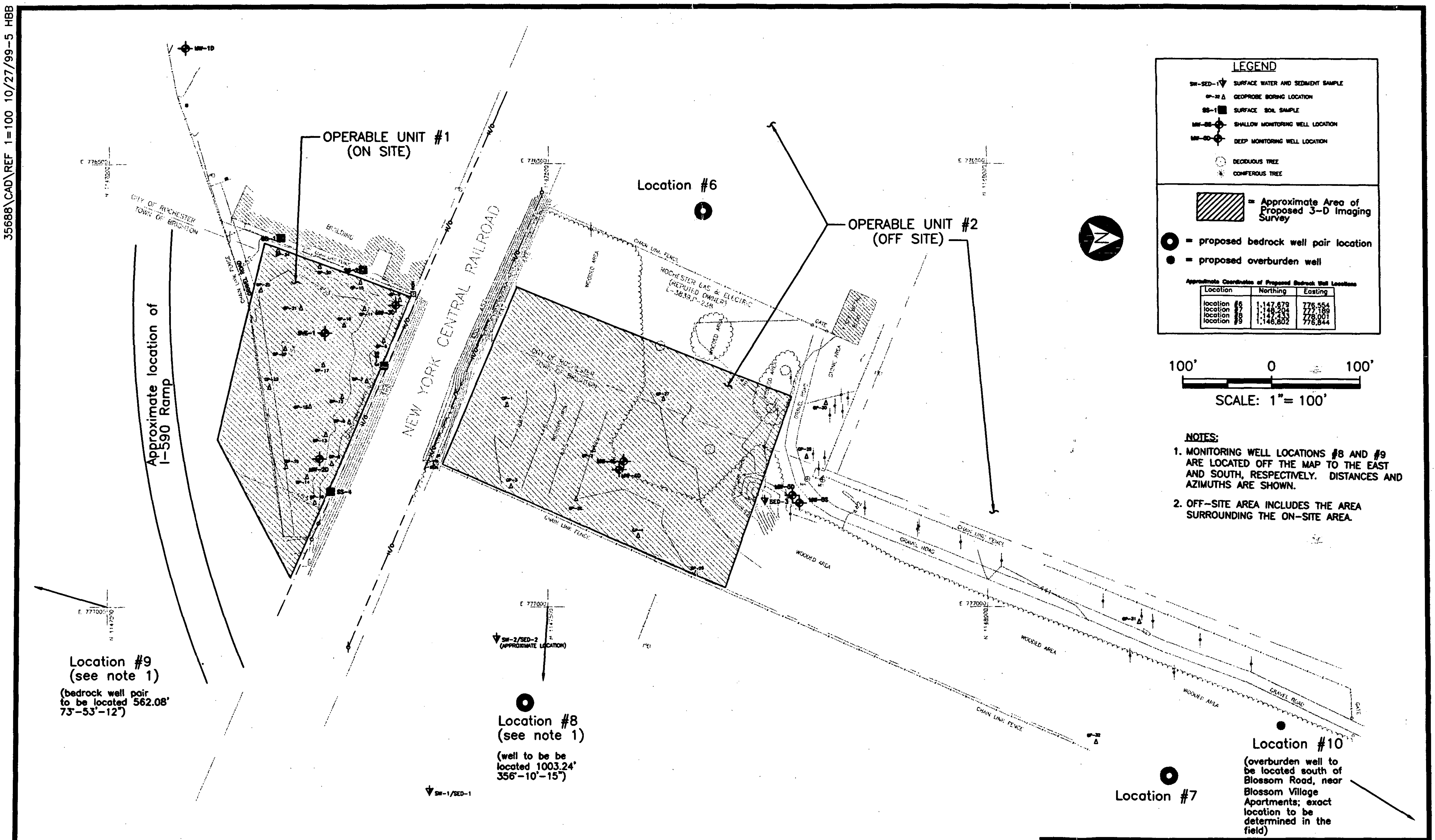

(bedrock well pair to be located 562.08' 73°-53'-12")

(well to be be located 1003.24' 356°-10'-15")

(overburden well to be located south of Blossom Road, near Blossom Village Apartments; exact location to be determined in the field)

Approximate Coordinates of Proposed Bedrock Well Locations

Location	Northing	Easting
location #6	1,147,679	776,554
location #7	1,148,204	777,189
location #8	1,147,433	778,001
location #9	1,146,802	776,844

NOTES:

1. MONITORING WELL LOCATIONS #8 AND #9 ARE LOCATED OFF THE MAP TO THE EAST AND SOUTH, RESPECTIVELY. DISTANCES AND AZIMUTHS ARE SHOWN.
2. OFF-SITE AREA INCLUDES THE AREA SURROUNDING THE ON-SITE AREA.

SOURCE: PARSONS ENGINEERING SCIENCE, Inc. 9/22/98.

PROPOSED WELL LOCATIONS

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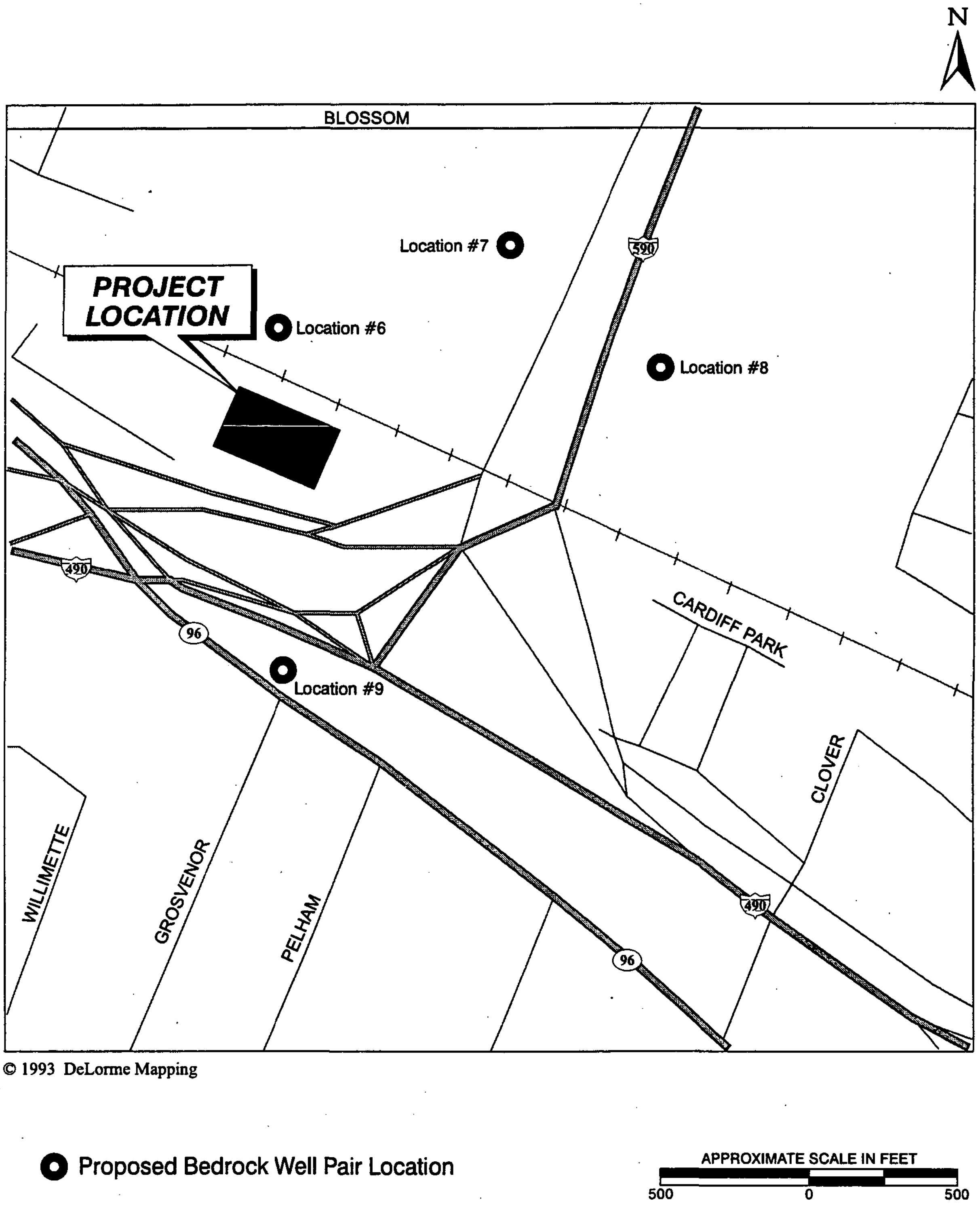
FIGURE A2-1

CC-6210



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NOTE: Refer to Figure A2-1

URS Greiner Woodward Clyde

PROPOSED WELL
LOCATIONS SUPPLEMENTAL

FIGURE A2-1A

bedrock wells is the Penfield/Decew rock contact. Shallow bedrock wells will be approximately 25 to 30 feet deep (below ground surface).

The bedrock monitoring wells will be completed as open bedrock monitors. The overburden monitoring well will consist of 2-inch inside diameter (ID) stainless-steel screen and riser. The well screen will be 5-foot in length with a continuous wrap 0.010-inch slot. The sand pack (No. 1 Morie) will be placed above the screen, followed by a 2-foot bentonite plug seal, and the remainder of the borehole will be tremie-grouted to the surface with a cement-bentonite grout. The steel surface casing will be fitted with a locking cap. Drilling and well construction procedures are described and illustrated in Section C3.0 of the FSP. Well construction specifications for each well will be documented on well construction diagrams.

A2.3 Well Development, Hydraulic Conductivity Testing, and Groundwater/DNAPL Sampling

Following completion, the newly installed monitoring wells will be developed to ensure that they will provide representative samples of groundwater beneath the site. The wells will be slug-tested following development to provide estimates of hydraulic conductivity for the bedrock aquifer. After a two-week equilibration period, the monitoring wells will be purged and sampled. Specific procedures are detailed in the following sections.

A2.3.1 Well Development

Following completion of drilling and well installation, each monitoring well will be developed by pumping with a submersible pump or Waterra Hydrolift pump with dedicated/disposable high-density polyethylene (HDPE) tubing and foot-valves until the discharged water is relatively sediment-free. The volume of water removed from wells will not be less than that lost to the formation during drilling. The effectiveness of the development measures will be closely monitored to keep the volume of discharged water to the minimum amount necessary to obtain sediment-free samples. Temperature, pH, specific conductance, and dissolved oxygen will be monitored during development and must reach steady-state. A portable turbidimeter will be used to monitor development effectiveness. A turbidity reading of less than 50 nephelometric turbidity units (NTU) will be used as a guide for achieving well development. Well development progress will be documented on appropriate forms presented in the FSP.

Water levels and total well depth in all new monitoring wells will be measured using an electronic water level indicator or a weighted tape. Initially, water level measurements will be taken prior to and following well development to establish static conditions. Subsequent water level measurements will be taken from monitoring wells until the active field investigation is complete. Water levels also will be measured prior to groundwater sampling. Water level measurement procedures are presented in the FSP (Section C4.4).

A2.3.2 Hydraulic Conductivity Testing

Slug tests will be performed in all newly installed monitoring wells using a Hermit Data Logger, a pressure transducer, and stainless-steel slugs. Both falling head (slug-in) and rising head (slug-out) tests will be performed if the well screens are submerged below the water table. The tests will consist of inserting or removing the slug from the well and monitoring the recovery of the water level in the well to static conditions. This data will be analyzed using the methods of Bouwer and Rice (1976) and Bouwer (1989).

A2.3.3 Groundwater/DNAPL Sampling

The nine newly installed monitoring wells and seven existing monitoring wells will be sampled approximately two weeks after development and slug testing have been completed. Water will be purged from each well prior to sampling using the low-flow aeration method and field parameters (pH, eH, conductivity, temperature, dissolved oxygen, turbidity) will be documented for the pre- and post-purge water (USEPA, 1995). These parameters will be measured in a flow- through cell and must be stable prior to sampling. Dedicated/disposable HDPE tubing attached to a submersible pump will be used to collect the groundwater samples. All groundwater samples will be analyzed for target compound list (TCL) VOCs and target analyte list (TAL) metals. If DNAPL is encountered, then it will be sampled. As part of the budget estimate, three DNAPL samples have been assumed. These samples will be collected using bottom-filling, HDPE bailers. The DNAPL samples will be collected from existing monitoring wells MW-3D, MW-4D, and one additional well to be identified in the field in consultation with the NYSDEC. An additional sample of water used during drilling and equipment decontamination (rinse blank) also will be collected and submitted for the above parameters. More detailed purging and groundwater sampling procedures are provided in the FSP (Section C4.0).

A2.4 Site Survey and Mapping

Field surveys will be conducted to locate all sampling points and monitoring wells, and to prepare a site base map. A combination of conventional surveying (angles, distances, differential leveling) and global positioning system (GPS) methodologies will be used. Horizontal coordinates will be based on the New York State Plane Coordinate System, Transverse Mercator Projection, East Zone, North American Datum of 1983. Vertical coordinates (elevations) will be based on the North American Vertical Datum of 1988. The survey data will be compiled to produce a site base map at a scale of one-inch-equals-50-feet. The base map will include the approximately position of the I-490 and I-590 interchange lanes scaled off of existing United States Geological Survey (USGS) quadrangle maps.

A2.5 Sample Analysis

Samples collected for definitive chemical analysis will be preserved, packaged, and shipped according to procedures specified in the QAPjP (Part B) and the FSP (Part C). Laboratory data will be reviewed for usability and completeness under the supervision of URSGWC's QA/QC Officer. Methods of sample analysis and numbers of samples to be collected are shown in Table B5-1 of the QAPjP.

All applicable laboratory analyses will be performed in accordance with the NYSDEC Analytical Services Protocols (ASP), October 1995 and will follow appropriate NYSDEC protocols, which meet or exceed USEPA Contract Laboratory Program (CLP) QA/QC protocols and USEPA SW-846 Methods. Quality assurance and quality control procedures associated with the environmental sampling and analytical program will be as specified in the QAPjP. The laboratory will be required to meet ASP 1995 requirements and provide appropriate deliverables.

A2.6 Data Validation

The analytical program is intended to produce a database adequate to characterize the site, and to qualitatively assess its impact on human health and the environment. Data validation for the sampling and analysis will include a limited review of holding times, completeness of all required deliverables, review of QC results (surrogates, spikes, duplicates) to determine if the data are within the protocol required limits and specifications, a determination that all samples were analyzed using established and agreed upon protocols, an evaluation of the raw data to confirm the results provided in the data summary sheets agree with the quality control verification forms, and a review of data qualifiers. Invoices will be reviewed for accuracy. Spreadsheets will be reviewed.

If this initial data review reveals significant deviations and problems with the analytical data, URSGWC may recommend a complete validation of the data. Following data review, URSGWC will develop a Data Usability Summary Report in accordance with the NYSDEC's guidance document dated September 1997.

A2.7 Draft Summary Report

Following analysis of the data, the site investigation will be documented in a draft summary report. The draft summary report will present all of the collected information in either a tabular or graphic format including data tables, borehole logs, contour maps, and cross-sections and will be accompanied by written text presenting our preliminary interpretation of site conditions. This report will form the basis for interpretations during all subsequent tasks. The NYSDEC will be provided with the draft boring logs and the raw chemical data.

A2.8 Investigation-Derived Waste Characterization and Disposal

Wastes that are encountered during drilling will be placed in drums or overpacks (as appropriate) and staged on site, awaiting sampling and disposal. Sampling/waste hauling/disposal will be coordinated by URSGWC. CECOS International, Inc. will characterize, transport, and dispose of the waste. Fifty drums are assumed to require disposal for budgeting purposes. All decontamination fluids and well development water will be containerized on site in bulk 1,500-gallon holding tanks. The water will be treated and disposed of off site. Personal protective equipment will be placed into trash bags for disposal at a municipal landfill.

A3.0 TASK 3 - THREE-DIMENSIONAL ACOUSTIC IMAGING SURVEY (OFFSITE AND ONSITE)

A3.1 Offsite Survey

A three-dimensional high resolution seismic reflection survey will be performed in an area north of the site. The purpose of this task is to investigate and define the presence of a suspected DNAPL pool (DNAPL was found in the bottom of MW-4D during the 1998 sampling of that well). The objectives of the survey include: 1) evaluating three-dimensional high-resolution seismic reflection of the subsurface stratigraphy of the survey area; 2) imaging and mapping of significant fractures in the shallow bedrock, from as close to the surface of the bedrock as possible to an approximate depth of 70 to100 feet into the bedrock; 3) defining the potential for the presence of DNAPL pools in the shallow bedrock; and 4) defining optimal placement of DNAPL recovery wells. The survey will include an area of approximately 75,000 square feet. The survey area is characterized as a partially wooded field located near the I-490/I-590 highway interchange, immediately north of active railroad tracks, and immediately east of an active RG&E substation (the survey area is owned by Rochester Gas & Electric).

A3.2 Onsite Survey

A three-dimensional high resolution seismic reflection survey will be performed as a part of the effort for the Operable Unit #1 remedial design. This is discussed further in the Project Management Work Plan. The purpose of this task is to investigate and define the presence of a suspected DNAPL pool (DNAPL was found in the bottom of MW-3D during the 1998 sampling of that well). The objectives of the survey include: 1) evaluating three-dimensional high-resolution seismic reflection evaluation of the subsurface stratigraphy of the survey area; 2) imaging and mapping of significant fractures in the shallow bedrock, from as close to the surface of the bedrock as possible to an approximate depth of 70 to 100 feet into the bedrock; 3) defining the potential for the presence of DNAPL pools in the shallow bedrock; and 4) defining optimal placement of DNAPL recovery wells. The survey will include an area of approximately 40,000 square feet. The survey area is a triangular-shaped grassy lot, approximately 1 acre, enclosed by a chain-link fence and bordered to the west by a commercial building, to the north by railroad tracks, and along the southeast by a highway interchange ramp (part of the I-490/I-590 highway interchange).

A3.3 Multi-Electrode Resistivity Profiling

Electrical resistivity profiling will be performed along selected traverses both on-site and off-site within the proposed area of 3D seismic coverage, to help delineate water-bearing fracture zones. Successful geophysical surveys exploit the physical properties of the target object (in this case, water-bearing fracture zones) versus the surrounding materials. Although fracture zones may exhibit seismic reflection signatures, the water contained in those fractures may also produce resistivity anomalies, because the fractures are more electrically-conductive than the surrounding competent dolomite. Comparing seismic and resistivity cross sections may produce more confident interpretations regarding water-bearing fracture positions than either method alone.

Resistivity profiling will be performed an Advanced GeoSciences model Sting R-1 resistivity meter, with a Swift automated-electrode array. The Swift array utilizes stainless steel electodes driven into the ground at regular spacings (probably 10 or 20 feet apart at this site) along straight-line traverses. Up to 28 electrodes are typically deployed at one time. The Sting and Swift instruments then perform resistivity measurements using every available combination of current and voltage electrode. The dipole-dipole electrode array will be used.

The measured resistivity values will be contoured, to check for anomalies of interest to this project. Inversion software can then be utilized to infer the position and goemetry of geologic structures (including fracture zones) that might have produced the observed resistivity anomalies.

A3.4 Three-Dimensional Acoustic Imaging Reporting

A separate report will be prepared by the subcontractor (one report to document the findings of both surveys) which will document:

- All pertinent background information
- Data generated as a part of the survey
- Analysis/discussion of the findings of the survey
- Presence/location of significant fractures in the bedrock

Presence/location of any potential DNAPL pools

REFERENCES

Bouwer, H. 1989. The Bouwer and Rice Slug Test-An Update. *Groundwater*, 27 (3), pp. 304-309.

Bouwer, H. and R.C. Rice. 1976. A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells. *Water Resources Research*, Vol. 12, pp. 423-428.

USEPA, 1995. Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples From Monitoring Wells. (Revision 2)

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PART B

QUALITY ASSURANCE PROJECT PLAN
(QAPjP)

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B1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPjP) is designed to provide an overview of quality assurance/quality control (QA/QC) procedures and programs which will be adhered to during the Operable Unit #2 (Offsite) continuing investigation activities as described in the site-specific Work Plan. The QAPP will give specific methods and QA/QC procedures for chemically testing environmental samples obtained from the Scobell Chemical Site. In addition, it will help verify the quality of the data produced during the continuing investigation.

B2.0 PROJECT/SITE DESCRIPTION

The site is located in the Town of Brighton, Monroe County, New York. A complete description of the Scobell Chemical site is provided in Section A1.0 - Site History and Description, of the Scobell Chemical Work Plan.

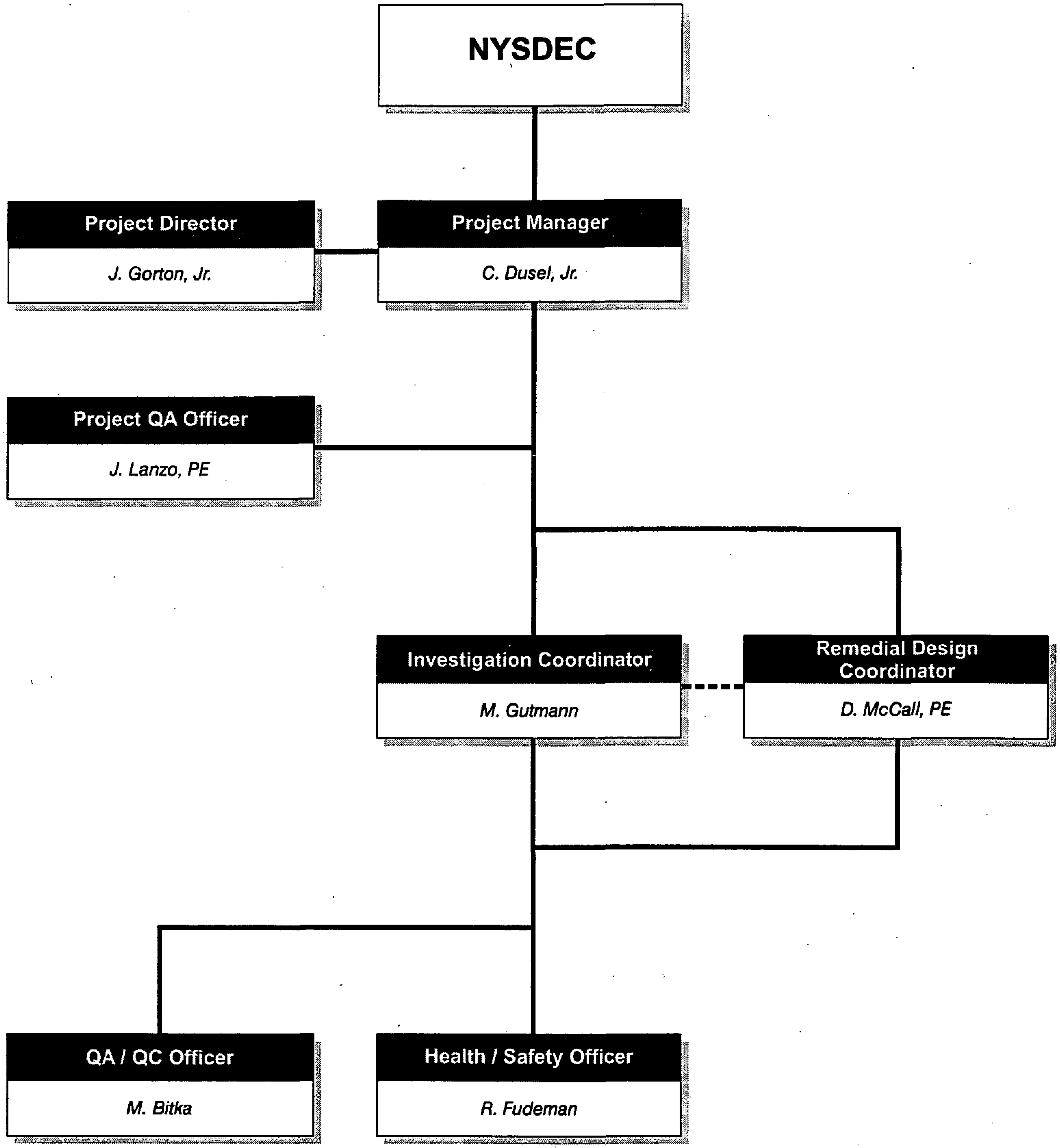
B3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The URS Greiner Woodward Clyde (URSGWC) organizational structure for this project is presented in Figure B1-1. It identifies the names of key project personnel. The URSGWC Project QA Officer is responsible for verifying that corporate QA procedures are followed. The Site Investigation Coordinator is responsible for verifying that QA procedures are followed in the field. This will provide for the valid collection of representative samples. The QA/QC Officer (or designee) will be in direct contact with the analytical laboratory to monitor laboratory activities so that holding times and other QA/QC requirements are met.

The Site Investigation Coordinator will be responsible for coordinating the activities of all personnel involved with the implementing the project in the field, and will be in daily communication with the Site Investigation Coordinator. This person will verify that all field work is carried out in accordance with the approved project Field Sampling Plan.

In addition to overall project coordination, the Project Manager will be responsible for overseeing both the analytical and field QA/QC activities. The ultimate responsibility for maintaining quality throughout the project rests with the Project Manager.

The analytical laboratory to be used for the analysis of aqueous and dense nonaqueous-phase liquid (DNAPL) samples is H2M Labs, Inc. located in Melville, New York. The laboratory is certified by New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) for the appropriate categories (i.e., contract laboratory procedures). The QA Manager of the laboratory will be responsible for performing project-specific audits and for overseeing the quality control data generated. Also, the Laboratory Project Manager will be in daily communication with the QA/QC Officer (or designee).



URS Greiner Woodward Clyde

PROJECT ORGANIZATION

FIGURE B1-1

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B4.0 DATA QUALITY OBJECTIVES

B4.1 Background

Data quality objectives (DQOs) are qualitative and quantitative statements which specify the quality of data required to support the continuing investigation for the Scobell Chemical Site. DQOs focus on the identification of the end use of the data to be collected. The project DQOs will be achieved utilizing screening and definitive data categories, as outlined in *Guidance for the Data Quality Objectives Process,* EPA QA/G-4 (September 1994). The definitive data are generated using rigorous analytical methods, such as approved United States Environmental Protection Agency (USEPA) reference methods. A summary of the analytical methods to be used is presented in Table B4-1.

The project DQOs for data collected during this continuing investigation are:

A. To determine the nature and extent of aqueous and nonaqueous offsite contamination resulting from the migration from the onsite area.

B. To identify, evaluate, and select a long-term remedial action that is cost effective and environmentally sound.

C. To maintain the highest possible scientific/professional standards for each procedure.

D. To assure the ultimate defensibility of the data produced during the continuing investigation.

B4.2 QA Objectives For Chemical Data Measurement

For the definitive data category described above, the data quality indicators of precision, accuracy, representativeness, comparability, and completeness will be measured during the offsite chemical analysis.

B4.2.1 Precision

Precision examines the distribution of the reported values about their mean. The distribution of reported values refers to how different the individual reported values are from the average reported value. Precision may be affected by the natural variation of the matrix or contamination within that matrix, as well as by errors made in field and/or laboratory handling procedures. Precision is evaluated using analyses of a laboratory matrix spike/matrix spike duplicate (for organics) and matrix duplicates (for inorganics), which not only exhibit sampling and analytical precision, but indicate analytical precision through the reproducibility of the analytical results. Relative percent difference (RPD) is used to evaluate precision. RPD criteria must meet the requirements for the methods identified in Table B4-1.

B4.2.2 Accuracy

Accuracy measures the analytical bias in a measurement system. Accuracy may be affected by: errors that occurred during the sampling process; contamination originating in the field, during preservation procedures, or during sample handling; natural variations in the sample matrix; or by errors that occurred during sample preparation and analysis. Sampling accuracy may be assessed by evaluating the results of rinse and trip blanks. These data help to assess the potential contamination contribution from various outside sources. The laboratory objective for accuracy is to equal or exceeds the accuracy demonstrated for the applied analytical methods on samples of the same matrix. The percent recovery criterion is used to estimate accuracy based on recovery in the matrix spike/matrix spike duplicate and matrix spike blank samples. The spike and spike duplicate, which indicates effect that the matrix may have on the target compounds, is also a good gauge of method efficiency. For volatile, semivolatile, herbicide, and

TABLE B4-1
ANALYTICAL METHODS
SCOBELL CHEMICAL SITE

Parameter	Method No.	Holding Time From VTSR	Reference
TCL Volatiles + 10 TICs	95-1	7 days unpreserved, 10 days preserved	1
TCL Semivolatiles + 30 TICs	95-2	5 days (aqueous)/10 days (soil) extraction, then 40 days for analysis	1
TCL Pesticides/PCBs	95-3	5 days (aqueous)/10 days (soil) extraction, then 40 days for analysis	1
TAL Metal (23)	CLP-M	6 months (except mercury - 26 days)	1
Cyanide	CLP-M	12 days	1
TCLP Extraction	1311	Volatiles (ZHE) - 7 days Extractables (non-ZHE) - 5 days Metals - 6 months Mercury - 5 days	2
TCLP Volatiles	8260B	7 days from TCLP extraction	2
TCLP Semivolatiles	8270C	Extract within 7 days from TCLP extraction, then 40 days for analysis	2
TCLP Pesticides	8081A	Extract within 7 days from TCLP extraction, then 40 days for analysis	2
TCLP Metals	6010B/7000A	180 days from TCLP extraction (except Hg – 28 days)	1
Total PCBs	8082	5 days (aqueous)/10 days (soil) extraction, then 40 days for analysis	2
TCLP Herbicides	8151A	Extract within 7 days from TCLP extraction, then 40 days for analysis	2
Ignitability	1030	As soon as possible	2
Reactivity	Ch. 7, Section 7.3	As soon as possible	2
Corrosivity	9040B/9045C	As soon as possible	2

VTSR - Validated Time of Sample Receipt at the Laboratory

REFERENCES

1 New York State Department of Environmental Conservation, *Analytical Services Protocol* (ASP), 10/95 Edition.
2 USEPA, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846 Integrated Manual, Final Update III*, June 1997.

pesticide/polychlorinated biphenyls (PCBs), analyses surrogate recovery results are measured. Acceptable ranges of recovery are reported in the referenced methods identified in Table B4-1.

B4.2.3 Representativeness

Representativeness expresses the degree to which the sample data accurately and precisely represent the characteristics of a population of samples, parameter variations at a sampling point, or environmental conditions. Representativeness is a qualitative parameter which is most concerned with the proper design of the sampling program or subsampling of a given sample. Objectives for representativeness are defined for sampling and analysis tasks and are a function of the investigative objectives (i.e., determination of vertical and horizontal extent of contamination). The sampling procedures, as described in the Field Sampling Plan, have been selected with the goal of obtaining representative samples for the media of concern.

B4.2.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. A DQO for this program is to produce data with the greatest possible degree of comparability. This goal is achieved through using standard techniques to collect and analyze representative samples and reporting analytical results in appropriate units. Complete field documentation using standardized data collection forms will support the assessment of comparability. Comparability is limited by the other parameters (e.g., precision, accuracy, representativeness, completeness, comparability), because only when precision and accuracy are known can data sets be compared with confidence. In order that data sets may be comparable, it is imperative that contract-required methods and procedures be explicitly followed.

B4.2.5 Completeness

Completeness is defined as a measure of the amount of valid data obtainable from a measurement system compared to the amount that was expected to be obtained under normal conditions. To meet project needs, it is important that appropriate QC procedures be maintained to verify that valid data are obtained. For the data generated, a goal of 90 percent is required for completeness (or usability) of the analytical data. If this goal is not met, then NYSDEC and URSGWC project personnel will determine whether the deviations may cause the data to be rejected.

B5.0 SAMPLING LOCATIONS AND PROCEDURES

Sampling locations and procedures are discussed in Section A2.0 of the Work Plan. The laboratory analytical program is provided in Table B5-1.

TABLE B5-1
ANALYTICAL PROGRAM
SCOBELL CHEMICAL SITE

MATRIX	SCHEDULE	METHOD	NO. OF SAMPLES
DNAPL			
Samples:	TCL VOCs	ASP 95-1	3
	TCL SVOCs	ASP 95-2	3
	TCL Pesticides/PCBs	ASP 95-3	3
	TAL Metals (plus cyanide)	ASP CLP-M	3
Lab QC:			
MS/MSD/MSB	TCL VOCs	ASP 95-1	3
MS/MSD/MSB	TCL SVOCs	ASP 95-2	3
MS/MSD/MSB	TCL Pesticides/PCBs	ASP 95-3	3
MS/MD/LCS	TAL Metals (plus cyanide)	ASP CLP-M	3
GROUNDWATER			
Samples:	TCL VOCs	ASP 95-1	16
	TAL Metals (plus cyanide)	ASP CLP-M	16
Field QC:			
RB/TB	TCL VOCs	ASP 95-1	4
RB	TAL Metals (plus cyanide)	ASP CLP-M	1
Lab QC:			
MS/MSD/MSB	TCL VOCs	ASP 95-1	3
MS/MD/LCS	TAL Metals (plus cyanide)	ASP CLP-M	3
WASTEWATER/DRILL CUTTINGS			
Samples:	TCLP Extraction	SW 1311	2
	TCLP Volatiles	SW 8260B	2
	TCLP Semivolatiles	SW 8270C	2
	TCLP Pesticides	SW 8081A	2
	TCLP Herbicides	SW 8151A	2
	Total PCBs	SW 8082	2
	TCLP METALS	SW 6010B/7000A	2
	Ignitablity	SW 1030	2
	Reactivity	SW Ch. 7, Section 7.3	2
	Corrosivity	SW 9040B/SW 9045C	2

Notes:

MD	- matrix duplicate	SVOC	- semivolatile organic compound
MS	- matrix spike	TCL	- target compound list
MSD	- matrix spike duplicate	TCLP	- toxicity characteristic leachate procedure
LCS	- laboratory control sample	VOC	- volatile organic compound

B6.0 SAMPLE CUSTODY AND HOLDING TIMES

Procedures addressing field and laboratory sample chain-of-custody and holding times are presented in the Field Sampling Plan. Table B4-1 contains sample methods and holding time requirements.

B7.0 ANALYTICAL PROCEDURES

All analyses will be performed in accordance with the following documents:

- New York State Department of Environmental Conservation, (NYSDEC) *Analytical Services Protocol* (ASP), 10/95 Edition.

- United States Environmental Protection Agency (USEPA) *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Final Update III*, June 1997.

Table B5-1 identifies the specific methods to be performed on the individual matrices. All holding times begin with validated time of sample receipt (VTSR) at the laboratory.

B8.0 CALIBRATION PROCEDURES AND FREQUENCY

To obtain a high level of precision and accuracy during sample processing procedures, laboratory instruments must be calibrated properly. Several analytical support areas must be considered so the integrity of standards and reagents is upheld prior to instrument calibration. The following sections describe the analytical support areas and laboratory instrument calibration procedures.

B8.1 Analytical Support Areas

Prior to generating quality data, several analytical support areas must be considered:

Standard/Reagent Preparation - Primary reference standards and secondary standard solutions shall be obtained from National Institute of Standards and Technology (NIST), or other reliable commercial sources to verify the highest purity possible. The preparation and maintenance of standards and reagents will be accomplished according to the methods referenced in Table B4-1. All standards and standard solutions are to be formally documented (i.e., in a bound logbook) and should identify the supplier, lot number, purity/concentration, receipt/preparation date, preparer's name, method of preparation, expiration date, and any other pertinent information. All standard solutions shall be validated prior to use. Care shall be exercised in the proper storage and handling of standard solutions (e.g., separating volatile standards from nonvolatile standards). The laboratory shall continually monitor the quality of the standards and reagents through well documented procedures.

Balances - The analytical balances shall be calibrated and maintained in accordance with manufacture specifications. Calibration is conducted with two Class "S" weights that bracket the expected balance use range. The laboratory shall check the accuracy of the balances daily and they must be documented properly in permanently bound logbooks.

Refrigerators/Freezers - The temperature of the refrigerators and freezers within the laboratory shall be monitored and recorded daily. This will verify that the quality of the standards and reagents is not compromised and the integrity of the analytical samples is upheld. Appropriate acceptance ranges (between 2 and 6 degrees Celsius for refrigerators) shall be clearly posted on each unit in service

Water Supply System - The laboratory must maintain a sufficient water supply for all project needs. The grade of the water must be of the highest quality (analyte-free) in order to eliminate false-positives from the analytical results. Ultraviolet cartridges or carbon absorption treatments are recommended for organic analyses and ion-exchange treatment is recommended for inorganic analyses. Appropriate documentation of the quality of the water supply system(s) will be performed on a regular basis.

B8.2 Laboratory Instruments

Instrument calibration is required to verify that the analytical system is operating properly and at the sensitivity necessary to meet established quantitation limits. Each instrument for organic and inorganic analyses shall be calibrated with standards appropriate to the type of instrument and linear range established within the analytical method(s). Calibration of laboratory instruments will be performed according to methods specified in Table B4-1. In general, standards will be used that bracket the expected concentration of the samples. This will require the using different concentration levels that are used to demonstrate the instrument's linear range of calibration.

Calibration of an instrument must be performed before analyzing any samples and then at periodic intervals (continuing calibration) during the sample analysis to verify that the instrument is still calibrated. If the contract laboratory cannot meet the method-required calibration, corrective action shall be taken, as discussed in Section B11.0. All corrective action procedures taken by the contract laboratory are to be documented, summarized within the case narrative, and submitted with the analytical results.

B9.0 INTERNAL QUALITY CONTROL CHECKS

Internal QC checks are used to determine if analytical operations at the laboratory are in control, as well as determining the effect sample matrix may have on data being generated. The type and frequency of specific QC samples performed by the contract laboratory will be according to the specified analytical method and project specific requirements. Acceptable criteria and/or target ranges for these QC samples are presented within the analytical methods referenced in Table B4-1.

QC results which vary from acceptable ranges shall result in the implementation of appropriate corrective measures, the potential application of qualifiers, and/or an assessment of the impact these corrective measures have on the established data quality objectives. Quality control samples, including any project-specific QC, will be analyzed are discussed below.

B9.1 Batch QC

Method Blank Samples - A method blank is defined as laboratory-distilled or deionized water that is carried through the entire analytical procedure. The method blank is used to determine the level of laboratory background contamination. Method blanks are analyzed at a frequency of one per analytical batch.

Matrix Spike Blank Samples - A matrix spike blank (MSB) sample is an aliquot of water spiked (fortified) with all the compounds being analyzed for calculation of precision and accuracy to verify that the analysis being performed is in control. A MSB will be performed for each matrix and organic parameter.

Laboratory Control Samples - A laboratory control sample (LCS) is a known matrix spiked with elements being analyzed for calculation of precision and accuracy to verify that the analysis being performed is in control. An LCS will be performed for each matrix and inorganic parameter.

B9.2 Matrix-Specific QC

Matrix Spike Samples - An aliquot of a matrix is spiked with known concentrations of specific compounds as stipulated by the methodology. The matrix spike (MS) and matrix spike duplicate (MSD) samples are subjected to the entire analytical procedure to assess both accuracy and precision of the method for the matrix by measuring the percent recovery and relative percent difference of the two spiked samples. The samples are used to assess matrix interference effects on the method, as well as to evaluate instrument performance. MS/MSDs are analyzed at a frequency of one each per 20 samples per matrix. MS/MSDs (an MD for metals only) will be performed for the parameters as listed in Table B5-1.

Matrix Duplicate Samples - The matrix duplicate (MD) is two representative aliquots of the same sample which are prepared and analyzed identically. Collection of duplicate samples provides for the evaluation of precision both in the field and at the laboratory by comparing the analytical results of two samples taken from the same location. Obtaining duplicate samples from a soil matrix requires homogenization of the sample aliquot (except for volatiles) before filling sample containers to best achieve representative samples. Every effort will be made to obtain replicate samples; however, due to interferences, lack of homogeneity, and the nature of the soil samples, the analytical results are not always reproducible. Duplicate samples are to be included at a frequency of one per 20 samples per matrix for metals only, as listed in Table B5-1.

B9.3 Additional QC

Rinsate (Equipment) Blanks - A rinsate blank is a sample of laboratory-demonstrated analyte-free water passed through and over the cleaned sampling equipment. A rinsate blank is used to indicate potential contamination from sample instruments used to collect and transfer samples. This water must originate from one common source within the laboratory and must be the same water used by the laboratory performing the analysis. The rinsate blank should be collected, transported, and analyzed in the same manner as the samples acquired that day. Rinsate blanks will be performed at the rate as listed in Table B5-1 for the total number of samples collected throughout the sampling event. Rinse blanks will be performed for samples (i.e., groundwater) where dedicated disposable equipment is used at the rate of one per lot number or case of bailers.

Trip Blanks - Trip blanks are only required when analyzing for volatile organics in aqueous matrices. They consist of a set of sample bottles filled at the laboratory with laboratory demonstrated analyte free water. These samples then accompany the bottles that are prepared at the laboratory into the field and back to the laboratory, along with the collected samples for analysis. These bottles are never opened in the field. Trip blanks will be analyzed for volatile organic parameters. Trip blanks must be included at a rate of one per aqueous volatile sample shipment.

B10.0 CALCULATION OF DATA QUALITY INDICATORS

B10.1 Precision

Precision is evaluated using analyses of a field duplicate and/or a laboratory MS/MSD sample which not only exhibit sampling and analytical precision, but indicate analytical precision through the reproducibility of the analytical results. Relative percent difference (RPD) is used to evaluate precision by the following formula:

$$\% RPD = \frac{(X_1 - X_2)}{[(X_1 + X_2)/2]} \times 100\%$$

where:

X_1 = Measured value of sample or matrix spike

X_2 = Measured value of duplicate or matrix spike duplicate

Precision will be determined through the use of MS/MSD samples (for organics) and matrix duplicate samples (for inorganics) analyses. RPD criteria for this project must meet the method requirements referenced in Table B4-1.

B10.2 Accuracy

Accuracy is defined as the degree of difference between the measured or calculated value and the true value. The closer the numerical value of the measurement comes to the true value or actual concentration, the more accurate the measurement is. Analytical accuracy is expressed as the percent recovery of a compound or element that has been added to the environmental sample at known concentrations before analysis. Analytical accuracy may be assessed through the use of known and unknown QC samples and spiked samples. Accuracy is presented as percent recovery. Accuracy will be determined from matrix spike, matrix spike duplicate, and matrix spike blank samples, as well as from surrogate compounds added to organic fractions (i.e., volatiles, semivolatiles, herbicides, pesticides/PCB), and is calculated as follows:

$$\% R = \frac{(X_s - X_u)}{K} \times 100\%$$

where:

X_s = Measured value of the spike sample

X_u = Measured value of the unspiked sample

K = Known amount of spike in the sample

B10.3 Completeness

Completeness is calculated on a per matrix basis for the project and is calculated as follows:

$$\% \text{ Completeness} = \frac{(X_v - X_n)}{N} \times 100\%$$

where:

X_v = Number of valid measurements

X_n = Number of invalid measurements

N = Number of valid measurements expected to be obtained

B11.0 CORRECTIVE ACTIONS

Laboratory corrective actions shall be implemented to resolve problems and restore proper functioning to the analytical system when errors, deficiencies, or out-of-control situations exist at the laboratory. Full documentation of the corrective action procedure needed to resolve the problem will be filed in the project records, and the information summarized in the case narrative. A discussion of the corrective actions to be taken is presented in the following sections.

B11.1 Incoming Samples

Problems noted during sample receipt shall be documented by the laboratory. URSGWC's QA/QC Officer (or designee) shall be contacted immediately for problem resolution. All corrective actions shall be documented thoroughly.

B11.2 Sample Holding Times

If any sample extractions and/or analyses exceed method holding time requirements, URSGWC's QA/QC Officer (or designee) shall be notified immediately for problem resolution. All corrective actions shall be documented thoroughly.

B11.3 Instrument Calibration

Sample analysis shall not be allowed until all initial calibrations meet the appropriate requirements. All laboratory instrumentation must be calibrated in accordance with method requirements. If any initial/continuing calibration standards exceed method QC limits, equipment must be recalibrated and, if necessary, all samples analyzed subsequent to the previously acceptable calibration check will be reanalyzed.

B11.4 Reporting Limits

The laboratory must meet the required detection limits as referenced in the methods listed in Table B4-1. If difficulties arise in achieving these limits due to sample matrix, the laboratory must notify URSGWC project personnel for problem resolution. In order to achieve those detection limits, the laboratory must utilize all appropriate cleanup procedures in an attempt to maintain the project-required detection limits. When any sample requires a secondary dilution due to high levels of target analytes, the laboratory must document all initial analyses and secondary dilution results. Secondary dilution will be permitted only to bring target analytes within the linear range of calibration. If samples are analyzed at a secondary dilution with no target analytes detected, URSGWC's QA/QC Officer (or designee) will be immediately notified so that appropriate corrective actions can be initiated.

B11.5 Method QC

All QC samples, including blanks, matrix duplicates, matrix spikes, matrix spike duplicates, surrogate recoveries, matrix spike blank, and other method-specified QC samples, shall meet the method requirements referenced in Table B4-1. Failure of method-required QC will result in the review and possible qualification of all affected data. If the laboratory cannot find any errors, the affected sample(s) shall be reanalyzed and/or re-extracted/redigested, then reanalyzed within method-required holding times to verify the presence or absence of matrix effects. If matrix effect is confirmed, the corresponding data shall be flagged accordingly using the flagging symbols and criteria as defined by the data validation guidelines identified in Section B12.2. If matrix effect is not confirmed, then the entire batch of samples may have to be reanalyzed and/or re-extracted/redigested, then reanalyzed at no cost to the URSGWC. URSGWC shall be notified as soon as possible to discuss possible corrective actions should unusually difficult sample matrices be encountered.

B11.6 Calculation Errors

All analytical results must be reviewed systematically for accuracy prior to submittal. If upon data review calculation and/or reporting errors exist, the laboratory will be required to reissue the analytical data report with the corrective actions appropriately documented in the case narrative.

B12.0 DATA REDUCTION, VALIDATION, AND USABILITY

For all NYSDEC ASP analyses, including volatiles, semivolatiles, pesticides/PCBs, herbicides, toxicity characteristic leaching procedure/Resource Conservation and Recovery Act (TCLP/RCRA) characteristics, and metals, NYSDEC ASP Superfund deliverable requirements will be employed for documentation and reporting of all data. The NYSDEC ASP Superfund deliverables include all requirements of Category B deliverables. The standard NYSDEC Data Package Summary Forms (see Appendix A) will be completed by the analytical laboratory and included in the deliverable data packages.

B12.1 Data Reduction

Laboratory analytical data are first generated in raw form at the instrument. These data may be either in a graphic or tabular format. Specific data generation procedures and calculations are found in each of the referenced methods. Analytical results must be reported consistently. Data for aqueous samples will be reported in concentrations of micrograms per liter (µg/L). Data for soils will be reported in concentrations of micrograms per kilogram (µg/kg) for organics and milligrams per kilogram (mg/kg) for inorganics, and reported on a dry weight basis.

Identification of all analytes must be accomplished with an authentic standard of the analyte traceable to NIST or USEPA sources. Data reduction will be performed by individuals experienced with a particular analysis and knowledgeable of requirements.

B12.2 Data Validation

Data validation is a systematic procedure of reviewing a body of data against a set of established criteria to provide a specified level of assurance of validity prior to its intended use.

Data validation will be performed by environmental chemists under the supervision of the QA/QC Officer. All analytical samples collected will receive a limited data review. This review will include: a review of holding times; completeness of all required deliverables; review of QC results (surrogates, spikes, duplicates) to determine if the data are within the protocol required limits and specifications; a determination that all samples were analyzed using established and agreed upon analytical protocols; an evaluation of the raw data to confirm the results provided in the data summary sheets agree with the quality control verification forms; and a review of laboratory data qualifiers. The methods referenced in Table B4-1 as well as the general guidelines presented in the following documents will be used to aide the chemist during the data review:

- USEPA Region II, *CLP Organic Data Review*, SOP No. HW-6, Rev. #11, June 1996.
- USEPA Region II, *Evaluation of Metals Data for the Contract Laboratory Program* (CLP) based on SOW 3/90, SOP Revision XI, January 1992.

Where possible, discrepancies will be resolved by URSGWC's chemists (i.e., letters will be written to laboratories). A complete analytical data validation is not anticipated. However, if the initial limited data review reveals significant deviations and problems with the analytical data, URSGWC may recommend a complete validation of the data.

B12.3 Data Usability

A Data Usability Summary Report (DUSR) will be prepared following the guidelines presented in the NYSDEC Division of Environmental Remediation's *Guidance for the Development of Data Usability Summary Reports*, June 1999 Revision. The DUSR will describe the samples and the analytical parameters, data deficiencies, analytical protocol deviations, and quality control problems and their effect on the data. The DUSR will also include recommendations on resampling/reanalysis.

B13.0 PREVENTIVE MAINTENANCE

The laboratory is responsible for maintaining its analytical equipment. Preventive maintenance is provided on a regular basis to minimize down-time and the potential interruption of analytical work. Instruments are maintained in accordance with the manufacturer's recommendations. If instruments require maintenance, only trained laboratory personnel or manufacturer-authorized service specialists are permitted to do the work. Maintenance activities will be documented and kept in permanent logs. These logs will be available for inspection by auditing personnel.

B14.0 PERFORMANCE AND SYSTEM AUDITS

Audits will include a careful evaluation of both field and laboratory quality control procedures, and will be performed before or shortly after systems are operational. The audits will be conducted by an individual who is technically knowledgeable about the operation(s) under review. Performance audits are conducted by introducing control samples into the data production process. These control samples may include performance evaluation samples, or field samples spiked with known amounts of analyte.

Systems audits are onsite qualitative inspections and reviews that provide a quantitative measure of the quality of the data produced by one section of or the entire measurement process. The audits are performed against a set of requirements that may be a quality assurance project plan or work plan, a standard method, or a project statement of work. The primary objective of the systems audits is to verify that the QA/QC procedures are being followed.

B14.1 Performance and External Audits

As part of its established quality assurance program, the laboratory is required to take part in regularly-scheduled performance evaluations and laboratory audits from state and federal agencies. They are conducted as part of the certification process and to monitor the laboratory performance. The audits also provide an external quality assurance check of the laboratory, and provide reviews and information on the management systems, personnel, standard operating procedures, and analytical measurement systems. Acceptable performance on evaluation samples and audits is required for certification and accreditation. The laboratory shall use the information provided from these audits to monitor and assess the quality of its performance. Problems detected in these audits shall be reviewed by the Laboratory QA Manager and Laboratory Management, and corrective action shall be instituted as necessary.

B14.2 Systems/Internal Audits

As part of its quality assurance program, the Laboratory QA Manager shall conduct periodic checks and audits of the analytical systems. The purpose of these is to verify that the analytical systems are working properly, and that personnel are adhering to established procedures and documenting the required information. These checks and audits also assist in determining or detecting where problems are occurring.

The Laboratory QA Manager periodically will submit laboratory control samples. These samples will serve to check the entire analytical method, the efficiency of the preparation method, and the analytical instrument performance. The results of the control samples are reviewed by the Laboratory QA Manager who reports the results to the analyst and the Laboratory Director. When a problem is indicated, the Laboratory QA Manager will assist the analyst and laboratory management in determining the reason and in developing solutions. The Laboratory QA Manager also will recheck the systems as required.

REFERENCES

Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Quality Assurance Manual, Final Copy , Revision I, October 1989.

National Enforcement Investigations Center of USEPA Office of Enforcement. *NEIC Policies and Procedures*. Washington: USEPA.

New York State Department of Environmental Conservation. 1995. *Analytical Services Protocol,* October. Albany, NY..

New York State Department of Environmental Conservation. 1999. Division of Environmental Remediation, *Guidance for the Development of Data Usability Summary Reports*. June. Albany, NY.

United States Environmental Protection Agency (USEPA). 1987. *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87-001, (OSWER Directive 9355.0-14). December. Cincinnati, OH: USEPA.

USEPA. 1994. *Guidance for the Data Quality Objective Process*, EPA QA/G-4. September. Washington: USEPA.

USEPA. 1992. *Evaluation of Metals Data for the Contract Laboratory Program (CLP) based on SOW 3/90, HW-2 (SOP Revision XI)*. 30 January. USEPA Region II.

USEPA. 1996. *Contract Laboratory Program Organic Data Review, SOP No. HW-6, Revision 11.* June. USEPA Region II.

APPENDIX B-1

NYSDEC DATA PACKAGE SUMMARY FORMS

To be included with all lab data and with each workplan

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE IDENTIFICATION AND ANALYTICAL REQUIREMENT SUMMARY

Customer Sample Code	Laboratory Sample Code	Analytical Requirements					
		*VOA GC/MS Method #	*BNA GC/MS Method #	*VOA GC Method #	*Pest PCBs Method #	*Metals	*Other

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
SEMIVOLATILE (BNA)
ANALYSES

Laboratory Sample ID	Matrix	Date Collected	Date Rec'd at Lab	Date Extracted	Date Analyzed

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
VOLATILE (VOA)
ANALYSES

Laboratory Sample ID	Matrix	Date Collected	Date Rec'd at Lab	Date Extracted	Date Analyzed

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
PESTICIDE/PCB
ANALYSES

Laboratory Sample ID	Matrix	Date Collected	Date Rec'd at Lab	Date Extracted	Date Analyzed

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
SEMIVOLATILE (BNA)
ANALYSES

Laboratory Sample ID	Matrix	Analytical Protocol	Extraction Method	Auxiliary Cleanup	Dil/Conc Factor

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY INORGANIC ANALYSES

Laboratory Sample ID	Matrix	Metals Requested	Date Rec'd at Lab	Date Analyzed

PART C

FIELD SAMPLING PLAN
(FSP)

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C1.0 INTRODUCTION

This Field Sampling Plan (FSP) is designed to provide detailed, step-by-step procedures for the field activities outlined in the Work Plan for the Continuing Investigation/Remedial Design at the Scobell Chemical Site. It will serve as the field procedures manual to be strictly followed by all URSGWC personnel. Adherence to these procedures will ensure the quality and defensibility of the field data collected. In addition to the field procedures outlined in this document, all personnel performing field activities must do so in compliance with: (1) the appropriate health and safety guidelines found in the Health and Safety Plan (HASP); (2) the quality assurance/quality control measures outlined in the Quality Assurance Project Plan (QAPjP); (3) the scope of work outlined in the Work Plan and (4) the time schedule outlined in the Project Management Work Plan Budget Estimate.

C2.0 MOBILIZATION

A mobile, temporary decontamination pad will be constructed to decontaminate vehicles/heavy equipment/drill rigs entering and leaving the site. The decontamination area will be large enough to allow the storage of cleaned equipment and materials prior to use, as well as to stage drums of contaminated material. Drums of decontamination fluids and investigation-derived wastes will be stored on pallets covered with plastic sheeting in the decontamination area.

Proposed well locations will be staked, labeled, and flagged prior to drilling. Utilities in areas designated for intrusive activities will be cleared through the Underground Facilities Protective Organization (UFPO). Vehicle access routes to drilling and sampling locations shall be determined and cleared before beginning intrusive activities.

C3.0 SUBSURFACE INVESTIGATION

C3.1 General Drilling Program

The subsurface investigation program will provide information which will assist in geological, geotechnical, hydrogeological, and chemical site interpretations. Borings and monitoring wells are proposed as part of the subsurface program.

The following applicable investigation and monitoring well installation procedures are discussed in the subsequent subsections.

- Hollow-Stem Auger Drilling
- Split-Spoon Sampling
- NX -Coring
- Wash-Rotary Drilling
- Disposal of Drill Cuttings
- Plugging/Abandonment of Borehole
- Overburden Well Construction
- Bedrock Well Construction
- Well Development
- Slug Testing
- Documentation (Section C6.12);

C3.2 Hollow-Stem Auger Drilling

Summary: A hollow-stem auger (HSA) drilling is a standard method of subsurface drilling which enables the recovery of representative subsurface samples for identification and laboratory testing.

Procedure: 1) Advance the boring by rotating and advancing the augers the desired distance into the subsurface. The borings will be advanced incrementally to permit continuous or intermittent sampling as required.

2) Remove center plug from augers and sample subsurface per method stipulated by the project geologist or hydrogeologist. Sampling methods are presented in Section C3.3.

Reference: American Society of Testing Materials (ASTM), "Standard Practice for Soil Investigation and Sampling by Auger Borings," Standard D1452-80, and "Standard Method for Penetration Test and Split Barrel Sampling of Soils," Standard D1586-84.

C3.3 Split-Spoon Sampling

Summary: Split-spoon sampling is a standard method of soil sampling to obtain representative samples for identification and laboratory testing as well as to serve as a measure of resistance of soil to sampler penetration.

Procedure:

1) Measure the sampling equipment lengths to ensure that they conform to specifications. Confirm the weight of the hammer (140 pounds).

2) Clean out the auger flight to the bottom depth prior to sampling. Select additional components as required (i.e., leaf spring core retainer for clays or a sand trap for non-cohesive sands).

3) Lower the sampler to the bottom of the auger column and check the depth against length of the rods and the sampler.

4) Attach the drive head sub and hammer to the drill rods without the weight resting on the rods.

5) Lower the weight and allow the sampler to settle up to 6 inches. If it settles more, consider using another sampler.

6) Mark four 6-inch intervals on the drill rods relative to a drive reference point on the rig. With the sampler resting on the bottom of the hole, drive the sampler with the 140 pound hammer falling freely over its 30-inch fall until 24 inches have been penetrated or 100 blows applied.

7) Record the number of blows per 6 inches. Determine the "N" value by adding the blows for the 6- to 12-inch and 12- to 18-inch interval of each sample attempt.

8) After penetration is complete, remove the sample.

9) Open sampler and describe the soil.

10) Document all properties and sample locations in the field notebook and later on the Boring Log form (Figure C3-1).

11) Place sample in suitable container, label (Section C7.0), and store on site until onsite work has been completed, at which time the samples will be properly disposed of.

Reference: ASTM "Standard Method for Penetration Test and Split Barrel Sampling of Soils, Standard D1586-84.

C3.3.1 Unified Soil Classification System

Soils are classified for engineering purposes according to the Unified Soil Classification System (USCS) adopted by the United States Army Corps of Engineers and United States Department of the Interior Bureau of Reclamation. Soil properties which form the basis for the USCS are:

- Percentage of gravel, sand, and fines
- Shape of the grain-size distribution curve
- Plasticity and compressibility characteristics

According to this system, all soils are divided into three major groups: coarse-grained, fine-grained, and highly-organic (peaty). The boundary between coarse-grained and fine-grained soils is taken to be the 200-mesh sieve (0.074 millimeters). In the field, the distinction is based on whether the individual particles can be seen with the unaided eye. If more than 50 percent of the soil by weight is judged to consist of grains that can be distinguished separately, the soil is considered to be coarse-grained.

The coarse-grained soils are divided into gravelly (G) or sandy (S) soils, depending on whether more or less than 50 percent of the visible grains are larger than the No. 4 sieve (3/16 inch). They are each divided further into four groups:

TEST BORING LOG

URS Greiner Woodward Clyde

PROJECT:

SHEET: OF

CLIENT:

JOB NO.:

BORING CONTRACTOR:

BORING LOCATION:

GROUND WATER:

GROUND ELEVATION:

DATE	TIME	LEV	TYPE

	CAS.	SAMP	CORE	TUBE
TYPE				
DIA.				
WT.				
FALL				

* PENETROMETER READING

DATE STARTED:

DATE FINISHED:

DRILLER:

GEOLOGIST:

REVIEWED BY:

		SAMPLE				DESCRIPTION					
DEPTH FEET	STRATA	NO.	TYPE	BLOWS PER 6"		RECOVERY RQD %	COLOR	CONSISTENCY HARDNESS	MATERIAL DESCRIPTION	CLASS USCS	REMARKS
5											
10											
15											
20											
25											
30											
35											

COMMENTS: ______

______

PROJECT NO.: ______

BORING NO.: ______

URSF-031/1 OF 1/TBL/GCM

Figure C3-1

W: Well graded; fairly clean (less than 5 percent finer than 0.074 mm)

P: Poorly graded (gap-graded); fairly clean (less than 5 percent finer than 0.074 mm)

C: Clayey (greater than 12 percent finer than 0.074mm); plastic (clayey) fines. Fine fraction above the A-line with plasticity index above 7.

M: Silty (greater than 12 percent finer than 0.074 mm); nonplastic or silty fines. Fine fraction below the A-line and plasticity index below 4.

The soils are represented by symbols such as GW or SP. Borderline materials are represented by a double symbol, as GW-GC.

The fine-grained soils are divided into three groups: inorganic silts (M), inorganic clays (C), and organic silts and clays (O). The soils are further divided into those having liquid limits lower than 50 percent (L), or higher than 50 percent (H). The distinction between the inorganic silts (M), the inorganic clays (C), and organic soils (O) is made on the basis of a modified plasticity chart. Soils CH and CL are represented by points above the A-line, whereas soils OH, OL, and MH correspond to positions below the A-line. Soils ML, except for a few clayey fine sands, are also represented by points below the A-line. The organic soils O are distinguished from the inorganic soils M and C by their characteristic odor and dark color.

C3.3.2 Visual Identification

Soil properties required to define the USCS classification of a soil are the primary features to be considered in field identification. These properties and other observed characteristics normally identified in describing a soil are defined below:

- Color
- Moisture conditions
- Grain size
    - Estimated maximum grain size
    - Estimated percent by weight of fines (material passing No. 200 sieve)
- Gradation

- Grain shape
- Plasticity
- Predominant soil type
- Secondary components of soil
- Classification symbol
- Other features such as:
  - organic, chemical, or metallic content
  - compactness
  - consistency
  - cohesiveness near plastic limit
  - dry strength
  - source - residual, or transported (aeolian, water borne, glacial deposit, etc.)

C3.4 NX-Coring

Summary: NX-Coring is a standard method of subsurface drilling which enables the recovery of bedrock cores for identification.

Procedure:

1) Advance the boring into the bedrock by core drilling using a NX-size, double-tube, swivel-type core barrel. Continue drilling until core blockage occurs or until the net length of the core barrel has been drilled.

2) Remove the core barrel from the hole and disassemble it as necessary to remove the core. Reassemble the core barrel and return it to the hole. Resume coring.

3) Place recovered core in the core box with the upper (surface) end of the core at the upper-left corner of the core box. Fit fractured, bedded, or jointed pieces of core together as they naturally occurred.

4) The following observations will be recorded from the rock core:

   a) Core recovery percent

   b) Color

   c) Rock classification

d) Rock hardness

e) Rock brokenness, including descriptions of natural breaks

f) Rock Quality Designation (RQD)

$$RQD = \frac{\text{Sum of core lengths} > 4\text{"/run} \times 100}{\text{Total length of core run}}$$

Reference: ASTM, "Standard Practice for Diamond Core Drill for Site Investigation," Standard D2113-83 (1987)

C3.5 Wash Rotary Drilling

Summary: Wash rotary drilling is a method of subsurface drilling wherein a drilling fluid (water in this case) is circulated through the drill string to wash cuttings out of the borehole and lubricate drilling tools.

Procedure:

1) Connect drilling water supply pump to drill string.
2) Advance the boring by spinning the drill bit the desired distance into the subsurface.
3) Use a recirculating system to collect and separate cuttings rising out of the borehole.
4) Note rate of drilling and volume of water lost down the borehole.

C3.6 Disposal of Drill Cuttings

Summary: Drill cuttings will be disposed of in accordance with New York State Department of Environmental Conservation (NYSDEC) *Technical and Administrative Guidance Memorandum* (TAGM) HWR-89-4032, November 21, 1989.

Procedure:

1) Cuttings will be stored/disposed of on site in bulk and monitored for volatile emissions with on site instruments. If any action level specified in the Health and Safety Plan (HASP) is exceeded, corrective

action such as interim cover or placement in containers will be implemented promptly.

2) If pure wastes are present in the cuttings, the material shall be sampled and analyzed to ensure chemical compatibility with other cuttings before placing the materials in a common storage or disposal area.

3) Drill cuttings generated near or adjacent to the site will be collected and transported to the site for disposal.

4) If materials are found to be hazardous, cuttings will be disposed of off site at a properly permitted treatment, storage or disposal facility.

C3.7 Plugging/Abandoning Borehole

Summary: Boreholes that are not completed as monitoring wells will be sealed (plugged) prior to abandonment to prevent downhole contamination. Sealing can be achieved by backfilling the borehole with bentonite or with a cement/bentonite grout. The grout will be introduced from bottom to top using either a tremie pipe or the drill rods.

Procedure: 1) Determine most suitable seal materials. Grout specifications generally have mixture ratios as follows:

Grout Slurry Composition (Percent Weight)

1.5 to 3.0 percent - Bentonite (Quick Gel)
40 to 60 percent - Cement (Portland Type I)
40 to 60 percent - Water

2) Calculate the volume of the borehole based on the bit or auger head diameter plus 10 percent and determine the volume of grout to be emplaced. Generally, the total mixed volume is the borehole volume plus 20 percent.

3) Identify the equipment to be used for preparing and mixing of the grout. Ensure the volume of the tanks to be used for mixing has been measured adequately. Document these volumes.

4) Identify the source of the water to be used for the grout and determine its suitability for use. In particular, water with high sulfate or chloride levels, or heated water, should not be used. These types of waters can cause operational difficulties or modify the set-up for the grout.

5) Identify the equipment to be used for emplacing the grout. Ensure that the pump to be used has adequate pressure to enable complete return to surface.

6) Identify the volumes to be pumped at each stage or in total if only one stage is to be used.

7) Prepare the borehole plugging plan and discuss the plan and activities with the drilling contractor prior to beginning any mixing activities.

8) Begin mixing the grout to be emplaced.

9) Record the type and amount of materials used during the mixing operation. Ensure that the ratios are within specification tolerance.

10) Begin pumping the grout through the return line bypass system to confirm that all pump and surface fittings are secure.

11) Initiate downhole pumping. Record the times and volumes emplaced on the form.

12) Document the return circulation of grout. This may be facilitated by using a colored dye or other tagging method if a mudded borehole condition exists prior to grout injection.

13) Identify which procedures will be used for grouting in the upper feet. When casing exists in the borehole, decisions are required as to the timing for removal and final disposition of the casing. Generally it will not be removed prior to grouting because of the potential for difficult access and loss of circulation in the upper soil or rock layers. Accordingly, when cement return is achieved at surface, the casing is commonly removed and the borehole is topped off with grout or soil. If casing removal is not possible or not desired, the casing left in place is cut off at or near the

ground surface. If casing is not present during grouting, the grout level in the borehole is topped off after the rods or tremie pipe is removed.

14) Clear and clean the surface near the borehole. Level the ground to about the pre-existing grade. Add grout or cement as necessary to the area near the borehole.

Note: On occasion, there may be some settling of the grout which takes place over several days. If this settling occurs, the natural soil from the immediate vicinity are used to put the level at grade. A follow-up check at each site should be made within one week to 10 days of completion. Document the visit and describe any action taken.

C3.8 Overburden Well Construction

The monitoring well network will conform to the program and design specifications set forth in the Work Plan.

Summary: One shallow overburden monitoring well (B-10) will be installed to allow for collection of groundwater samples. This monitoring well will conform to the construction specification described below.

Procedure:

1) Collect split-spoon samples from the ground surface continuously to the top of bedrock. Characterize soil samples following procedures specified in Section C3.3.

2) Advance the 4¼-inch inside diameter (ID) HSAs to the top of bedrock.

3) Remove the center plug from the augers and measure the depth to the top of bedrock from the ground surface using a weighted measuring tape.

4) Attach a nominal 3⅞-inch roller bit to the drill rods and ream 3 feet into bedrock through the augers.

5) Insert a 5-foot section of 2-inch ID continuous wrap wire-wound stainless-steel well screen. Attach sections of 2-inch ID stainless-steel riser pipe through the augers as necessary. Cap the top of the riser pipe to prevent well construction material from entering the well.

6) Add sand to the screened section of the well and slowly remove the augers. The sand pack should extend at least 2 feet above the top of the well screen. Measure with a weighted measuring tape to ensure the sand pack has been installed accurately.

7) Slowly add bentonite pellets into the borehole and continue to slowly remove the augers. The bentonite seal should extend at least 2 feet above the sand pack. Measure with a weighted measuring tape.

Note: The rate of removal of the augers from the borehole should closely follow the rate that the sand pack and bentonite pellets fill the borehole.

8) Hydrate the bentonite pellets with water and let set for 30 minutes.

9) Mix cement/bentonite grout per the specifications presented in Section 3.7.

10) Add the grout to the borehole via a tremie pipe or hose. Fill the borehole to 2 feet below the ground surface.

11) Backfill the remaining 2 feet of the borehole with concrete.

12) Cut the well riser pipe just below the ground surface and install protective flush-mount casing into the concrete around riser pipe.

13) Insert riser cap (J-plug) into well riser. Lock the protective casing cap.

14) Document well construction details in the field notebook and transfer the data onto the Shallow Bedrock Monitoring Well Construction Detail form (Figure 3-2).

C3.9 Bedrock Well Construction

Summary: Four pairs (eight) deep bedrock monitoring wells will be installed. Constructing monitoring wells within the bedrock aquifer allows for the collection of groundwater samples and groundwater elevations.

Procedure: 1) Collect split-spoon soil samples at two foot increments while advancing 8½-inch ID HSAs to the top of bedrock. Follow the procedure in Section C3.3. Split-spoon samples will be collected only at the deep well borings.

SHALLOW BEDROCK WELL CONSTRUCTION DETAILS

URS Greiner Woodward Clyde

DRILLING SUMMARY

Geologist:

Drilling Company:

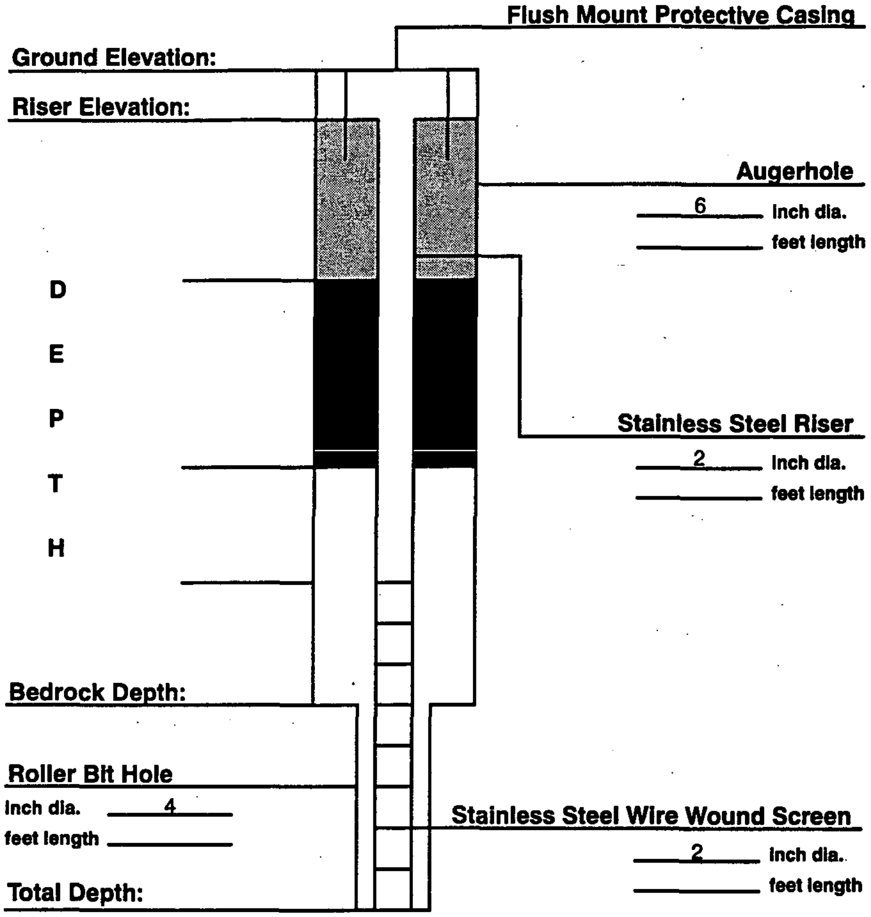
Driller:

Rig Make/Model:

Date:

GEOLOGIC LOG

Depth(ft.)	Description



WELL DESIGN

CASING MATERIAL	SCREEN MATERIAL	FILTER MATERIAL
Surface:	Type:	Type: Setting:
		SEAL MATERIAL
Monitor:	Slot Size:	Type: Setting:

COMMENTS	LEGEND
	▨ Cement/Bentonite Grout ■ Bentonite Seal ☐ Silica Sandpack
	Well No.
Client: Location:	Project No.

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Figure C3-2

2) Remove the center plug from the augers and measure the depth to the top of bedrock from the ground surface using a weighted measuring tape.

3) Attach a nominal 7⅞-inch roller bit to the drill rods and ream 3 feet into the bedrock through the augers.

4) Install 6-inch steel casing into the borehole and set it 3 feet into the bedrock. The steel casing should be flush with the ground surface.

5) Remove the augers and grout the annular space between the steel casing and the borehole wall. Allow the grout to cure for 24 hours before continuing with the boring.

6) At deep well boring locations collect NX- rock core samples at 5- to 10-foot increments to approximately 65 feet below ground surface. After coring, attach a 5⅞-inch roller bit to the drill rods and ream throughout the core interval.

7) Install sections of 4-inch steel casing into the borehole. Cut the 4-inch steel casing approximately 2 feet above grade.

8) Mix cement/bentonite grout per the specifications presented in Section 3.7.

9) Add the grout to the borehole between the steel casing and well riser via a tremie pipe. Grout the annular space to the surface. Allow grout to cure for 24 hours.

10) Collect a 10-foot NX-rock core sample in deep well borings beyond the 4-inch steel casing.

11) Attach a 3⅞-inch roller bit to the drill rods and ream the borehole throughout core interval.

12) Insert riser cap (J-plug) into well riser. Lock the steel casing lid.

13) Document well construction details in the field notebook and transfer the data onto the Bedrock Monitoring Well Construction Detail form (Figure 3-3).

Note: Shallow wells will be installed identical to the deep wells to an anticipated depth of 25 to 35 feet. Split spoon sampling and coring will not be conducted at the shallow well location.

BEDROCK WELL CONSTRUCTION DETAILS

URS Greiner Woodward Clyde

DRILLING SUMMARY

Geologist:

Drilling Company:

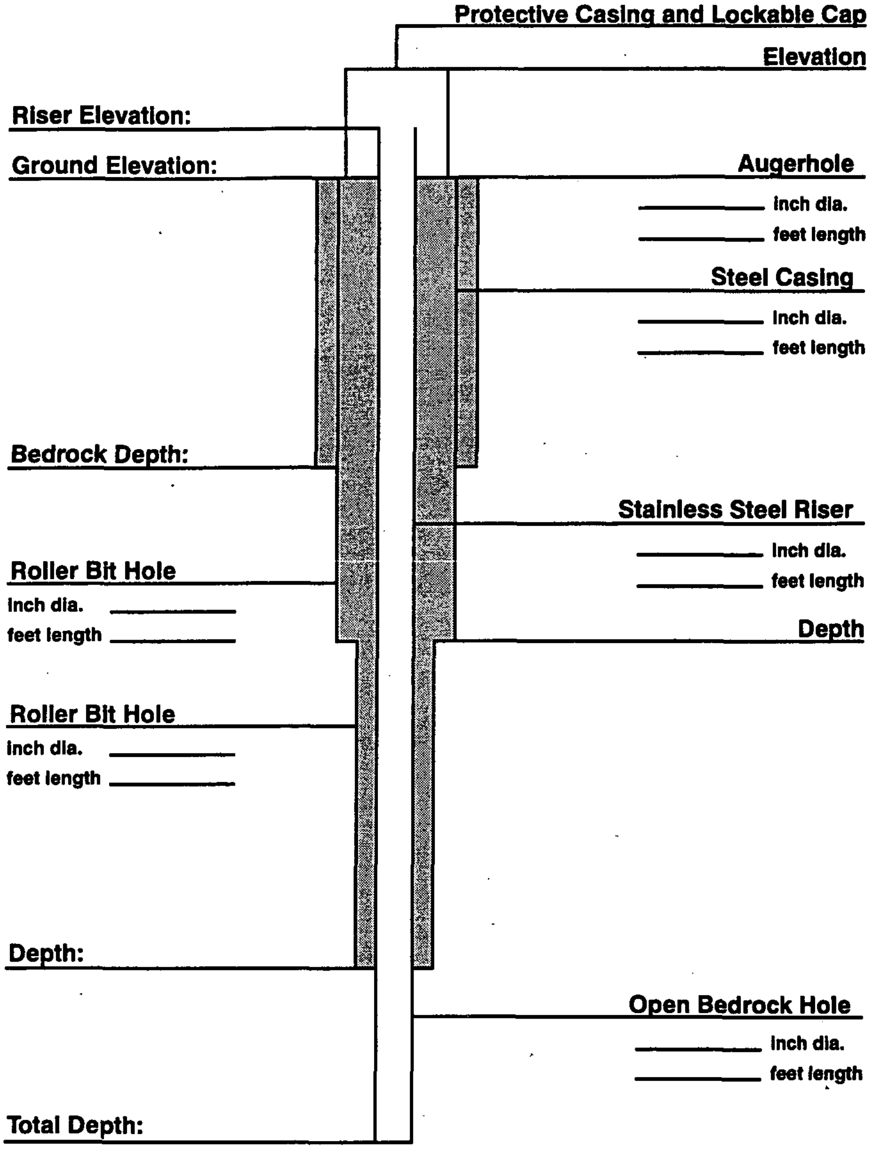
Driller:

Rig Make/Model:

Date:

GEOLOGIC LOG

Depth(ft.)	Description



WELL DESIGN

CASING MATERIAL	SCREEN MATERIAL	FILTER MATERIAL
Surface:	Type:	Type: Setting:
Monitor:	Slot Size:	SEAL MATERIAL Type: Setting:

COMMENTS	LEGEND
	▨ Cement/Bentonite Grout ■ Bentonite Seal □ Silica Sandpack
	Well No.

Client:	**Location:**	**Project No.**

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Figure C3-3

C3.10 Well Development

Summary: Following completion of drilling and well installation, each monitoring well will be developed by pumping until the discharged water is relatively sediment free and the indicator parameters (pH, temperature, and specific conduction) have reached steady-state. Developing the well not only removes any sediment, but also may improve the hydraulic properties of the formation. The effectiveness of the development measures will be monitored closely to keep the volume of discharged water to the minimum necessary to obtain sediment-free samples. A portable turbidimeter will be used to monitor effectiveness of development. A turbidity reading of less than 50 nephelometric turbity units (NTUs) and steady-state pH, temperature, dissolved oxygen, and specific conductivity readings will be used as a guide for discontinuing well development.

Procedure:

1) An appropriate well development method should be selected, depending on water level depth, well productivity, and sediment content of water. Well development options include: manual pumping, and powered suction-lift or hydrolift pumping.

2) Equipment should be assembled, decontaminated (if necessary), and installed in the well. Care should be taken not to introduce contaminants to the equipment during installation.

3) Well development should proceed by repeatedly removing water from the well until the discharged water is relatively sediment-free. The volume of water removed from the wells will not be less than that lost to the formation during drilling. All development water will be containerized on site in a bulk 1,500-gallon holding tank. The water either will be treated on site or disposed of off site. The effectiveness of development should be monitored at regular intervals using a portable turbidimeter. Volume of water removed and turbidity, pH, temperature, dissolved oxygen, and conductivity measurements will be recorded on a Well Development/Purging Log form (Figure C3-4).

4) Well development will be discontinued when the turbidity of the

WELL DEVELOPMENT / PURGING LOG

URS Greiner Woodward Clyde

PROJECT TITLE: ______________________ WELL NO.: ____________

PROJECT NO.: ______________________

STAFF: ______________________

DATE(S): ______________________

1. TOTAL CASING AND SCREEN LENGTH (FT.) = ____________
2. WATER LEVEL BELOW TOP OF CASING (FT.) = ____________
3. NUMBER OF FEET STANDING WATER (#1 - #2) = ____________
4. VOLUME OF WATER/FOOT OF CASING (GAL.) = ____________
5. VOLUME OF WATER IN CASING (GAL.)(#3 x #4) = ____________
6. VOLUME OF WATER TO REMOVE (GAL.)(#5 x ______) = ____________
7. VOLUME OF WATER ACTUALLY REMOVED (GAL.) = ____________

WELL ID.	VOL. (GAL./FT.)
1"	0.04
2"	0.17
3"	0.38
4"	0.66
5"	1.04
6"	1.50
8"	2.60

OR

$V = 0.0408 \times (\text{CASING DIAMETER})^2$

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
	0										
pH											
SPEC. COND. (μmhos)											
TURBIDITY (NTU)											
TEMPERATURE (°C)											

COMMENTS:

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Figure C3-4

discharged water is below 50 NTUs and the other indicator parameters have stabilized.

C3.11 Slug Testing

Summary: Slug testing is a rapid and inexpensive procedure for estimating the horizontal hydraulic conductivity of an aquifer material screened by a monitoring well. Equipment consists of dedicated/disposable nylon rope, a decontaminated stainless-steel slug and pressure transducer, a Hermit data logger, and a water level indicator.

Procedure:

1) Measure dimensions of the slug to be used to displace water in the monitor, and predetermine the volume of water which will be displaced and corresponding initial water level change which will occur by adding or removing the slug.
2) Record initial water level in the well (static water level).
3) Lower the precleaned pressure transducer into well to well bottom. Pull transducer up 1 foot. Connect transducer to Hermit data logger.
4) Insert stainless-steel slug into well, below water table, with nylon rope. Allow water level in well to return to static condition.
5) Simultaneously initiate Hermit data logger and rapidly insert or remove the slug from the well.
6) Monitor water level recovery in well with Hermit data logger until static water level has been regained.
7) Download Hermit data logger and record data in field notebook. Review data to verify slug test was successful.
8) Remove equipment from well and decontaminate.
9) Analyze data in office using computer.

C3.12 Documentation

Each subsurface boring will be logged in a bound field notebook during drilling by the supervising geologist. Field notes will include descriptions of subsurface materials encountered during drilling, sample numbers, and types of samples recovered from the borehole. Additionally, the geologist will note time and material expenditures for later verification of contractor invoices.

Upon completion of daily drilling activities, the geologist will complete the daily drilling record form and initiate chain-of-custody on any samples recovered for geotechnical or chemical laboratory testing. After completing the drilling program, the geologist will transfer field notes onto standard forms.

On a weekly basis, the project geologist will submit a summary report to the project manager containing at a minimum the following: (1) a summary of the daily drilling records; (2) progress report on field activities; and (3) a record of site visitors.

Properly completing the following forms/logs will be considered correct procedure for documentation during the drilling program:

- Field Notebook - weather-proof hand-bound field notebook
- Boring Log (C3-1)
- Monitoring Well Construction Details (Figures C3-2 and C3-3)
- Well Development/Purging Log (C3-4)
- Daily Drilling Records (Figure C3-5)

DAILY DRILLING RECORD

URS Greiner Woodward Clyde

PROJECT: ____________________ DATE: ____________________

CLIENT: ____________________ CONTRACTOR: ____________________

FROM	TO	PRODUCTIVE HOURS	ACTIVITY / COMMENTS
TOTAL PRODUCTIVE HRS.			LEVEL B / LEVEL C / LEVEL D (circle selection)

LABOR:		MATERIALS / SUPPLIES:	
UNITS	ACTIVITY	UNITS	ITEM

WEATHER:

URS ON-SITE COORDINATOR

CONTRACTOR REPRESENTATIVE

Figure C3-5

C4.0 GROUNDWATER INVESTIGATION

C4.1 Well Purging

Summary: To collect representative groundwater samples, groundwater wells must be adequately purged prior to sampling. Low volume sampling equipment and procedures will be used to retrieve groundwater samples. Purging will require the removal of one to three volumes of standing water by pumping at a rate of less than 1 liter per minute. Drawdown must not exceed 10 percent of the standing water column. Sampling should begin immediately after purging.

Procedure:

1) The well cover will be unlocked and carefully removed to avoid having any foreign material enter the well. The interior of the riser pipe will be monitored for organic vapors using a photoionization detector (PID). If a reading of greater than 5 parts per million (ppm) is recorded, the well will be vented until levels are below 5 ppm before purging begins.

2) Allow the well to equilibrate to atmospheric conditions for 1 hour before collecting data.

3) Using an electronic water level detector, measure the water level below top of casing. Knowing the total depth of the well, it will be possible to determine the volume of water in the well. Wash the end of the probe with soap-and-water-washed and rinse with deionized water between wells.

4) Calibrate field parameter meters (e.g., pH, eh, specific conductance, dissolved oxygen, PID/flame ionization detector, turbidity).

5) In all wells, a decontaminated submersible pump will be used to purge the required water volume (i.e., until stabilization of pH, temperature, specific conductivity, and turbidity). Dedicated new polyethylene discharge and intake tubing high density polyethylene (HDPE) will be used for each well.

6) Install slowly into the well pump and set the pump to about the midpoint of the well screen. Configure the dedicated HDPE tubing with

a gate valve and three-way valve with the discharge directed through the three-way valve and flow cell, and into a calibrated bucket.

7) Pump water at less than 1 liter per minute and measure the water level continuously. Adjust the discharge rate until the water level does not drop beyond 10 percent of the screen length.

8) Purge the well until the field parameters have stabilized. Field parameters will be recorded every 5 minutes. The stabilization criteria are: conductivity - 3 percent full scale range; pH - 0.10 pH unit; temperature - 0.2 degrees Celsius; Eh ± 10 millivolts; dissolved oxygen - 10 percent, turbidity - 10 percent. Field parameters will be considered stable after the above criteria have been met for three successive readings.

9) Purging three well volumes is not necessary if the indicator parameters are stable. However, at least one well volume must be purged before sampling can begin. During purging, it is permissible to by-pass the flow cell until the groundwater has cleared.

10) Indicator parameters must be measured continuously using the flow cell.

11) Well purging data are to be recorded in the field notebook and on the Well Development/Purging Log (Figure C3-4).

12) Follow procedures for water containment as specified in Step # 3 in Section C3.10.

C4.2 Groundwater Sampling

Summary: Groundwater sampling locations and frequency of sampling are defined in the Work Plan. The samples will be labeled and shipped following procedures outlined in Sections C7.0 and C8.0, and analyzed according to the program outlined in Section A2.5 of the Work Plan.

Procedure: 1) After well purging is completed, samples will be collected into the appropriate containers. Sampling order is critical and shall be collected as follows: volatile organic compounds, semivolatile organic compounds, pesticides, and metals.

2) Disconnect the flow cell during sampling and reduce pump rate to 100 milliliters per minute. Direct the discharge tubing toward the inside wall of the jar to minimize volatilization. Fill jars to overflowing. Preserve as needed and cap all jars.

3) Label all sample bottles in the field using a waterproof permanent marker following the procedure outlined in Section C7.0.

4) Collect samples into verifiably clean sample bottles (containing required preservatives) and placed on ice in coolers for transport to the Support Zone for processing (preservation and packing) prior to shipment to the analytical laboratory. Initiate chain-of-custody. The analytical laboratory will certify that the sample bottles are analyte-free. Table C4-1 presents the sample container, preservation, and holding time requirements.

5) Remove pump and disconnect valves and tubing. Submersible pumps must be decontaminated prior to and between each use. Follow decontamination procedure (Section C6.0) and clean pump by flushing 10 gallons of potable water through the pump. Rinse with deionized water after flushing the pump.

(6) Recorded well sampling data recorded in the field notebook and on the Well Development/Purging Log (Figure C3-4).

C4.3 Sampling Immiscible Layers in Groundwater

Summary: To collect nonaqueous phase liquid (NAPL) samples from groundwater monitoring wells, the presence and thickness of light NAPL (floaters) and/or dense NAPL (sinkers) must be evaluated. Sample collection should be performed in accordance with the appropriate safety requirements presented in the HASP following the procedures described below.

Procedure: 1) Perform well sampling for NAPLs before purging and sampling the aqueous matrix in the well for conventional parameters. Unlock and carefully remove the well cover. Monitor the interior of the riser for

TABLE C4-1
SAMPLE CONTAINER, PRESERVATION AND HOLDING TIME REQUIREMENTS
SCOBELL CHEMICAL SITE

PARAMETER	ANALYTICAL METHOD	CONTAINER	SAMPLE VOLUME	PRESERVATION	HOLDING TIME*
Water/Aqueous Waste					
TCL Volatiles	ASP 95-1	G	3-40ml VOA	Cool 4° C	7 days
TCL Semivolatiles	ASP 95-2	G	2-1 liter	Cool 4° C	5 days for extraction/40 days for analysis
TCL Pesicides/PCBs	ASP 95-3	G	2-1 liter	Cool 4° C	5 days for extraction/40 days for analysis
TAL Metals (total)	ASP CLP-M	P,G	1-1 liter	HNO_3 to pH<2, Cool 4° C	6 months; 26 days for mercury
Cyanide	ASP CLP-M	P	500 ml	NaOH to pH>12, Cool 4° C	12 days
TCLP Volatiles	8260B	G	3-40ml VOA	Cool 4° C	7 days to TCLP extraction; 7 days for analysis
TCLP Semivolatiles	8270C	G	2-1 liter	Cool 4° C	5 days to TCLP extraction/7 days until extraction/40 days for analysis
TCLP Pesticides	8081A	G	2-1 liter	Cool 4° C	5 days to TCLP extraction/7 days until extraction/40 days for analysis
TCLP Herbicides	8151A	G	2-1 liter	Cool 4° C	5 days to TCLP extraction/7 days until extraction/40 days for analysis
TCLP Metals	6010B/7000A	P,G	1-1 liter	Cool 4° C	6 months to TCLP extraction/ 6 months for analysis; mercury 5 days to TCLP extraction/ 26 days for analysis.
TCL PCBs	8082	G	2-1 liter	Cool 4° C	5 days for extraction/40 days for analysis
Ignitability	1010	G	1-1 liter	Cool 4° C	As soon as possible
Corrosivity	9040B				
Reactivity	Chapter 7 Section 7.3				
DNAPL/Solid Waste					
TCL Volatiles	ASP 95-1	G	2-4 oz.	Cool 4° C	10 days
TCL Semivolatiles	ASP 95-2	G	1-8 oz.	Cool 4° C	10 days for extraction/40 days for analysis
TCL Pesticides/PCBs	ASP 95-3	G	1-8 oz.	Cool 4° C	10 days for extraction/40 days for analysis
TCL PCBs	ASP 95-3	G	1-8 oz.	Cool 4° C	10 days for extraction/40 days for analysis
TAL Metals	ASP CLP-M	G	1-8 oz.	Cool 4° C	6 months; 26 days for Mercury
Cyanide	ASP CLP-M	G	1-8 oz.	Cool 4° C	12 days
TCLP Volatiles	8260B	G	2-4 oz. VOA	Cool 4° C	7 days to TCLP extraction; 7 days for analysis
TCLP Semivolatiles	8270C	G	1-8 oz.	Cool 4° C	5 days to TCLP extraction/7 days until extraction/40 days for analysis
TCLP Pesticides	8081A				5 days to TCLP extraction/7 days until extraction/40 days for analysis
TCLP Herbicides	8151A				5 days to TCLP extraction/7 days until extraction/40 days for analysis
TCLP Metals	ASP CLP-M				6 months to TCLP extraction/ 6 months for analysis; mercury 5 days to TCLP extraction/ 26 days for analysis.
TCL PCBs	8082	G	1-8 oz.	Cool 4° C	10 days until extraction/40 days for analysis
Ignitability	1030	G	1-8 oz.	Cool 4° C	As soon as possible
Corrosivity	9045C				
Reactivity	Chapter 7 Section 7.3				

* All holding times begin with the Validated Time of Sample Receipt (VTSR) at the laboratory.

New York State Department of Environmental Conservation, Analytical Services Protocol (ASP), 10/95 Edition.

USEPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), June 1997.

P- Polyethylene ; G- Glass

organic vapors using a PID. If a reading of greater than 5 ppm is recorded, allow the well to vent.

2) Measure the depth to the static liquid level below the top of the riser pipe using an oil/water interface probe. Measure "floaters" and "sinkers" with the interface probe.

3) Assemble the discrete bailer with a filler check valve on the top or bottom of the body of the bailer. If floaters are to be sampled, attach a filler check valve on the top of the bailer. If sinkers are to be sampled, attach a filler check valve to the bottom of the bailer.

4) Push-on a quick connect swagelok tubing connector onto the check valve assembly and attach ¼-inch polyethylene tubing.

5) Using a hand air pump, pressurize the bailer to a pounds-per-square-inch (psi) of one-half the sampling depth plus 5 psi.

6) Lower the bailer using the stainless-steel cable to the desired depth.

7) Release the pressure at the source (hand pump) and allow 3 to 5 minutes for the bailer to fill.

8) Repressurize the bailer to the psi used in Step 5 above and retrieve bailer from well.

9) Disconnect the quick connect fitting and remove the sample by depressing the check valve and allowing the sample to flow into the sample container.

10) Repeat steps 4 through 9 until sufficient volume is retrieved.

11) Disassemble and clean the bailer by the procedure in Section C6.0.

C4.4 Water and DNAPL Level Monitoring

Summary: Determining the groundwater surface elevations throughout a monitoring well network makes possible the construction of a potentiometric surface contour map and determination of groundwater flow patterns. Water levels in all monitoring wells will be measured using an electronic water level indicator or weighted tape. Initially, measurements will be taken following well development until the well has recovered to anticipated static conditions. Water levels also will be measured prior to groundwater sampling. Water level measurement procedures are presented below.

Procedure:

1) Clean water level probe and the lower portion of cable following standard decontamination procedures (Section C6.0), and test water level meter to ensure that the batteries are charged.
2) Lower probe slowly into the monitoring well until audible alarm indicates water.
3) Read depth, to the nearest hundredth of a foot, from the graduated cable using the V-notch on the riser pipe as a reference.
4) Repeat the measurement for confirmation and record the water level.
5) Remove the probe from the monitor slowly, drying the cable and probe with a clean "Chem Wipe" or paper towel.
6) Replace monitoring well cap and lock protective cap in place.
7) Decontaminate the water level meter (Section C6.0) if additional measurements are to be taken.

Dense nonaqueous-phase liquid (DNAPL) measurements and product thicknesses will be determined using an oil/water interface probe by the methods described above (Appendix C-1).

C5.0 SURVEYING AND MAPPING

Project control surveying will provide for site topographic mapping and the location of sampling points. All surveying will be performed under the supervision of a New York State-licensed land surveyor, following the requirements of the Work Plan, and the Health and Safety Plan.

C5.1 Establishing Horizontal Primary Project Control

Summary: To determine the horizontal locations of site features, horizontal control will be established by surveying to/from established survey monuments in the New York State Plane Coordinate System, Transverse Mercator Projection, East Zone, North American Datum of 1983. This information will be used on all topographic and site maps.

Procedure:

1) Research for monuments.
2) Recover monuments in field.
3) Set and reference points on primary traverse.
4) Turn angles and measure distances.
5) Compute closures and adjust traverse.

C5.2 Establishing Vertical Primary Project Control

Summary: To determine site elevations, vertical control must be established by surveying to/from established survey monuments in the North American Vertical Datum of 1988 network.

Procedure:

1) Research for monuments.
2) Recover monuments in field.
3) Set project benchmarks.
4) Run level line from monuments to set project benchmarks and back.
5) Reduce notes and adjust benchmark elevations.
6) Prepare recovery sketches.

C5.3 Global Positioning System (GPS) Surveying

Most of the surveying will be performed using GPS systems methodologies. This data will be converted into the horizontal and vertical coordinate systems noted in Sections C5.1 and C5.2. GPS data will be sufficient vertical accuracy to be able to interpret groundwater level measurements.

C6.0 SAMPLING EQUIPMENT CLEANING

Summary: To assure that no outside contamination will be introduced into the samples/data, thereby invalidating the samples/data, the following cleaning protocols will apply for all equipment used to collect samples/ data during the field investigations (drilling equipment will be steam-cleaned on the decontamination pad).

Procedure:

1) Thoroughly clean equipment with laboratory-grade soap and water until all visible contamination is removed.
2) Rinse with tap water, until all visible evidence of soap is removed.
3) Rinse with deionized water.
4) If the sample is to be analyzed for metals, rinse with a 10 percent reagent grade nitric acid solution. Follow with a deionized water rinse.
5) Rinse with pesticide grade methanol only if gross contamination is present on the sampling equipment.
6) Air dry.
7) Rinse several times with deionized water.
8) Air dry before using. If equipment will not be used immediately, wrap in oil-free aluminum foil.

C7.0 SAMPLE LABELING

Summary: To prevent misidentification and to aid in the handling of environmental samples collected during the field investigation, the following procedures will be followed.

Procedure: 1) Affixed to each sample container will be a non-removable (when wet) label. Apply label and wrap with 2-inch cellophane tape to cover label. The following information will be written on each label with permanent marker:

- Site name
- Sample identification
- Project number
- Date/time
- Sampler's initials
- Sample preservation
- Analysis required

2) Each sample of each matrix will be assigned a unique identification alpha-numeric code. An example of this code and a description of its components is presented below:

Examples

a. MW1-GW

MW1 = Monitoring Well 1
GW = Groundwater

b. SB1 - 2'-4'

SB1 = Soil Boring 1
2' - 4' =Two-foot to four-foot soil sample

Abbreviations

Monitor Type

MW = Monitoring Well
S = Shallow
D = Deep

Sample Type

SB = Soil Boring
EB = Equipment Rinse Blank
HW = Hydrant Water (Decontamination Water/Drilling Water)
GW = Groundwater
TB = Trip Blank
RB = Rinse Blank
MS = Matrix Spike
MSD = Matrix Spike Duplicate
MSB = Matrix Spike Blank

C8.0 SAMPLE SHIPPING

Summary: Proper documentation of sample collection and the methods used to control these documents are referred to as chain-of-custody (COC) procedures. These procedures are essential for presenting sample analytical chemistry results as evidence in litigation or at administrative hearings held by regulatory agencies. They also serve to minimize loss or misidentification of samples and to ensure that unauthorized persons do not tamper with collected samples.

The procedures used for this assessment follow the COC guidelines outlined in *NEIC Policies and Procedures*, prepared by the National Enforcement Investigations Center (NEIC) of the United States Environmental Protection Agency Office of Enforcement.

Procedure:

1) The COC record (Figure C8-1) should be completely filled out, with all relevant information.
2) The original COC remains with the samples. It should be placed in a Ziplock bag and taped inside the sample cooler. The sampler should retain a copy of the COC.
3) Mark volume levels on bottles with a grease pencil.
4) Place inert cushioning material, such as vermiculite or bubble-wrap, in bottom of cooler.
5) Place bottles in the cooler in such a way that they do not touch (use cardboard dividers or bubble-wrap).
6) Wrap volatile organic analyte (VOA) vials securely in bubble-wrap and tape. Place them in the center of the cooler.
7) Pack cooler with ice placed in doubled Ziplock plastic bags.
8) Pack cooler with cushioning material.
9) Tape drain shut.
10) Wrap cooler completely with strapping tape at two locations securing the lid. Do not cover any labels.
11) Place the address of the laboratory on top of cooler. For an out-of-town laboratory, add the following: Put "This side up" labels on all four

Figure C8-1

CHAIN OF CUSTODY RECORD

URS Greiner Woodward Clyde

PROJECT NO.	SITE NAME
SAMPLERS (SIGNATURE)	

STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	# OF CONTAINERS								REMARKS

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE	TIME	REMARKS	

Distribution: Original accompanies shipment, copy to coordinator field files

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sides and "Fragile" labels on at least two sides. Affix numbered custody seals on front right and left of cooler. Cover seals with wide, clear tape.

12) Ship samples via overnight carrier the same day that they are collected.

C9.0 INVESTIGATION-DERIVED WASTE CHARACTERIZATION AND DISPOSAL

Fluids generated during steam-cleaning and equipment decontamination include development and purge water which will require offsite disposal. Soil cuttings may also require off-site disposal. Sampling/waste hauling/disposal will be coordinated by URSGWC. A waste handling contractor will characterize, transport and dispose of investigation-derived waste (IDW). An estimated fifty drums are assumed to require disposal for cost estimating. Personal protective equipment (PPE) and high density polyethylene (HDPE) sampling equipment will be placed in trash bags for disposal at a municipal landfill.

APPENDIX C-1

METHODS FOR DNAPL SCREENING

Table 5. Determinant, Inferential, and Suggestive Indications of DNAPL Presence (modified from Cohen and Mercer, 1993, Cherry and Feenstra, 1991; Newell and Ross, 1992; and Cohen et al., 1992).

DETERMINING DNAPL PRESENCE BY VISUAL EXAMINATION OF SUBSURFACE SAMPLES	INFERRING DNAPL PRESENCE BY INTERPRETING CHEMICAL ANALYSES	SUSPECTING DNAPL PRESENCE BASED C ANOMALOUS FIELD CONDITIONS
Methods to detect DNAPL in wells: · NAPL/water interface probe detection of immiscible phase at base of fluid column · Pump from bottom of fluid column and inspect retrieved sample · Retrieve a transparent, bottom-loading bailer from the bottom of a well and inspect the fluid sample · Inspect fluid retrieved from the bottom of a well using a mechanical discrete-depth sampler · Inspect fluid retained on a weighted cotton string that was lowered down a well **Methods to enhance inspection of fluid samples for DNAPL presence:** · Centrifuge sample and look for phase separation · Add hydrophobic dye (such as Sudan IV or Red Oil) to sample, shake, and look for coloration of DNAPL fraction · Examine UV fluorescence of sample (many DNAPLs will fluoresce) · Assess density of NAPL relative to water (sinkers or floaters) by shaking solution or by using a syringe needle to inject NAPL globules into the water column **Methods to detect DNAPL in soil and rock samples:** · Examine UV fluorescence of sample (many DNAPLs will fluoresce) · Add hydrophobic dye and water to soil sample in polybag or jar, shake, and examine for coloration of the NAPL fraction · Conduct a soil-water shake test without hydrophobic dye (can be effective for NAPLs that are neither colorless nor the color of the soil) · Centrifuge sample with water and look for phase separation · Perform a paint filter test, in which soil is placed in a filter funnel, water is added, and the filter is examined for separate phases	**Chemical analysis results from which DNAPL presence can be inferred (with more or less certainty depending on the strength of the overall data):** · Concentrations of DNAPL chemicals in ground water are greater than 1% of the pure phase solubility or effective solubility · Concentrations of DNAPL chemicals on soils are greater than 10,000 mg/kg (equal to 1% soil mass) · Concentrations of DNAPL chemicals in ground water calculated from water/soil partitioning relationships and soil samples are greater than pure phase solubility or effective solubility · Organic vapor concentrations detected in soil gas exceeds 100-1000 ppm	**Field conditions that suggest DNAPL presence:** · Concentrations of DNAPL chemicals increase with depth in a pattern that cannot be explained by advective transport · Concentrations of DNAPL chemicals increase up the hydraulic gradient from the contaminant release area (apparently due to contaminated soil gas migration and/or, DNAPL movement along capillary and/or permeability interfaces that slope counter to the hydraulic gradient) · Erratic patterns of dissolved concentrations of DNAPL chemicals in ground water which are typical of DNAPL sites due to heterogeneity of (1) the DNAPL distribution, (2) the porous media, (3) well construction details, and (4) sampling protocols · Erratic, localized, very high contaminant concentrations in soil gas, particularly located just above the water table (where dense gas derived from DNAPL in the vadose zone will tend to accumulate) · Dissolved DNAPL chemical concentrations in recovered ground water that decrease with time during a pump-and-treat operation, but then increase significantly after the pumps are turned off (although complexities of contaminant desorption, formation heterogeneity, and temporal and spatial variations of the contaminant source strength can produce similar results) · The presence of dissolved DNAPL chemicals in ground water that is older than potential contaminant releases (using age dating) suggests DNAPL migration) · Deterioration of wells and pumps (can be caused by DNAPL; i.e., chlorinated solvents degrade PVC) · Patterns of dissolved chemicals that may be indicative of pulsed releases associated with recharge events through a DNAPL zone · Plume behavior where most of the plume mass is still near the source area, even after adequate time has passed to allow dissolved transport away · Mass removed during remediation far exceeds original calculation of dissolved and adsorbed mass-in-place