Final Site Management Plan Fourth Street Inactive Hazardous Waste Site
NYSDEC Site No. 9-15-167
City of Buffalo, Erie County

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Prepared for:

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List of Abbreviations and Acronyms

ASP	Analytical Services Protocol
CLP	(EPA) Contract Laboratory Program
COC	chain-of-custody
CP	Citizen Participation
CPP	Citizen Participation Plan
CPR	cardiopulmonary resuscitation
DNAPL	dense non-aqueous phase liquid
DOT	(U.S.) Department of Transportation
DUSR	data usability summary report
EDD	electronic data deliverable
EEEPC	Ecology and Environment Engineering, P.C.
ELAP	Environmental Laboratory Approval Program
EPA	U. S. Environmental Protection Agency
HASP	Health and Safety Plan
MGP	Manufactured Gas Plant
mL	milliliter
MSDS	material safety data sheet
MS/MSD	matrix spike/matrix spike duplicate
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	operation and maintenance

List of Abbreviations and Acronyms (cont.)

OSHA	Occupational Safety and Health Administration
PPE	personal protective equipment
QA	quality assurance
QC	quality control
RA	remedial action
RI/FS	Remedial Investigation/Feasibility Study
ROD	record of decision
SCG	standards, criteria, and guidance value
SOP	standard operating procedure
SVOC	semivolatile organic compound
TAGM	(NYSDEC) Technical and Administrative Guidance Manual
VOA	volatile organics analysis
VOC	volatile organic compound

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Introduction

Ecology and Environment Engineering, P.C., (EEEPC) has prepared this long-term Site Management Plan for the Fourth Street Inactive Hazardous Waste site, located in the city of Buffalo, Erie County, for the New York State Department of Environmental Conservation (NYSDEC).

This post-remedial Site Management Plan will be used as a tool to monitor and evaluate the performance and effectiveness of the completed remedial action. The performance and effectiveness of the remedial action shall be evaluated by monitoring the contaminants of concern—volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs)—contained in the groundwater. This manual is intended to provide guidance and direction to the staff responsible for performing:

- Groundwater sampling;
- Analysis; and
- Reporting.

Section 2 of this site management plan contains a description of the site background and previous history. Section 3 presents elements of sampling, monitoring, and evaluation of analytical results. Section 4 identifies the inspections and site maintenance required. Section 5 identifies appropriate personnel, chain of command, and training for the post-remedial activities. Section 6 outlines the post-remedial analytical records to be submitted to and maintained by NYSDEC during the post-remedial phase. Section 7 outlines the citizen participation plan to be implemented to communicate the results of the post-remedial operation and maintenance plan and the evaluation of those results to affected property owners and local officials. Section 8 presents references as they were used in the development of this site management plan.

2

Site Information

2.1 Site Description

The Fourth Street Inactive Hazardous Waste site (NYSDEC Site No. 9-15-167) is the former Citizens Gas Works Manufactured Gas Plant (MGP) located near the corner of Fourth and Carolina Streets in the City of Buffalo, Erie County, New York. The location of the property is shown on Figure 2-1. A property survey map is included in Appendix A.

2.2 Site History

Until 1915, the Citizens Gas Works operated an MGP at the site. This plant produced gas for heating and lighting by “heat-treating” coal and petroleum products. The by-products from the MGP operations included coal tar, coke, and ammonia. Large quantities of ash were also produced. During operation, substantial amounts of tar typically escaped collection and were spilled or disposed onto the land. The MGP buildings and structures were dismantled, with many of the foundations and structures left buried underground. A portion of the property was later used by the Greyhound Bus Company from 1934 to 1958.

A Phase II Environmental Investigation was done in May 1992 for the Waterfront Redevelopment Project by Huntingdon - Empire Soils Investigations, Inc. A Remedial Investigation/Feasibility Study (RI/FS) was completed in January 2001 for Buffalo Urban Renewal Agency by Parsons Engineering Science, Inc. The results of the RI were compared with standards, criteria, and guidance values (SCGs) or remediation goals in subsurface soil and groundwater and with potential public health and environmental exposure rates and, based on that comparison, the FS identified the areas and media of the site that required remediation. A record of decision (ROD) was signed in August 2001 calling for complete source removal and off-site disposal.

The site contamination and general excavation area for the remedial action (RA) was based on analytical data from previous soil boring investigations performed during remedial investigation activities. The excavation and removal limits given in the contract drawings were prepared also using data from pre-design investigations performed in 2003 and 2004 by EEEPC for NYSDEC. These limits were further confirmed at the start of construction by the remediation contractor through pre-mobilization borings located around the designed excavation limits.

2.3 Summary of Remedial Goals

The remedial goals selected for this site, as stated in the ROD, are:

- Eliminate to the extent practicable the source of contamination at the site to meet remediation goals;
- Eliminate, to the extent practicable, ingestion of groundwater affected by the site that does not attain New York State drinking water standards;
- Eliminate, to the extent practicable, off-site migration of groundwater that does not attain NYSDEC Class GA Ambient Water Quality Criteria;
- Eliminate, to the extent practicable, migration of dense non-aqueous phase liquid (DNAPL);
- Eliminate the potential for direct human or animal contact with the contaminated soils and waste materials on-site; and
- Eliminate the long-term threat of exposure to contamination to users of the adjacent Waterfront Elementary School (School No. 95 and/or nearby residential area.

A summary of standards for Class GA groundwater for the principal contaminants of concern at the site is presented in Table 2-1. A copy of the ROD is provided in Appendix B.

Table 2-1 Summary of Groundwater Standards

Class	Contaminant	Value[1] (µg/L)
VOCs	Benzene	1
	Toluene	5
	Xylenes	5
SVOCs	Napthalene[2]	10
	Phenolic compounds (total phenols)	1

Notes:

[1] Values obtained from 6 NYCRR Part 703, Table 1.

[2] Criteria given for surface waters only.

Key:

µg/L = Micrograms per liter.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

02:002700_DC05_05-B1968\Fig2-1.cdr-7/17/06-GRA

SOURCE: Map Works, Inc. 2001

SCALE

0 .5 Mile

Figure 2-1 Fourth Street Inactive Hazardous Waste Site Location Map

2.4 Summary of Remedial Action

As directed in the ROD, the RA consisted of source removal by excavation and off-site disposal and/or treatment. Non-hazardous soils were disposed of at an off-site landfill and MGP wastes exhibiting the toxicity characteristic for benzene (D018) were shipped to an off-site low-temperature thermal desorption facility in accordance with NYSDEC Technical and Administrative Guidance Manual (TAGM) 4061. After excavation, the site was backfilled with clean off-site soils and restored with a surface parking lot and driveways for use by the adjacent Waterfront Elementary School (Public School No. 95). The RA at the site was performed by Earth Tech, Inc., from July 2005 to August 2006. The RA is further detailed in the Fourth Street Inactive Hazardous Waste Site, Remedial Action Summary Report (EEEPC 2006a).

Soils at the south and northwest perimeter of the excavation limits were left in place along the large, active utility areas, as directed by the Buffalo Sewer Authority and National Grid and as approved by NYSDEC. The proposed excavation limits and the actual excavation limits are shown in as-built drawings prepared by Earth Tech, Inc. and are included here as Appendix C. A Soils Management Plan (EEEPC 2006b) for the site was prepared that provides guidelines for management of potentially contaminated soil material that may be encountered during any future excavation activities such as development and/or utility construction and maintenance at the Fourth Street Inactive Hazardous Waste Site. This report is provided as Appendix D.

As of August 2006, the site is still considered a Class 2 inactive hazardous waste site. Because all contamination was removed from the subject area (with the exception of the utility corridors), it is anticipated that the site will be reclassified to a Class 4 inactive hazardous waste site to reflect a one-year groundwater monitoring program. Provided that the groundwater achieves remediation goals as expected, the inactive hazardous waste site will likely be redefined to only include the area along the utility corridor. The remainder of the inactive hazardous waste site will be reclassified to a Class 5 inactive hazardous waste site, and the remediated areas will be removed from the registry description. NYSDEC will require that an Environmental Easement be prepared and filed.

3

Monitoring, Testing, and Records

3.1 Monitoring Program

3.1.1 General

This post-remedial monitoring program was developed to assess the effectiveness of the RA. Contamination at the site was limited to subsurface soil, which was removed to the extent practicable during the RA, and groundwater. As a result, post-remedial environmental monitoring will be limited to groundwater monitoring and will not include long-term monitoring of any surface water or soils on-site.

3.1.2 Groundwater Monitoring

As part of the RI/FS, up-gradient and down-gradient monitoring wells were installed to observe the local groundwater contaminant trends. Additional wells (MW-2, MW-6R, MW-11, MW-12, and MW-13) were installed as part of the RA. All monitoring wells within the area of the RA are flush-mounted. MW-8 has an above-grade protective well casing. A total of 10 wells are located in the region of the site that should be monitored as part of this program. The monitoring well locations are indicated on Figure 3-1. A summary of groundwater monitoring well construction is provided as Table 3-1. Geotechnical logs from the RI and well construction logs from the RA are included in Appendix D. Groundwater samples shall be collected from all 10 monitoring wells on site. Monitoring well MW-2 and MW-4 are considered the upgradient wells on site.

After a baseline sampling event, sampling and reporting will be provided semi-annually for the first two years. NYSDEC will determine reporting frequency thereafter. The proposed groundwater sampling schedule is presented in Table 3-2.

3.1.3 Groundwater Well Sampling Procedures

Typical groundwater well sampling procedures to be applied at this site are given in Sampling Guidelines and Protocols, Technological Background and Quality Control/Quality Assurance for NYSDEC Spill Response Program (NYSDEC, 1991). Pertinent sections of this document are presented in Appendix E and include descriptions of:

Table 3-1 Groundwater Monitoring Well Construction Summary

Monitoring Well ID	Well Diameter (inches)	Well Material	Top of Inner Casing Elevation[1] (feet AMSL)	Well Depth (feet below TOIC)[2,3]	Approximate Screened Interval (feet below TOIC)
MW-2	2	Sch 40 PVC	580.85	16.42	4 - 14
MW-4	2	Sch 40 PVC	587.35	16.08	NA
MW-5	2	Sch 40 PVC	579.43	18.02	5 - 19
MW-6R	2	Sch 40 PVC	580.86	18.2	10 - 20
MW-7	2	Sch 40 PVC	580.70	18.74	7 - 20
MW-8	2	Sch 40 PVC	583.88	23.52	7 - 22
MW-10	2	Sch 40 PVC	580.75	17.83	6 - 16
MW-11	2	Sch 40 PVC	581.05	20.5	10 - 20
MW-12	2	Sch 40 PVC	584.10	25.75	16 - 26
MW-13	2	Sch 40 PVC	583.22	24.2	14 - 24

Notes:

[1] TOIC elevations based on surveyed data presented in the “Final Topographic Survey,” as prepared by Foit-Albert Associates on August 14, 2006, with the exception of the elevations for MW-4 and MW-8 which were obtained from “Final Pre-design Investigation and Engineering Design Report for the Fourth Street Inactive Hazardous Waste Site” (EEEPC 2004).

[2] Well depths for MW-4, MW-5, MW-7, MW-8, and MW-10 were obtained from 11/10/03 field measurements by EEEPC, as presented in “Final Pre-design Investigation and Engineering Design Report for the Fourth Street Inactive Hazardous Waste Site” (EEEPC 2004).

[3] Well depths for MW-2, MW-6R, MW-11, MW-12, and MW-13 were obtained from well purging logs prepared as part of the RA on 4/26/06 and 6/20/06.

Key:

MW = Monitoring well.
NA = Not available.
Sch = Schedule.
TOIC = Top of inner casing.

Table 3-2 Proposed Groundwater Sampling Schedule

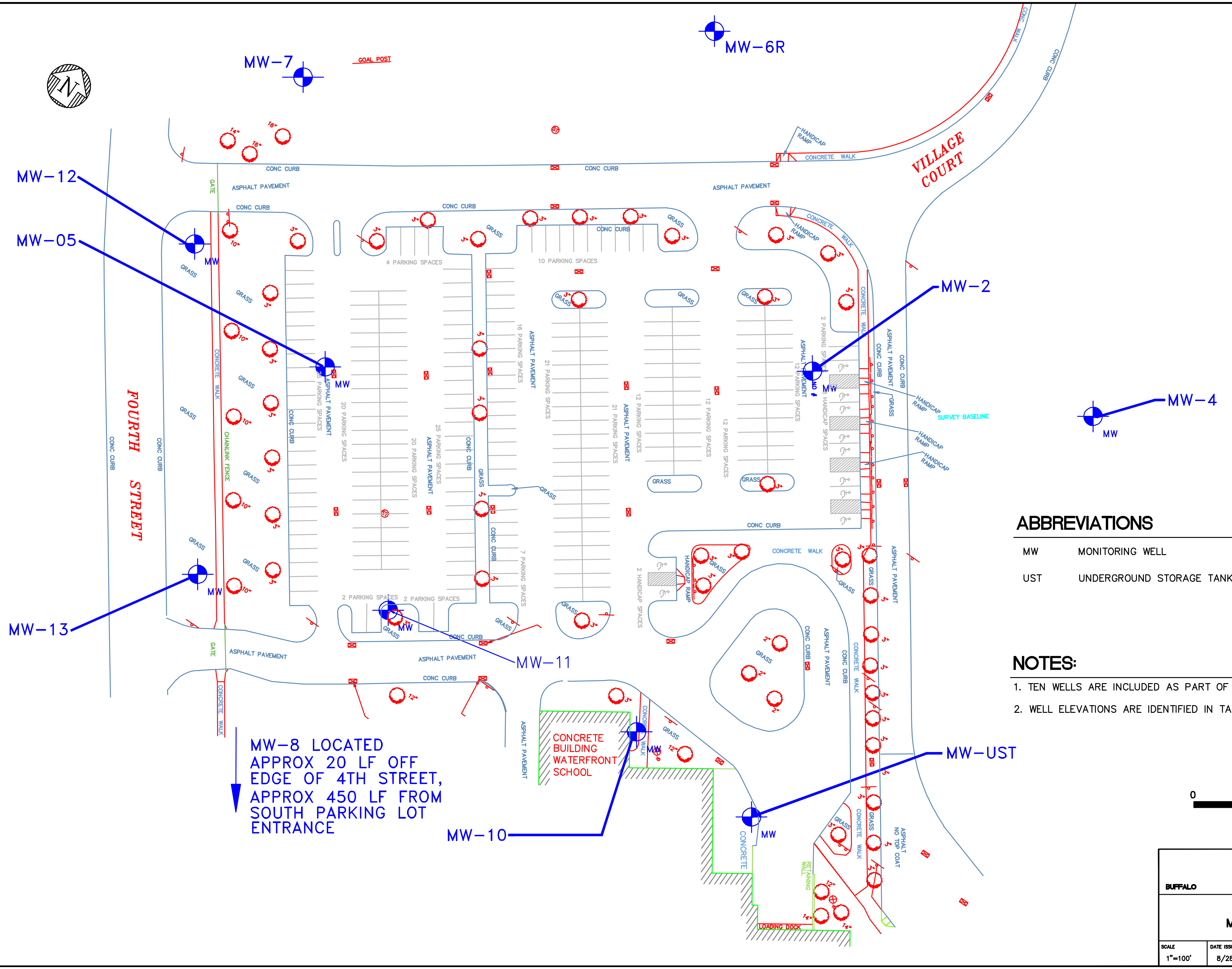
Monitoring Wells	Baseline Sampling[1]		Second Year and Long-Term Sampling[2]		Analyses	Method[3]
	Frequency	Number of Wells	Frequency	Number of Wells		
MW-2 MW-4 MW-5 MW-6R MW-7 MW-8 MW-10 MW-11 MW-12 MW-13	One time	10	Semiannual	10	TCL VOCs TCL SVOCs	8260B 8270C

Notes:

[1] Baseline sampling to be conducted within 12 months of completion of RA.

[2] NYSDEC to reevaluate all analytical results after a year of monitoring for potential program refinement

[3] EPA SW-846, latest edition, and NYSDEC Analytical Service Protocols (ASP) July 2005.



ABBREVIATIONS

MW	MONITORING WELL
UST	UNDERGROUND STORAGE TANK (NOT PART OF MONITORING PROGRAM)

NOTES:

1. TEN WELLS ARE INCLUDED AS PART OF MONITORING PROGRAM.
2. WELL ELEVATIONS ARE IDENTIFIED IN TABLE 3-1 OF SITE MANAGEMENT PLAN.

SCALE IN FEET
0 60 120

FOURTH STREET

BUFFALO ERIE COUNTY NEW YORK

FIG 3-1
MONITORING WELL LOCATIONS

SCALE	DATE ISSUED	C.A.D. FILE NO.	DRAWING NO.	REV.
1"=100'	8/28/06	11X17 Mon Wells.dwg	FIG – 3-1	

F:\N\13 4th ST\ENVIRONMENTAL EASEMENT 8-15-06\11x17 Mon Wells.dwg
Buff Plot 8-28-06 KMK

- Sampling equipment;
- Equipment decontamination procedures;
- Sample preservation;
- Sample packaging and shipping procedures;
- Field quality control procedures;
- Monitoring well development and purging techniques;
- Groundwater sampling equipment and techniques;
- Field data collection;
- Recommended sample containers, sample preservation, maximum sample holding times and permissible sample types; and
- Chain-of-custody procedures.

Another useful guide to groundwater sampling is provided in ASTM D5903-96, Standard Guide for Planning and Preparing for a Groundwater Sampling Event, which includes a checklist of sampling equipment. This standard is provided in Appendix F.

All groundwater samples shall be submitted for VOC and SVOC analyses as indicated in Table 3-2.

Typical groundwater sampling equipment and procedures are described below.

Equipment

- Electronic water-level indicator graduated to 0.01 foot;
- Whale pump or equivalent submersible pump equipped with new discharge tubing and/or disposable polyethylene bailers;
- pH, temperature, specific conductance, and turbidity meters;
- Field logbook;
- Appropriate sample containers (see Table 3-3); and
- A cooler with ice.

Table 3-3 Required Analytical Methods for the Fourth Street Inactive Hazardous Waste Site

Parameter	Method	Containers	Preservation	Holding Time
Groundwater				
TCL VOCs	SW8260B	Three 40-mL glass VOA vials with teflon septa	Cool to 4°C	5 days
TCL SVOCs	SW8270C	Two 1-L amber glass with septa per analysis	Cool to 4°C	5 days for extraction, 40 days for analysis

Procedures

- Decontaminate the water-level probe.
- Slowly lower the electronic water level probe of the instrument until the indicator light illuminates and/or the alarm sounds and record in the logbook the depth to water from a marked reference point on the top of the well casing.
- Lower the probe to the bottom of the well casing and record the total depth of the well from the marked reference point in the logbook.
- Calculate the volume of water in the well using the formula $V=Tr^2(0.163)$ Where:
  V = Static volume of well in gallons;
  T = Depth of water in the well, measured in feet;
  r = Inside radius of well casing in inches; and
  0.163 = a constant conversion factor.
- Slowly begin to pump water from the well at a uniform rate.
- Record the initial temperature, pH, conductivity, and turbidity in the logbook.
- Begin to purge three to five times the volume of water standing in the well casing.
- Record the temperature, pH, conductivity, and turbidity at least every 10 minutes or at the removal of each well volume.
- Purge until pH, specific conductance, and temperature have stabilized over three consecutive readings, turbidity of the discharge is 50 NTUs (nephelometric turbidity units) or less and at least three well volumes have been removed.
- If 50 NTUs cannot be obtained after five well volumes have been removed, return within 24 hours with a disposable polyethethylene bailer to collect the sample volumes for all analytical parameters.

- Fill appropriate sample containers.
- Place samples in a cooler maintained with ice at 4°C upon collection.
- Record the sample pH, temperature, and specific conductance.
- Package and ship the samples to the laboratory.

Sample Containers and Preservation

The volumes and containers for groundwater samples as well as sample preservation and holding time requirements are presented in Table 3-3. Pre-washed sample containers shall be provided by the analytical laboratory and are to be prepared in accordance with NYSDEC bottle-washing procedures. All containers shall have assigned lot numbers to ensure traceability through the supplier. Samples shall be stored on ice pending delivery to the analytical laboratory.

Sample Labeling

All samples shall be assigned a unique sample identifier. Labels for each sample container shall contain the sample identifier, date of sample collection, analytical parameters, and type of preservation used. The sampler shall initial any change in the label information prepared prior to sample collection.

Sample Packaging and Shipping

Water sample containers shall be placed inside sealed plastic bags as a precaution against cross-contamination caused by sample container leakage or breakage. They shall be placed in coolers in such a manner as to eliminate the chance of breakage during shipment, and ice in plastic bags shall be placed in the coolers to keep the samples at 4°C throughout shipment. A temperature blank consisting of a 40-milliliter (mL) volatile organic analysis (VOA) vial one-half full of water shall be added to each cooler being shipped.

Sample shipment shall be performed in strict accordance with all applicable U.S. Department of Transportation (DOT) regulations. Arrangements shall be made with the laboratory's project manager for samples that are to be delivered to a laboratory on a weekend so that holding times are not compromised.

Sample Custody

A sample is considered to be in custody under the following conditions:

- The sample is directly in one's possession;
- The sample is clearly in one's view;
- The sample is placed in a locked location; or
- The sample is in a designated secure area.

In order to demonstrate that the samples and coolers have not been tampered with during shipment, adhesive custody seals shall be used. The custody seals shall be placed across the cooler lids in such a manner that they will be visibly disturbed upon opening the cooler. The seals shall be signed or initialed and dated by field personnel at the time they are affixed to the cooler.

Documentation of sample chain-of-custody (COC) is necessary to demonstrate that the integrity of the samples has not been compromised between collection and delivery to the laboratory. A COC record shall accompany each sample cooler to document the transfer of custody from the field to the laboratory. All information requested in the COC record shall be completed. One copy of the COC form shall be retained by the sampler and placed in the project records file. The remaining pages shall be sealed in a plastic bag and placed inside the cooler. Upon receipt at the laboratory, the COC forms shall be completed. It is the responsibility of the subcontracted laboratory to document the condition of custody seals and sample integrity upon receipt.

3.2 Analytical Program

Tables 3-2 and 3-3 provide a summary of sampling and analysis for the Fourth Street Inactive Hazardous Waste Site. The laboratory shall follow the most recent NYSDEC Analytical Services Protocol (ASP) for all analytical methods, quality assurance (QA)/quality control (QC), holding times, and reporting requirements. Laboratory data for the baseline event shall be reported with full data package (Level B) and standard laboratory electronic data deliverable (EDD). Laboratory data for the semi-annual events will be reported in a summary data package (including sample results, QC summary forms, and calibration summaries with no raw data) and EDD. The laboratory must certify that the electronic data match the hard copy reported for each package. The data for the baseline sampling event shall be reviewed following NYSDEC’s Guidance for the Development of Data Usability Summary Reports (June 1999). Data for subsequent rounds shall be reviewed for completeness and to ensure that all analytical problems are reported in the case narrative and that appropriate laboratory qualifiers are added. For any problems identified, concerns on data usability should be reviewed with the laboratory and all related data checked to determine the extent of the error.

The samples and analytical methods planned for this site are provided on Table 3-3.

The collection of field QC samples is summarized on Table 3-4.

Table 3-4 Field Quality Control Guidelines, Fourth Street Inactive Hazardous Waste Site

QC Sample	Description
Field Duplicate	One per matrix per 10 samples or per sampling round.
Trip Blank	One per shipment for each set of groundwater samples shipped.

The laboratory QC sample requirements are summarized on Table 3-5.

Table 3-5 Laboratory Quality Control Sample Guidelines, Fourth St. Inactive Hazardous Waste Site

QC Sample	Description
MB	One per matrix per preparation batch for each analysis.
MSB/LCS	One per matrix per preparation batch for each analysis. The MSB/LCS must contain all target analytes of concern at the site or as specified by the method.
Surrogate Spikes	Per samples as specified by the method.
MS/MSD	One per matrix per preparation batch for each analysis containing all target analytes of concern at the site or as specified by the method.

Key:

LCS = Laboratory Control Sample.
MSB = Matrix Spike Blank.
MS/MSD = Matrix Spike/Matrix Spike Duplicate.

Tables 3-6 and 3-7 list the target compounds for the project and QC acceptance criteria. All laboratory reporting limits must be below the NYSDEC Class GA Ambient Water Quality Standards and Guidance Values.

Table 3-6 Target Compound List and Reporting Limits

Test Name and Method	Analyte	Matrix	Units	PQL	Guidance Value [(1)] [(2)]
Method 8270C	1,1'-Biphenyl	Water	µg/L	10	5
Method 8270C	2,4,5-Trichlorophenol	Water	µg/L	25	1
Method 8270C	2,4,6-Trichlorophenol	Water	µg/L	10	1
Method 8270C	2,4-Dichlorophenol	Water	µg/L	10	5
Method 8270C	2,4-Dimethylphenol	Water	µg/L	10	50
Method 8270C	2,4-Dinitrophenol	Water	µg/L	25	10
Method 8270C	2,4-Dinitrotoluene	Water	µg/L	10	5
Method 8270C	2,6-Dinitrotoluene	Water	µg/L	10	5
Method 8270C	2-Chloronaphthalene	Water	µg/L	10	10
Method 8270C	2-Chlorophenol	Water	µg/L	10	-
Method 8270C	2-Methylnaphthalene	Water	µg/L	10	NA
Method 8270C	2-Methylphenol	Water	µg/L	10	1
Method 8270C	2-Nitroaniline	Water	µg/L	25	5
Method 8270C	2-Nitrophenol	Water	µg/L	10	1
Method 8270C	3,3´-Dichlorobenzidine	Water	µg/L	10	5
Method 8270C	3-Nitroaniline	Water	µg/L	25	5

Table 3-6 Target Compound List and Reporting Limits

Test Name and Method	Analyte	Matrix	Units	PQL	Guidance Value (1) (2)
Method 8270C	4,6-Dinitro-2-methylphenol	Water	µg/L	25	-
Method 8270C	4-Bromophenyl phenyl ether	Water	µg/L	10	-
Method 8270C	4-Chloro-3-methylphenol	Water	µg/L	10	5
Method 8270C	4-Chloroaniline	Water	µg/L	10	5
Method 8270C	4-Chlorophenyl phenyl ether	Water	µg/L	10	-
Method 8270C	4-Methylphenol	Water	µg/L	10	1
Method 8270C	4-Nitroaniline	Water	µg/L	25	5
Method 8270C	4-Nitrophenol	Water	µg/L	25	1
Method 8270C	Acenaphthene	Water	µg/L	10	20
Method 8270C	Acetophenone	Water	µg/L	10	-
Method 8270C	Acenaphthylene	Water	µg/L	10	-
Method 8270C	Anthracene	Water	µg/L	10	50
Method 8270C	Atrazine	Water	µg/L	10	7.5
Method 8270C	Benz(a)anthracene	Water	µg/L	10	0.002
Method 8270C	Benzaldehyde	Water	µg/L	10	-
Method 8270C	Benzo(a)pyrene	Water	µg/L	10	ND
Method 8270C	Benzo(b)fluoranthene	Water	µg/L	10	0.002
Method 8270C	Benzo(b)fluoranthene	Water	µg/L	10	0.002
Method 8270C	Benzo(g,h,i)perylene	Water	µg/L	10	-
Method 8270C	Benzo(k)fluoranthene	Water	µg/L	10	0.002
Method 8270C	Benzo(k)fluoranthene	Water	µg/L	10	0.002
Method 8270C	Bis(2-chloroethoxy)methane	Water	µg/L	10	5
Method 8270C	Bis(2-chloroethyl)ether	Water	µg/L	10	1
Method 8270C	Bis(2-ethylhexyl)phthalate	Water	µg/L	10	5
Method 8270C	Butyl benzyl phthalate	Water	µg/L	10	50
Method 8270C	Caprolactam	Water	µg/L	10	-
Method 8270C	Carbazole	Water	µg/L	10	-
Method 8270C	Chrysene	Water	µg/L	10	0.002
Method 8270C	Dibenz(a,h)anthracene	Water	µg/L	10	NA
Method 8270C	Dibenzofuran	Water	µg/L	10	-
Method 8270C	Diethyl phthalate	Water	µg/L	10	50
Method 8270C	Dimethyl phthalate	Water	µg/L	10	50
Method 8270C	Di-n-butyl phthalate	Water	µg/L	10	50
Method 8270C	Di-n-octyl phthalate	Water	µg/L	10	-
Method 8270C	Fluoranthene	Water	µg/L	10	50
Method 8270C	Fluorene	Water	µg/L	10	50
Method 8270C	Hexachlorobenzene	Water	µg/L	10	0.04
Method 8270C	Hexachlorobenzene	Water	µg/L	10	0.04
Method 8270C	Hexachlorobutadiene	Water	µg/L	10	0.5
Method 8270C	Hexachlorocyclopentadiene	Water	µg/L	10	5
Method 8270C	Hexachloroethane	Water	µg/L	10	5
Method 8270C	Indeno(1,2,3-cd)pyrene	Water	µg/L	10	0.002
Method 8270C	Indeno(1,2,3-cd)pyrene	Water	µg/L	10	0.002
Method 8270C	Isophorone	Water	µg/L	10	50
Method 8270C	Naphthalene	Water	µg/L	10	10

Table 3-6 Target Compound List and Reporting Limits

Test Name and Method	Analyte	Matrix	Units	PQL	Guidance Value (1) (2)
Method 8270C	Nitrobenzene	Water	µg/L	10	0.4
Method 8270C	N-Nitrosodi-n-propylamine	Water	µg/L	10	NA
Method 8270C	N-Nitrosodiphenylamine	Water	µg/L	10	50
Method 8270C	Pentachlorophenol	Water	µg/L	25	1
Method 8270C	Phenanthrene	Water	µg/L	10	50
Method 8270C	Phenol	Water	µg/L	10	1
Method 8270C	Pyrene	Water	µg/L	10	50
Method 8260B	1,1,1-Trichloroethane	Water	µg/L	1	5
Method 8260B	1,1,2,2-Tetrachloroethane	Water	µg/L	1	5
Method 8260B	1,1,2-Trichloroethane	Water	µg/L	1	1
Method 8260B	1,1,2-Trichloro-1,2,2-trifluoroethane	Water	µg/L	1	-
Method 8260B	1,1-Dichloroethane	Water	µg/L	1	5
Method 8260B	1,1-Dichloroethene	Water	µg/L	1	5
Method 8260B	1,1-Dichloroethene	Water	µg/L	1	5
Method 8260B	1,2,4-Trichlorobenzene	Water	µg/L	1	5
Method 8260B	1,2,4-Trichlorobenzene	Water	µg/L	1	5
Method 8260B	1,2-Dibromo-3-chloropropane	Water	µg/L	1	0.04
Method 8260B	1,2-Dibromoethane	Water	µg/L	1	-
Method 8260B	1,2-Dichlorobenzene	Water	µg/L	1	3
Method 8260B	1,2-Dichlorobenzene	Water	µg/L	1	3
Method 8260B	1,2-Dichloroethane	Water	µg/L	1	0.6
Method 8260B	1,2-Dichloropropane	Water	µg/L	1	1
Method 8260B	1,3-Dichlorobenzene	Water	µg/L	1	3
Method 8260B	1,3-Dichlorobenzene	Water	µg/L	1	3
Method 8260B	1,4-Dichlorobenzene	Water	µg/L	1	3
Method 8260B	1,4-Dichlorobenzene	Water	µg/L	1	-
Method 8260B	2-Butanone	Water	µg/L	5	50
Method 8260B	2-Hexanone	Water	µg/L	5	50
Method 8260B	4-Methyl-2-pentanone	Water	µg/L	5	-
Method 8260B	Acetone	Water	µg/L	5	-
Method 8260B	Benzene	Water	µg/L	1	1
Method 8260B	Bromodichloromethane	Water	µg/L	1	50
Method 8260B	Bromoform	Water	µg/L	1	50
Method 8260B	Bromomethane	Water	µg/L	1	5
Method 8260B	Carbon disulfide	Water	µg/L	1	-
Method 8260B	Carbon tetrachloride	Water	µg/L	1	5
Method 8260B	Chlorobenzene	Water	µg/L	1	5
Method 8260B	Chloroethane	Water	µg/L	1	5
Method 8260B	Chloroform	Water	µg/L	1	7
Method 8260B	Chloromethane	Water	µg/L	1	-
Method 8260B	cis-1,2-Dichloroethene	Water	µg/L	1	5
Method 8260B	cis-1,3-Dichloropropene	Water	µg/L	1	0.4
Method 8260B	Dibromochloromethane	Water	µg/L	1	5
Method 8260B	Dibromochloromethane	Water	µg/L	1	50

Table 3-6 Target Compound List and Reporting Limits

Test Name and Method	Analyte	Matrix	Units	PQL	Guidance Value (1) (2)
Method 8260B	Dichlorodifluoromethane	Water	µg/L	1	5
Method 8260B	Ethylbenzene	Water	µg/L	1	5
Method 8260B	Isopropylbenzene	Water	µg/L	1	5
Method 8260B	Methyl acetate	Water	µg/L	1	-
Method 8260B	Methyl tert-butyl ether	Water	µg/L	1	-
Method 8260B	Methylcyclohexane	Water	µg/L	1	-
Method 8260B	Methylene chloride	Water	µg/L	1	5
Method 8260B	Styrene	Water	µg/L	1	5
Method 8260B	Tetrachloroethene	Water	µg/L	1	5
Method 8260B	Toluene	Water	µg/L	1	5
Method 8260B	trans-1,2-Dichloroethene	Water	µg/L	1	5
Method 8260B	trans-1,3-Dichloropropene	Water	µg/L	1	0.4
Method 8260B	Trichloroethene	Water	µg/L	1	5
Method 8260B	Trichlorofluoromethane	Water	µg/L	1	5
Method 8260B	Vinyl chloride	Water	µg/L	1	2
Method 8260B	Xylenes, Total	Water	µg/L	1	5
Method 8260B	Ethylbenzene	Water	µg/L	1	-

1) Criteria shown are Class GA groundwater standards and guidance values (water matrix) from the NYSDEC, Division of Water, Technical and Operational Guidance Series 1.1.1, June 1998.

(2) Guidance value may be below the PQL. The guidance value does not account for values reported below the PQL and above the method detection limit (MDL). In many cases, the MDL will be below the criteria.

Key:

µg/L = Micrograms per liter.
PQL = Practical Quantitation Limit.

Table 3-7 Method Quality Control Limit Summary

Analyte	Method	Matrix	Sample Type	Analyte Type	Low Limit	High Limit
2,4-Dinitrotoluene	Method 8270C	Water	MS	A	24	96
2-Chlorophenol	Method 8270C	Water	MS	A	27	123
4-Chloro-3-methylphenol	Method 8270C	Water	MS	A	23	97
4-Nitrophenol	Method 8270C	Water	MS	A	10	80
Acenaphthene	Method 8270C	Water	MS	A	46	118
N-Nitrosodi-n-propylamine	Method 8270C	Water	MS	A	41	116
Pentachlorophenol	Method 8270C	Water	MS	A	9	103
Phenol	Method 8270C	Water	MS	A	12	110
Pyrene	Method 8270C	Water	MS	A	26	127
1,2-Dichlorobenzene-d4	Method 8270C	Water	MS	S	16	110
2,4,6-Tribromophenol	Method 8270C	Water	MS	S	10	123
2-Chlorophenol-d4	Method 8270C	Water	MS	S	33	110
2-Fluorobiphenyl	Method 8270C	Water	MS	S	43	116
2-Fluorophenol	Method 8270C	Water	MS	S	21	110
Nitrobenzene-d5	Method 8270C	Water	MS	S	35	114
Phenol-d5	Method 8270C	Water	MS	S	10	110

Table 3-7 Method Quality Control Limit Summary

Analyte	Method	Matrix	Sample Type	Analyte Type	Low Limit	High Limit
Terphenyl-d14	Method 8270C	Water	MS	S	33	141
1,1-Dichloroethene	Method 8260B	Water	MS	A	61	145
Benzene	Method 8260B	Water	MS	A	76	127
Chlorobenzene	Method 8260B	Water	MS	A	72	130
Toluene	Method 8260B	Water	MS	A	76	125
Trichloroethene	Method 8260B	Water	MS	A	71	120
1,2-Dichloroethane-d4	Method 8260B	Water	MS	S	76	114
4-Bromofluorobenzene	Method 8260B	Water	MS	S	86	115
Toluene-d8	Method 8260B	Water	MS	S	88	110

Note: All limits are presented in percent recovery.

LCS Recoveries	70% – 130% for Method 8260B
	50% – 150% for Method 8270C

Key:

A = Target analyte.
LCS = Laboratory Control Sample.
MS = Matrix spike.
S = Surrogate.

3.2.1 Corrective Action

The project manager is responsible for initiating corrective action and implementing it in the field, and the laboratory manager is responsible for implementing it in the laboratory. It is their combined responsibility to see that all analytical and sampling procedures are followed as specified in applicable documents and that the data generated meet the prescribed acceptance criteria.

Field Situations

In the field, corrective action may be initiated by the project manager, field team leader, or the NYSDEC on-site representative. The necessity for corrective action may arise in the normal course of field events. Typical corrective actions include:

- Replacement of equipment, either in part or totally, because of malfunction;
- Additional instruction of personnel in proper procedures, whenever necessary;
- Discussion of any unique on-site problems in order to arrive at an appropriate solution; and
- Correction of custody forms and field notebooks when errors occur.

Laboratory Situations

Corrective action as a result of failure of QC samples to meet the objectives listed in Tables 3-6 and 3-7 is required for this project. Corrective actions may include but are not limited to:

- Reanalyzing samples, if holding times permit;
- Correcting laboratory procedures;
- Recalibrating instruments using freshly prepared standards and reanalyzing samples;
- Replacing solvents or other reagents that give unacceptable blank values;
- Additional training of laboratory personnel in correct sample preparation and analysis procedures; and
- Accepting data with an acknowledged level of uncertainty.

Whenever corrective action is deemed necessary, the laboratory manager shall ensure that the following steps are taken:

- The problem is defined;
- The cause of the problem is investigated and determined;
- Appropriate corrective action is determined, implemented, and documented in the case narrative; and
- Corrective actions should be reported immediately to NYSDEC if the samples cannot be re-analyzed within project specifications.

Documentation

Immediate corrective actions taken in the field will be documented in the field logbooks and approved by the field team leader or project manager. Corrective actions that result in deviations from the analytical program should be documented in a memorandum to the project manager or QA officer. They shall ensure appropriate changes are incorporated into the final report.

The laboratory should maintain a rigorous documentation system to ensure that all data are compared against established QC criteria. Specific procedures for each laboratory are documented in standard operating procedures (SOPs) that should be approved by the QA coordinator, the laboratory manager, or the laboratory director. In general, all QC data are reviewed by the analyst and approved by the supervisor, who determines whether reanalysis is necessary and what corrective actions should be taken. An out-of-control event that is submitted for reporting must be accompanied by a description of the reason that the data are unacceptable and of the corrective action taken.

3.2.2 Quality Assurance Reports

Upon completion of a project sampling effort, analytical and QC data will be included in a comprehensive report that summarizes the work and provides a data evaluation. A discussion of the validity of the results in the context of QA/QC procedures shall be made as well as a summary of all QA/QC activity.

Serious analytical or sampling problems shall be reported to NYSDEC immediately. Time and type of corrective action, if needed, will depend on the severity of the problem and relative overall project importance. Corrective actions may include altering procedures in the field or modifying laboratory protocol. All corrective actions will be implemented after notifying NYSDEC and NYSDEC's approval.

In addition to the laboratory report narrative, data usability summary reports (DUSRs) that include any independent data review will also be provided to NYSDEC.

3.2.3 Reporting and Deliverables

For this project, all analyses will be reported to NYSDEC using a format acceptable to NYSDEC.

Before submitting the report to NYSDEC, all data shall be evaluated for precision, accuracy, and completeness as described above.

3.3 Evaluation of Analytical Results

It is anticipated that all groundwater sampling results will initially be evaluated by NYSDEC on either an annual or semi-annual basis.

The results of those analyses will be compared and evaluated with either:

- The limits to which the remedial cleanup was performed;
- The results of upgradient or background monitoring;
- The initial goals established in the ROD; or
- The SCG limits as established by NYSDEC (see Table 2-1 and the ROD [Appendix B]).

In areas where analytical results indicate contaminant concentrations have increased or have exceeded limits, there will either be increased monitoring by analysis or interim remedial actions will be evaluated, selected, and initiated by NYSDEC.

4

Site Maintenance

4.1 General

Maintenance activities related to the site will be limited to inspection and repairs to the monitoring well infrastructure and disposal of wastes generated as a result of the post-remedial monitoring program. The site consists of multiple parcels consisting of a surface parking lot and grassed areas owned and maintained by either the Buffalo Urban Renewal Agency, the City of Buffalo, or the City of Buffalo/Erie County Parks Department. There is no fencing, signage, protective cover, leachate system, or treatment system in place at this site that requires maintenance.

4.2 Monitoring Well Inspections and Maintenance

Sampling personnel shall conduct an inspection of each existing monitoring well during each sampling event. Features to be noted include:

- The condition of the concrete pad surrounding the flush-mount wellhead;
- The presence of depressions or standing water around the flush-mount wellhead;
- The condition of the protective casing, cap, and lock; and
- The condition of the inner casing or riser, including inner diameter and annular space.

Regular maintenance may include replacement of bolts, j-plugs, locks, etc. Sampling personnel shall record any problems or unacceptable conditions beyond regular maintenance that reduce the functionality of the monitoring well network. Problems or other unacceptable conditions shall be repaired or replaced in a timely manner in order to maintain the functionality of the monitoring well network.

4.3 Waste Disposal

Waste derived from post-remedial monitoring may require special disposal procedures, depending on its contaminant concentrations. Decisions pertaining to disposal procedures must be made after a waste characterization analysis has been performed.

All wastes created during post-remedial monitoring shall be segregated into solid and liquid wastes and containerized in DOT-approved drums. All drums shall be secured if temporarily staged on site to prevent tampering or damage. Wastes shall be disposed of within a timely manner.

Proposed waste sampling analytical parameters and frequency are presented in Table 4-1. Actual waste sampling analytical parameters and sampling frequency must be approved by the proposed disposal facility accepting the waste.

Table 4-1 Proposed Waste Characterization Sampling Parameters

Analysis	Method Reference	Sample Type and Frequency
Waste Water		
Phosphate, total	365.2	One composite consisting of grab samples from each drum for each sampling event
Suspended solids, total	160.2	
Cyanide, total	9012A	
PCBs	8082	
Petroleum hydrocarbons	8015B	
pH	9040B	
Metals, TAL-1 list	6010B	
SVOCs	8270C	
VOCs, STARS list	8260B	
Solid Waste		
Cyanide, reactive	9012A-7.3.3	One composite consisting of grab samples from each drum for each sampling event
PCBs	8082	
Petroleum hydrocarbons	8015B	
pH	9045C	
Sulfide, reactive	9034-7.3.4	
TCLP Metals	6010B	
TCLP SVOCs	8270C	
TCLP VOCs	8260B	

Key
PCB = Polychlorinated biphenyl.
STARS = Spill Technology and Remediation Services.
SVOC = Semivolatile organic compound.
TAL = Target Analyte List.
TCLP = Toxicity characteristic leaching procedure.
VOC = Volatile organic compound.

4.3.1 Waste Water

Waste water generated as part of the post-remedial monitoring may include:

- Purged groundwater; and

- Wash water used for decontamination.

It is possible that a temporary discharge permit may be obtained from the Buffalo Sewer Authority in order to dispose of waste water. Examples of a temporary discharge application, pollutant guidance, and temporary discharge permit are all presented in Appendix G. It is also possible that waste water may be released to the ground surface, upon NYSDEC's approval.

4.3.2 Solid Waste

Solid wastes generated during the post-remedial monitoring may include:

- Personal protective equipment (PPE); and
- Disposable sampling equipment.

5

Personnel

5.1 Manpower Requirements

Post-remedial monitoring activities will be handled by designated staff and trained personnel using appropriate methods and procedures for field sampling and analysis as described in this report.

5.2 Qualifications

5.2.1 Sampling

Personnel from any outside consultants selected to perform post-remedial sampling and monitoring must have experience in the methods and procedures used to obtain environmental samples and field reporting. All samples shall be shipped to an approved laboratory under signed chain-of-custody procedures, and analysis will be performed within the holding times prescribed by New York State ASP.

5.2.2 Laboratory

The laboratory used to perform analyses for this site management plan shall be a New York State Department of Health (NYSDOH)-certified Environmental Laboratory Approval Program (ELAP)/Contract Laboratory Program (CLP) facility certified at a minimum for VOCs and SVOCs.

5.2.3 Data Validation Chemist

The data reviewer will meet all the requirements listed in NYSDEC's Guidance for the Development of Data Usability Summary Reports (DUSRs) (June 1999). A copy of the reviewer's credentials will be submitted with the report.

5.3 Preparation of a Site-Specific Health and Safety Plan

Prior to initiating field activities at the site, it is necessary to prepare a site-specific health and safety plan (HASP) in accordance with the requirements of 29 CFR 1910.120. Accordingly, the HASP should include:

- The names of key personnel responsible for site health and safety, including an appointed site health and safety officer;

- A safety and health-risk analysis for each site task and operation;

- Employee training requirements;
- Specification of personal protective equipment (PPE) to be used by employees for each of the site tasks and operations being conducted;
- Medical surveillance requirements;
- Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used;
- Site control measures;
- Decontamination procedures;
- Site standard operating procedures;
- Emergency telephone numbers including, at a minimum, NYSDEC Region 9, NYSDEC's Albany Operations and Maintenance (O&M) Section, NYSDOH, local police and ambulatory; and,
- A contingency plan for responses to emergencies.

See Appendix H for a generic safety plan.

5.4 Training

All personnel performing monitoring, inspection, or remediation activities at the Fourth Street Inactive Hazardous Waste site should have received the Occupational Safety and Health Administration's (OSHA's) 40-hour health and safety training course for work at hazardous waste sites. This includes 8-hour refresher training, first aid/cardiopulmonary resuscitation (CPR) training, and annual physical examinations.

5.5 Material Safety Data Sheets

All staff shall be aware of OSHA hazardous communication requirements. Personnel shall review all required material safety data sheets (MSDSs) and instructions pertaining to all anticipated chemicals prior to the initiation of any work.

6 Records

At minimum, all post-remedial monitoring and analytical results will be submitted to NYSDEC for review and evaluation within 45 days of sampling activities. All reports shall be retained by NYSDEC as permanent records associated with the Fourth Street Inactive Hazardous Waste site and shall be held for 30 years after the completion of the sampling event.

Send reports to:

Mr. Gerald J. Rider (or other)
NYSDEC
Remedial Bureau D, Section B
625 Broadway, 12th Floor
Albany, New York 12233-7013

Mr. Martin Doster (or other)
Regional Hazardous Waste Engineer
NYSDEC Region 9 Office
270 Michigan Avenue
Buffalo, New York 14203

Mr. Cameron O’Connor (or other)
NYSDOH
584 Delaware Avenue
Buffalo, New York 14202

6.1 Monitoring and Analytical Data

The monitoring and analytical report shall be submitted within 45 days after field sampling has occurred.

6.2 Inspections and Maintenance

All records and information on monitoring well inspections and maintenance shall be included as a part of the groundwater monitoring report. If maintenance is projected for the future or cannot be completed as a result of winter weather or other difficulties, it should be noted in the groundwater monitoring report and rescheduled when conditions warrant.

Records of all completed maintenance efforts, including any transportation and disposal of waste, shall also be included in the groundwater monitoring report immediately following waste disposal.

Any other site problems observed during monitoring events will also be reported to NYSDEC to initiate corrective actions.

7

Citizen Participation

A requirement of the post-remedial site management program is for its results and evaluations of the results to be communicated to affected property owners and local officials.

Citizen Participation Plan

A citizen participation plan (CPP) shall be developed by NYSDEC to facilitate public participation and provide a line of communication to those individuals affected by the action regarding post-remedial monitoring of the site. The Regional Hazardous Waste Engineer and Regional Citizen Participation (CP) Specialist will coordinate timing and determine the need for future CP activities.

The site CPP shall essentially be an annual summary report from NYSDEC providing post-remedial monitoring analytical results. The report shall also address any future activities that will take place at the site and any changes to the site management plan as a result of information obtained. A copy of this CPP should be sent directly to the document repository each year.

Table 7-1 provides a list of current project-related officials and property owners in the event contact is required regarding further post-remedial activities. This list should be updated as necessary.

Table 7-1 Citizen Participation Plan Contact List (as of September 2006)

Agency	Address	Contact Name	Phone Number
NYSDEC	Region 9 270 Michigan Ave. Buffalo, NY 14203-2999	Martin Doster	716-851-7220
NYSDEC	Remedial Bureau D, Section B 625 Broadway, 12th Floor Albany, NY 12233-7013	Gerald J. Rider	518-402-9812
New York State Department of Health	584 Delaware Ave. Buffalo, NY 14202	Cameron O'Connor	716-847-4502
City of Buffalo	Buffalo Urban Renewal Agency Room 920, City Hall Buffalo, NY 14202	Dennis Sutton	716-851-6587
City of Buffalo (parks)	Community Development	Dennis Maloney	716-851-5013
City of Buffalo (Buffalo Public Schools)	Board of Education	Bob Rua	716-816-3673
Erie County Department of Health	95 Franklin Street Buffalo, NY 14202	Environmental Health Services	716-858-7677
Erie County Department of Environment and Planning	95 Franklin Street Buffalo, NY 14202	Environmental Compliance Services	716-858-6370

8

References

Ecology and Environment Engineering, P.C. (EEEPC). 2006a. Fourth Street Inactive Hazardous Waste Site, Remedial Action Summary Report.

__________. 2006b. Fourth Street Inactive Hazardous Waste Site, Soils Management Plan.

__________. 2004. Final Pre-Design Investigation and Engineering Design Report for the Fourth Street Inactive Hazardous Waste Site.

6 New York Code of Rules and Regulations (NYCRR) 6 NYCRR Parts 700 -705.

New York State Department of Environmental Conservation. December 2002. Draft DER-10, Technical Guidance for Site Investigation and Remediation.

__________. March 1991. Sampling Guidelines and Protocols, Technological Background and Quality Control/Quality Assurance for the NYSDEC Spill Response Program.

U.S. Environmental Protection Agency (EPA). January 1995. SW-846, Test Methods for the Evaluation of Solid Waste, 3rd ed. Update II-B.

A

Property Survey

NOTE : LANDS CONVEYED TOTHE CITY OF BUFFALO BY DEED RECORDED IN LIBER 10833 OF DEEDS AT PAGE 7297 ARE THE SAME LANDS AS THOSE CONVEYED TO THE NEW YORK STATE URBAN DEVELOPMENT CORPORATION BY DEED RECORDED IN LIBER 8442 OF DEEDS AT PAGE 247, PARCEL 14.

MEMBER

Kevin P. Clough, RLS
Corp. Lic. No 028

NO IRONS SET OR FOUND AT PROPERTY CORNERS UNLESS NOTED HEREON.

NOTE: THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF AN ABSTRACT OF TITLE AND IS SUBJECT TO ANY STATE OF FACTS THAT MAY BE REVEALED BY AN EXAMINATION OF SUCH.

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FOR
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CITY OF BUFFALO
COUNTY OF ERIE STATE OF NEW YORK

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Engineers and Surveyors
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Buffalo, New York 14219-1494
(716) 827-8000
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DATE: JUNE 15, 2005	JOB NO. 05J2-0406	
SCALE: 1" = 40'	DWG. NO. SC-3261	

B

Record of Decision

Department of Environmental Conservation

Division of Environmental Remediation

Record of Decision

Fourth Street Site
Buffalo (C), Erie County, New York
Site Number 9-15-167

August 2001

New York State Department of Environmental Conservation
GEORGE E. PATAKI, *Governor*	ERIN M. CROTTY, *Commissioner*

DECLARATION STATEMENT - RECORD OF DECISION

Fourth Street Inactive Hazardous Waste Site

Buffalo (C), Erie County, New York
Site No. 9-15-167

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedy for the Fourth Street class 2 inactive hazardous waste disposal site which was chosen in accordance with the New York State Environmental Conservation Law. The remedial program selected is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300).

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for the Fourth Street inactive hazardous waste site and upon public input to the Proposed Remedial Action Plan (PRAP) presented by the NYSDEC. A listing of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Assessment of the Site

Actual or threatened release of hazardous waste constituents from this site, if not addressed by implementing the response action selected in this ROD, presents a current or potential significant threat to public health and the environment.

Description of Selected Remedy

Based upon the site investigations and Remedial Investigation/Feasibility Study, the NYSDEC has selected Alternative 3B, complete source removal and backfilling the excavated areas with clean fill.

The elements of the selected remedy are as follows:

, Excavation and off-site disposal of contaminated soils (complete source removal).

, Treatment of contaminated groundwater collected during excavation.

, Possible re-routing of some utilities.

, Removal of all Manufactured Gas Plant (MGP) structures and piping.

, Backfilling the excavated areas.

, Groundwater monitoring with periodic evaluations. The results of this monitoring will form the basis for a decision about what, if any, active groundwater remediation will be undertaken.

, In the event that complete removal of soil contamination cannot be achieved and significant levels of soil or groundwater contamination remain on site after completion of the remedy, the NYSDEC will seek to have a deed restriction placed on the site to prevent the use of groundwater and to prevent intrusive activities that could result in uncontrolled exposures to subsurface contamination. This contingency will be invoked if the NYSDEC determines that it is technically impracticable to remove all of the significant soil contamination or if significant levels of site-related groundwater contamination remain after completion of the remedy.

New York State Department of Health Acceptance

The New York State Department of Health concurs with the remedy selected for this site as being protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

_________	______________________________
Date	Michael J. O'Toole, Jr., Director Division of Environmental Remediation

TABLE OF CONTENTS

Record of Decision
Fourth Street Site
Buffalo (c), Erie County
Site No. 915167
August 2001

SECTION 1: SITE LOCATION AND DESCRIPTION

This 5 acre site consists of a vacant lot which is located near the corner of Fourth and Village Court streets in the City of Buffalo. As shown in Figure 1 the site is bounded by the Waterfront School building and the National Fuel Gas Buffalo Service Station on the south, Fourth Street on the west, Pine Harbor Apartments on the east and play grounds on the north. The site is located in a mixed residential, commercial, and recreational setting approximately 1500 feet east of the Lake Erie shoreline. A school parking lot is built on a portion of the site. As described in Section 2.1 below, the site was formerly used as a Manufactured Gas Plant (MGP). There is tar on the surface in one area of the site which is believed to be a result of test pit excavations during the 1991-92 site investigation. A fence has been installed to prevent access to that area. Three water lines, a sewer, and several other utility lines are also underground in the site area. No drinking water wells are located in the vicinity of the site. It is noted that the National Fuel Gas property, located south of the site, is another former Manufactured Gas Plant site which is currently undergoing an environmental investigation.

In general, fill material is present over the entire site. The depth of fill varies from 4.5 to 14 feet. The fill consists of bricks, cement, slag, coal, wood, silt, sand, and gravel. Below this fill material are sediment layers of glacial lake deposits consisting of clay, silt, gravel, and sand. Below the sediment layer is limestone bedrock which is found at an approximate depth of 22 feet below the ground surface.

Precipitation onto the top of the land surfaces is collected by area sewers and is treated at the Buffalo Sewer Authority before being discharged into the Niagara River. In the site area, the general groundwater (precipitation that has seeped into the ground) flow direction is towards Lake Erie, however, the hydrology on the south side of the school building is complex due to the building and the former Wilkeson Slip (which is completely filled in and is not visibly noticeable) located at the property line of the school and National Fuel Gas. The groundwater (water table) is encountered between 4 to 6 feet below ground surface.

SECTION 2: SITE HISTORY

2.1: Operational/Disposal History

From 1870 to approximately 1915 the Citizens Gas Works operated an MGP at the site property. (See Fig. 2 - Location of Historical Structures). This plant produced gas for heating and lighting by "heat-treating" coal and petroleum products. From 1934 to 1958 a portion of the property was used by the Greyhound Bus Company. Historical information and maps indicate that historical businesses in the area contained coal bins, sand piles, engine rooms, garages, etc.

The exact nature of the operation at the Citizens Gas Works is unknown, however, a typical MGP facility produced gas by either a carbonation or gasification process. The carbonation process heated coal in the absence of oxygen to produce primarily a methane and hydrogen gas mixture called coal gas. The gasification process infused steam through hot coal or coke, resulting in the formation of water gas, which consisted primarily of hydrogen and carbon dioxide. Water gas was often combined with "oil gas" to increase its BTU content.

The by-products from these operations included a dense, oily liquid known as "coal tar", coke, and ammonia. Large quantities of ash were also produced from the carbonation process. Substantial amounts of tar typically escaped collection and was spilled or disposed onto the land. It is believed that during demolition of the Citizens Gas Works facility, these wastes were covered with various fill materials.

The site is currently owned by the Buffalo Urban Renewal Agency.

2.2: Remedial History

C 1991-1992 - The Buffalo Urban Renewal Agency (BURA) undertakes an environmental assessment in preparation for a possible residential development.

C 1996 - NYSDOH conducts sampling of sump water and indoor air in the basement of the Waterfront School.

C 1996 - NYSDEC/NYSDOH collects samples of surface soils, subsurface soils, waste material and groundwater.

C 1996 - Based upon the significant threat created by the presence of hazardous waste as defined in the 6NYCRR Part 371, the site was listed as a class 2 site in the Registry of Inactive Hazardous Waste Disposal Sites in New York State. A classification 2 means that the site poses a significant threat to the public health and/or the environment and action is required.

C 1998 - 2001 : BURA undertakes a remedial investigation and feasibility study of the property.

SECTION 3: <u>SITE CONTAMINATION</u>

To evaluate the contamination present at the site and to evaluate alternatives to address the significant threat to human health and the environment posed by the presence of hazardous waste, BURA completed a Remedial Investigation/Feasibility Study (RI/FS) in January 2001.

3.1: Current Status - Summary of the Site Investigations:

To determine the nature and extent of environmental problems at the Fourth Street site, several site investigations were completed between 1992 and 1999. The site investigations conducted at this site are summarized below:

1. Phase II Environmental Investigation: *Waterfront Redevelopment Project - Huntingdon - Empire Soils Investigations, Inc. - May, 1992.*

During this investigation, the following tasks were performed:

C Soil gas sampling at 25 locations
C Excavated 29 test pits
C Installed 4 monitoring wells

During this investigation coal tar was discovered in some test pits. Test results of tar material (see Table 1) indicate elevated levels of total polycyclic aromatic hydrocarbons (PAHs - 53,000 ppm), benzene, toluene, ethylbenzene, and xylenes (BTEX- 9,160 ppm), and phenols (3,050 ppm).

Elevated levels of BTEX were found in two groundwater monitoring wells MW-01 (20,800 ppb) and MW-02 (27,900 ppb).The levels of PAHs and phenolic compounds were also elevated in MW-01 (5,200 ppb naphthalene, and 71,000 ppb total phenols) and MW-02 (6,500 ppb naphthalene and 114,000 ppb of total phenols). A thick oily material - also referred to as DNAPL (dense non-aqueous phase liquid) - was present in MW-02.

2. NYSDEC/NYSDOH Sampling 1996:

The purpose of this sampling was to determine the level of contamination in surficial soils and groundwater and to determine whether or not the coal tar waste was hazardous according to the 6NYCRR Part 371.

The following samples were collected:

8 surface soil samples
1 groundwater sample
4 subsurface samples

The results confirmed earlier data that groundwater was highly contaminated with benzene (16,000 ppb) and the waste material exceeded regulatory threshold levels thereby designating the coal tar as hazardous waste (7.5 ppm benzene in a leaching test compared to the regulatory level of 0.5 ppm). The data also determined that surface soils near the school contained total PAHs equal to 420 ppm, of which 220 ppm were carcinogenic PAHs. This area was subsequently fenced to prevent trespass.

3. Remedial Investigation (RI)

Remedial Investigation/Feasibility Study at the Fourth Street site by Parsons Engineering Science - January 2001:

The purpose of the RI was to define the nature and extent of contamination resulting from previous activities at the site. The RI was conducted in two phases. The first phase was conducted between April and November 1998 and the second phase between June and August 1999**.**

The RI included the following activities:

- Installation of 23 soil borings and 8 monitoring wells for analysis of soils and groundwater to determine the nature and extent of contaminants in the subsurface as well as determining physical properties of soil and hydrogeologic conditions.

- Collection of 12 surface soil samples to determine levels of contamination in surficial soils.
- Collection of eight sub-surface soil samples to determine any NAPL migration along the under ground utility lines.

To determine which media (soil, groundwater, etc.) contain contamination at levels of concern, the analytical data from the RI and other site investigations was compared to environmental standards, criteria, and guidance values (SCGs). Groundwater SCGs identified for the Fourth Street site are based on NYSDEC Ambient Water Quality Standards and Guidance Values and Part 5 of the NYS Sanitary Code. The Remedial Investigation/Feasibility Study evaluated background values as well as total organic carbon to develop site-specific clean-up goals for this site. After review by NYSDEC it was determined that the values are consistent with Technical and Administrative Guidance Memorandum (TAGM) - 4046 values. Therefore, TAGM-4046 values will be used as the recommended remedial goals for this site.

After comparison to the remediation goals and evaluation of potential public health and environmental exposure routes, it has been determined that certain areas and media of the site will require remediation. More complete information can be found in the RI/FS Report dated January 2001.

Chemical concentrations are reported in parts per billion (ppb) or parts per million (ppm). For comparison purposes, where applicable, SCGs are provided for each medium.

3.1.1 Nature of Contamination:

As described in the RI Report, many surface soil, subsurface soil, and groundwater samples were collected at the site to characterize the nature and extent of contamination. The main categories of contaminants which exceed their standards, criteria, guidance values (SCGs) or remediation goals in subsurface soil and groundwater are volatile organic compounds (VOCs) - benzene, toluene, ethylbenzene, and xylenes (BTEX) and semivolatile organic compounds (SVOCs) - polycyclic aromatic hydrocarbons (PAHs) and phenols.

Contaminants were released to the soil in the form of coal tar, which is a dense, oily liquid that does not readily dissolve in water. Materials such as this are referred to as dense non-aqueous phase liquids (DNAPL). DNAPL was determined to have impacted approximately 40,000 cubic yards of soil/fill material.

3.1.2 Extent of Contamination:

Table 1 summarizes the levels of contamination found in soil, groundwater, and waste/tar and compares the data with the SCGs/remediation goals for the site. The following are the media which were investigated and a summary of the findings of the investigation.

SOIL

Surface Soil :

Five on-site and seven off-site (background) surface soil samples were collected (see Fig.3). PAHs were detected in all on-site and off-site samples. Concentrations of PAHs in surficial on-site soils ranged from

1 ppm in SS-04 to 136 ppm in SS-01. SS-01 is located in the area of the retort house of the former MGP facility (see Fig. 2). Total cyanides were detected in three on-site samples at low levels (highest concentration was 7.2 ppm in SS-03).

The total PAHs in off-site (background) surface soil samples varied from 0.75 to 19 ppm. Total cyanides were not detected in off-site samples. Surface soils do not contain significant concentrations of volatile organic compounds.

Subsurface Soil:

Subsurface soil samples showed four types of contaminants (BTEX, PAHs, phenols, and cyanides). Among the off-site subsurface soil samples, the highest level of BTEX (33 ppm) and benzene (13 ppm) were found in SB-12 (see Fig. 4). [It appears that BTEX detected at the SB-12 location may be due to some source other than the MGP site because of the depth at which BTEX was found and also because of absence of PAHs in that sample. At MGP sites, BTEX and PAHs are often found to exist together in soils.] Total PAHs in off-site samples were found up to 21 ppm in SB-22 at a depth of 6-8 feet.

The on-site subsurface soil samples showed BTEX up to 32 ppm and xylenes at 17 ppm in SB-13. Total PAHs were found up to 212 ppm in SB-06 at a depth of 4-6 feet. [The purpose of subsurface soil sampling during the RI was to define the extent of contamination in the areas *outside* of the DNAPL-soaked soil i.e. samples were collected above and/or below the DNAPL layer.]

In the utility borings, levels of BTEX varied from 0.001 ppm to 0.43 ppm and total PAHs from non-detect to 0.9 ppm. These data indicate that contamination does not appear to be migrating off-site along the underground utility lines.

Traces of phenols were detected in SB-03, SB-22 and MW-9 locations. Total cyanides levels were 4.2 ppm in SB-03, 46.3 ppm in SB-06, and 2.9 ppm at MW-9.

GROUNDWATER

Groundwater samples were collected from monitoring wells MW-03 to MW-10 (well locations are shown in Fig. 5). No water samples were collected from MW-02 due to the presence of DNAPL in it.

BTEX concentrations in groundwater samples ranged from non-detect to 1,987 ppb. The highest concentration of BTEX was reported in MW-09, which is located next to the National Fuel Gas facility (NFG) where a similar MGP facility operated historically. As described in Section 1, the general groundwater flow direction is from east to west in the site area. MW-05 which detected BTEX at 21.7 ppb, is hydraulically down gradient of the tar area while MW-09 is up gradient of the site. The source of contamination in MW-09 will not be clearly determined until site investigation at the NFG is complete. No contamination was found in MW-0 7 and MW-0 8. BTEX was found in MW-04 (11 ppb), MW-06 (3 ppb), and MW-10 (1 ppb). The low levels of groundwater contamination could be due to very low solubility of DNAPL in water and slow groundwater movement in the area.

An evaluation of the groundwater flow patterns and chemical concentrations concludes that the highly concentrated DNAPL source area has a limited impact on the general down-gradient groundwater area. Cyanides were found in MW-03, MW-05, MW-09, and MW-10. The concentrations of cyanides were below the groundwater standard (200 ppb) and varied from 11 ppb to 140 ppb with the highest concentration being in MW-10.

DNAPL/TAR WASTE

As shown in Table 1, the data from the Empire Soils Investigation Report in 1992 shows DNAPL or coal tar in the source area to contain elevated levels of benzene (3,300 ppm), toluene (3,000 ppm), xylenes (2,700 ppm), phenolic compounds (3,000 ppm), and total PAHs (53,000 ppm).

During the RI, DNAPL was identified in samples from MW-02, MW-03, SB-03 to SB-07, and SB-13. The area of DNAPL occurrence is shown in Fig. 6.

The DNAPL area, containing BTEX and PAHs well above cleanup goals, is considered the source of contamination at this site resulting in the adverse impact to soil and groundwater.

[Note: DNAPL was also found between the School building and the National Fuel Gas (NFG) property. The extent of this DNAPL will be determined during investigation of the NFG site.]

INDOOR SCHOOL Water/Air

In 1996, the NYSDOH sampled sump water and indoor air in the basement of the Waterfront School. The analytical results documented very low concentrations of volatile organic compounds that are associated with site contaminants in one of the sumps. Sampling data did not document an adverse impact to the air quality in the school from the site.

3.2 Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the health risks can be found in Section 5 of the Remedial Investigation Report.

An exposure pathway is how an individual may come into contact with a contaminant. The five elements of an exposure pathway are 1) the source of contamination; 2) the environmental media and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events.

Pathways which are known to or may exist at the site include:

- ingestion of contaminated soil by local residents, students from the nearby school, or utility workers.

- inhalation of volatile compounds by visitors or workers at the site.

- dermal contact with contaminated soils by visitors or workers

- ingestion of groundwater through the use or consumption of water from groundwater wells. There is currently no known use of groundwater as a source of potable water. The area is served by public water; and

- Underground utility trenches and conduits may serve as potential preferential pathways for groundwater flow away from the site. Five sumps are also located in the basement of the Waterfront School and are potential receptors to groundwater.

3.3 Summary of Environmental Exposure Pathways:

This section summarizes the types of environmental exposures which may be presented by the site.

Currently the site does not directly impact any surface water body or wildlife. However, if the migration of DNAPL and other contaminants in soil is not prevented, contamination can migrate off-site through groundwater, sewers, and underground utility trenches.

Surface water route: Surface water enters the on-site sewer which is subsequently treated at the Buffalo Sewer Authority wastewater treatment plant. There was little evidence of on-site surface erosion that could cause adverse impacts to the sewer system and treatment plant.

Subsurface soil route: There is a possibility that due to the higher density of DNAPL, migration downwards will continue to occur within the unconsolidated fill until it reaches an impermeable layer. DNAPL may then begin horizontal migration along the impermeable boundary towards low lying areas and in the direction of groundwater movement.

SECTION 4: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The NYSDEC and the Buffalo Urban Renewal Agency (BURA) entered into a Consent Order (B9-0505-96-12) on July 24, 1997. The Order obligates BURA to implement the RI/FS remedial program. Upon issuance of the Record of Decision the NYSDEC will approach all Potentially Responsible Parties (PRPs) to implement the selected remedy under an Order on Consent.

SECTION 5: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. The overall remedial goal is to meet all Standards, Criteria and Guidance (SCGs)/ Remediation Goals and be protective of human health and the environment. At a minimum, the remedy selected should eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The goals selected for this site are:

- *Eliminate to the extent practicable the source of contamination at the site to meet remediation goals;*

- *Eliminate, to the extent practicable, ingestion of groundwater affected by the site that does not attain NYS drinking water standards;*

- *Eliminate, to the extent practicable, off-site migration of groundwater that does not attain NYSDEC Class GA Ambient Water Quality Criteria;*

- *Eliminate, to the extent practicable, migration of DNAPL;*

- *Eliminate the potential for direct human or animal contact with the contaminated soils and waste materials on site; and*

- *Eliminate the long-term threat of exposure to contamination to users of the School and/or nearby residential area.*

SECTION 6: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy should be protective of human health and the environment, be cost effective, comply with other statutory laws and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the Fourth Street site were identified, screened and evaluated in the report entitled Remedial Investigation/Feasibility Study at the Fourth Street site, dated November 1999. A summary of the detailed analysis follows.

As presented below, the time to implement reflects only the time required to implement the remedy, and does not include the time required to design the remedy, procure contracts for design and construction or to negotiate with responsible parties for implementation of the remedy.

6.1: Description of Alternatives

The potential remedies are intended to address the contaminated soils and groundwater at the site.

Alternative 1 - Limited Action:

Under this alternative, the site would be fenced to restrict public access; a deed restriction to prevent the use of on-site groundwater would be applied; groundwater monitoring would be performed for five years; and intrinsic bioremediation in groundwater would be enhanced. Under this alternative the site would essentially remain in an un-remediated state.

Present Worth:	$ 160,000
Capital Cost:	$ 60,000
Annual O&M:	$ 100,000
Time to Implement:	Less than 6 months

Alternative 2 - Containment:

This alternative was proposed in the Feasibility Study and would consist of constructing an impermeable cap with vegetation or an asphalt cover over the contaminated soils (see Fig. 7), a deed restriction to prevent the use of on-site groundwater, and groundwater monitoring.

Present Worth: $680,000 to $900,000*
Capital Cost: $550,000
Annual O&M: $130,000 to $350,000*
Time to Implement: Less than 6 months

[* The range of costs accounts for a potential groundwater monitoring period ranging from 5 to 30 years]

Alternative 3 A - Partial Source Removal and Off-site Disposal:

Under this alternative contaminated soils (estimated quantity - 27,000 cubic yards) would be excavated from the surface to a depth of one foot below the water table. Underground utilities in the site area, such as an 8 foot diameter sewer may have to be rerouted. A cost estimate for rerouting utilities is not included in this alternative. All MGP structures and piping would be removed. The excavated soils would be taken off-site for treatment, if needed, and for landfill disposal. The excavated area would be backfilled with clean fill and would likely be covered with asphalt for use as a parking lot. Groundwater would be monitored with re-evaluation in 5 years. The results of this monitoring would form the basis for a decision about what, if any, active groundwater remediation would be undertaken.

It is noted that the cost for this remedial alternative is higher than calculated in the Feasibility Study due to the following reasons:

C added the cost for odor control.
C added the cost for a detailed community Health & Safety Plan.
C revised the estimate of the volume of hazardous waste and soil to be excavated

Present Worth: $5,200,000
Capital Cost: $5,100,000
Annual O&M: $100,000
Time to Implement: Less than 6 months

Alternative 3 B - Complete Source Removal and Off-site Disposal:

This alternative would excavate all contaminated soils above the Recommended Soil Cleanup Objectives given in TAGM-4046 including surficial contaminated soils and subsurface soils associated with the source i.e., the former MGP facility. Additional data would be gathered during Remedial Design to determine the exact nature and extent of contamination.

Removal of the deeper DNAPL would require excavation under the water table. The groundwater encountered during excavation (estimated to be 552,000 gallons) would be removed and treated. (The cost to remove the groundwater encountered during excavation is included in the capital cost and is given in Appendix H of the RI/FS). The estimated volume of soil to be excavated is 40,000 cubic yards. The approximate limit of excavation is shown in Fig. 8. It is recognized that underground utilities, such as the

8 foot diameter sewer line, may cause difficulty during the excavation activities. A cost estimate for rerouting utilities is not included in this alternative. All MGP structures and piping would be removed.

Excavated soils would be taken off-site for treatment (if necessary) and/or landfill disposal. The excavated area would be backfilled with clean fill. Groundwater would be monitored with periodic evaluations. The results of this monitoring would form the basis for a decision about what, if any, additional active groundwater remediation would be undertaken.

It is noted that the cost for this remedial alternative is higher than calculated in the Feasibility Study as discussed above in Alternative 3A.

Present Worth:	$7,420,000
Capital Cost:	$7,320,000
Annual O&M:	$100,000
Time to Implement:	Less than 6 months

6.2 EVALUATION OF REMEDIAL ALTERNATIVES

The criteria used to compare the potential remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste sites in New York State (6 NYCRR Part 375). For each of the criteria, a brief description is provided, followed by an evaluation of the alternatives against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is included in the Feasibility Study.

The first two evaluation criteria are termed threshold criteria and must be satisfied in order for an alternative to be considered for selection.

1. **Compliance with New York State Standards, Criteria, and Guidance (SCGs)**:

Compliance with SCGs addresses whether or not a remedy will meet applicable environmental laws, regulations, and guidance. The most significant SCGs for this site are outlined in Table 2.

Alternatives 1 (Limited Action) and 2 (Containment) would not meet the SCGs for soil and groundwater. The source of contamination would stay in place at the site under both alternatives 1 and 2. Alternative 2 simply provides for a protective cover to be placed over the waste material (source area). The SCGs establish criteria for removing and/or treating the source areas of contamination to prevent future exposures from occurring. SCGs would not be fully addressed under Alternatives 1 and 2 since the source area would not be treated or removed. Alternative 3A (Partial Removal) would only partially meet the SCG objectives because highly contaminated materials would remain in contact with groundwater. Alternative 3B (full removal) would provide additional protection since contaminated soil and highly contaminated groundwater would be removed from the site. Alternative 3B would effectively remove the threat of site contamination migration to the school, as well as eliminate, to the extent feasible, migration through area utility lines to off-site receptors such as the Buffalo Sewer Authority and/or the Niagara River.

2. **Protection of Human Health and the Environment:**

This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

The site would remain in its current condition in Alternative 1 and the potential for exposure to pedestrians from surficial contaminated soils and to utility or construction workers from subsurface contamination in soils and groundwater would remain. In addition, highly concentrated waste materials left in close proximity to the public school is not considered protective of human health. Under Alternative 2 and 3A, the exposure of pedestrians to contamination would be significantly reduced, however, the exposure potential to utility or construction workers would remain. Since the contamination source would remain in Alternatives 1 and 2 and would only be partially removed in Alternative 3A, the potential exists that the highly concentrated waste material could impact the adjacent school, residential properties, or migrate off-site through sewers or utility lines. Therefore Alternatives 1, 2, and 3A would not be considered adequately protective of human health or the environment. Among all the alternatives considered for this site, only Alternative 3B (full removal) would provide adequate protection of human health and the environment. Alternative 3B would conceivably remove highly contaminated waste material (DNAPL/coal tar), contaminated soils above remediation goals, and significant amounts of highly contaminated groundwater.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. **Short-term Effectiveness**. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

In Alternatives 1 and 2, no excavation or treatment is proposed which would result in any short term impacts to the workers or the community. Short term impacts would occur during a period of 2-3 months from the hauling of cover material as described in Alternative 2. Hauling of cover material over a period of 2-3 months would have short term impacts such as dust and noise. Traffic controls would have to be put into place to prevent adverse impacts to the surrounding neighborhood.

Excavation and hauling of waste materials in Alternatives 3A and 3B could result in dust, odor, and noise for an estimated 6 months. Dust and odor controls would be implemented in accordance with a site Health and Safety Plan. Engineering controls would likely be required to control odors associated with the excavation of waste material. A community Health and Safety Plan would be required to continually monitor the air quality. The noise due to heavy equipment can be controlled by limiting work hours. Traffic controls would have to be in place to ease impacts on the surrounding neighborhood.

4. **Long-term Effectiveness and Permanence**. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes remain on site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the controls intended to limit the risk, and 3) the reliability of these controls.

Limited Action in Alternative 1 and Containment in Alternative 2 would not be considered permanent remedies since the source of contamination remains. In addition, direct engineering controls, such as groundwater control, would not be in place to prevent off-site migration of contaminants. Alternatives 1 and 2 would not be effective in preventing possible human exposures to contaminated soil, coal tar and highly contaminated groundwater that may migrate from the source area. Alternative 3A would not be considered a permanent remedy since waste below the water table would not be removed and no further controls are contemplated to prevent migration and prevent long term exposure to the wastes left behind. Removal of soil exceeding remediation goals and monitoring of remaining contaminated groundwater as proposed in Alternative 3B would substantially reduce the magnitude of risk and would be considered more permanent and effective in the long- term.

5. Reduction of Toxicity, Mobility, or Volume.

Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

Alternative 1 would not reduce the toxicity, mobility, or volume of contaminants in soil and groundwater. Alternative 2 would reduce infiltration due to rain and snow and would help reduce the mobility of contaminants through groundwater but would not reduce toxicity or volume of the waste. Alternative 3A would significantly eliminate the toxicity, mobility, and volume of the constituents in the soil above the groundwater table. Overall reduction in toxicity, mobility, or volume would be better achieved in Alternative 3B as wastes above and below the water table would be removed.

6. **Implementability.** The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc.

Alternatives 1 and 2 would be easy to implement. Alternatives 3A and 3B would be implementable, however, they would require significant engineering to overcome impediments such as re-routing underground utilities, or providing adequate protection to workers and the community during excavation of the waste material. The use of an enclosed structure to prevent fugitive dust and odor emissions would be evaluated in the engineering design. The scheduling of the construction activities would have to be coordinated with the school officials and local community.

With respect to all four alternatives, the administrative work for deed restrictions, data management, and reporting on groundwater monitoring would be considered routine and implementable. It is noted that implementation of the deed restriction would be dependent upon the landowners, in this case the Buffalo Urban Renewal Agency.

7. **Cost.** Capital and operation and maintenance costs are estimated for each alternative and compared on a present worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision. The costs for each alternative are presented in in the following table:

Alternative	Capital Cost	Annual O&M	Total
1	$60,000	$100,000	$160,000

2	$550,000	$130,000-$350,000	$680,000 - $900,000*
3A	$5,100,000	$100,000	$5,200,000**
3B	7,320,000	$100,000	$7,420,000**

[* In Alternative 2 range of costs for groundwater monitoring from 5 to 30 years. ** In Alternatives 3A and 3B, the cost for relocation of utilities is not included.]

Among the four alternatives evaluated in the FS, the most expensive alternative is 3B with a cost of $7,420,000. (This does not include costs to relocate utilities) The high cost would be due to complete removal of the waste.

This final criterion is considered a modifying criterion and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

8. **Community Acceptance** - Concerns of the community regarding the RI/FS reports and the Proposed Remedial Action Plan have been evaluated. A Responsiveness Summary has been prepared (attached as Appendix A) by the NYSDEC to respond to the comments received during the public comment period and the comments received during the public meeting. The NYSDEC did not receive any new information that would form the basis for selecting a different remedy. Therefore, the final selected remedy for this site is the same as was presented in the Proposed Remedial Action Plan.

It is noted that BURA has prepared a Remedial Investigation and Feasibility Study, however BURA's report dated January 2001 does not recommend Alternative 3B as the preferred remedy. NYSDEC and NYSDOH believe that Alternative 3B is the best remedial alternative and sought comments from the community including the Buffalo Urban Renewal Agency, the Buffalo Public School - Board of Education and other local government agencies as well as the general public.

SECTION 7: SUMMARY OF THE SELECTED REMEDY

Based upon the results of the RI/FS, and the evaluation presented in Section 6, the NYSDEC is selecting **Alternative 3B - Complete Source Removal** to meet TAGM-4046 cleanup levels and Off-Site Disposal as the remedy for this site.

This selection is based upon the conclusion that the remedy selected in Alternative 3B will best meet all the remedial goals for this site and will best achieve the threshold and balancing criteria described in Section 6.

Alternatives 1 and 2 would not meet clean up goals and would not be considered protective of human health and the environment since highly concentrated waste material containing elevated levels of known carcinogenic compounds such as benzene (3,300 ppm) and suspected carcinogenic PAHs (9,940 ppm) would remain on site.

Capping (covering) the waste on-site, as described in Alternative 2, would not allow for the potential for future development. Although Alternative 2 can be accomplished quicker and less expensive, with less short-term impact to the community, the long-term benefits of removing the wastes far outweigh the short-term benefits.

In the final analysis, the proximity of highly concentrated waste material next to a public school would pose a constant health threat to the school and the nearby residential areas and would require intense monitoring. Simply covering the waste material would not address the likelihood that contaminants from the waste may start migrating off-site via area utility lines and sewers.

Clean-up goals for soil will be fully met in Alternative 3B but not in Alternative 3A. By fully removing the waste material, the development potential of the property will be greatly increased. With partial removal of waste in Alternative 3A, groundwater SCGs would not be met in the foreseeable future. Initially groundwater SCGs will not be met in Alternative 3B, however, the threat of migration of highly contaminated groundwater to the nearby school will be significantly reduced. Alternative 3B has been selected over the other alternatives as it will best meet the SCGs/remediation goals and will be the most protective of human health and the environment.

Alternatives 1 and 2 were not selected because these alternatives would neither provide reduction of toxicity, mobility, or volume of waste nor would they be effective in the long term. Alternatives 1 and 2 would not meet the criteria for permanence. Alternative 3B was chosen over Alternative 3A because Alternative 3B will be effective in the long term and will be considered permanent, and will provide better reduction of toxicity, mobility, or volume of waste at the site.

The estimated present worth cost to implement the remedy will be $7,420,000. (Additional cost may be incurred to relocate utilities). The cost to construct the remedy is estimated to be $7,320,000 and the estimated average annual operation and maintenance cost for 5 years is $100,000. Alternative 3B will be more expensive as compared to other alternatives, however, considering the location of site next to a school, residential area, and play grounds, the long term benefit of Alternative 3B will outweigh the cost.

A detailed remedial engineering design will be required to verify the components of the conceptual design and provide the details necessary for the construction of the project. Any uncertainties identified during the RI/FS, such as the extent of waste, migration along utility lines etc. will be resolved during the Remedial Design.

The elements of the selected remedy are as follows:

- Excavation and off-site disposal of contaminated soils (complete source removal).

- Treatment of contaminated groundwater collected during excavation.

- Possible re-routing of some utilities.

- Removal of all MGP structures and piping.

- Backfilling the excavated areas.

- Groundwater monitoring with periodic evaluations. The results of this monitoring will form the basis for a decision about what, if any, active groundwater remediation will be undertaken.

- In the event that significant levels of soil or groundwater contamination remain on site after completion of the remedy, the NYSDEC will seek to have a deed restriction placed on the site to prevent the use of groundwater and to prevent intrusive activities that could result in uncontrolled exposures to subsurface contamination. This contingency will be invoked if the NYSDEC determines that it is determined to be technically impracticable to remove all of the significant soil contamination or if significant levels of site-related groundwater contamination remain after completion of the remedy.

SECTION 8: HIGHLIGHTS OF CITIZEN PARTICIPATION

Citizen Participation (CP) activities were implemented to provide concerned citizens and organizations with opportunities to learn about and comment upon the investigations and studies pertaining to the Fourth Street site. All reports were available for public review in the document repository. A public contact list was developed and used to distribute fact sheets and meeting announcements.

A public meeting was held on February 27, 2001 at the Waterfront School auditorium, Buffalo, New York to describe the Proposed Remedial Action Plan (PRAP). Prior to the meeting, a meeting notice and fact sheet were mailed to more than 330 people on February 16, 2001 to those persons on the contact list. The public comment period extended from February 19, 2001 until March 21, 2001. The public meeting was attended by approximately 100 persons. In general, the public supported the remedy as proposed in the PRAP. Comments received regarding the PRAP have been addressed and are documented in the Responsiveness Summary (Appendix A).

Table 1
Nature and Extent of Contamination

OFF-SITE SURFACE SOILS
(Reference: RI/FS Report January 2001)

Class	Contaminant of Concern	Concentration Range (ppm)	SCG (ppm)	Frequency of Exceeding SCG
SVOCs	Benzo(a)anthracene	0.074-1.800	0.224	4 of 7
	Benzo(a)pyrene	0.069-1.600	0.061	7 of 7
	Chrysene	0.076-1.600	0.400	4 of 7
	Dibenzo(a,h)anthracene	ND(0.010) - 1.900	0.014	5 of 7

ON-SITE SURFACE SOILS
(Reference: RI/FS Report January 2001)

Class	Contaminant	Concentration Range (ppm)	SCG (ppm)	Frequency of Exceeding SCG
SVOCs	Benzo(a)anthracene	0.020-11.000	0.224	4 of 5
	Benzo(a)pyrene	0.490-10.000	0.061	4 of 4
	Chrysene	0.120-8.800	0.400	3 of 5
	Dibenzo(a,h)anthracene	0.098-1.000	0.014	4 of 4

SUBSURFACE SOILS
(Reference: RI/FS Report January 2001)

Class	Contaminant	Concentration Range (ppm)	SCG (ppm)	Frequency of Exceeding of SCG
VOCs	Benzene	ND (0.012) - 13.000	0.060	11 of 30
	Toluene	ND(0.012) - 1.900	1.500	1 of 30
	Ethylbenzene	ND(0.0.2) - 19.000	5.500	5 of 30
	Xylenes	ND(0.012) - 17.000	1.200	5 of 30

Contaminants in TAR or DNAPL
(Ref.: Empire Soils Investigation Report May, 1992)

Contaminant	Concentration (ppm)
Benzene	3,300
Toluene	3,000
Ethylbenzene	160
Styrene	550
Xylenes	2,700
Total BTEX	9,160
Acenaphthene	740
Acenaphthylene	2,900
Anthracene	3,000
Benzo(a)anthracene	2,200
Benzo(b)fluoranthene	1,200
Benzo(k)fluoranthene	1,300
Benzo(a)pyrene	1,700
Benzo(g,h,i)perylene	680
Chrysene	2,100
Benzo(a,h)anthracene	160
Dibenzofuran	2,400
Fluoranthene	5700
Fluorene	2,600
Indeno(1,2,3-cd)pyrene	700
2-Methyl Naphthalene	3,800
Naphthalene	12,000
Phenanthrene	6,400
Pyrene	3,600
Total PAHs	53,000
2,4-Dimethyl Phenol	820
2-Methyl Phenol	460
4-Methyl Phenol	1,300
Phenol	470
Total Phenols	3,050

GROUNDWATER

(Ref: Empire Soils Report May, 1992)

Class	**Contaminant**	**Concentration - ppb**		**Standards -ppb**
		MW-1	**MW-2**	
VOCs	Benzene	16,000	21,000	0.7
	Toluene	3,700	5,800	
	Xylenes	1,100	1,100	
	Total BTEX	20,800	27,900	
SVOCs	2-Methyl Naphthalene	530	640	
	Naphthalene	5,200	6,500	10
	Phenol	17,000	27,000	
	2,4-Dimethyl Phenol	13,000	21,000	
	2-Methyl Phenol	13,000	20,000	
	4-Methyl Phenol	28,000	46,000	
	Total Phenols	71,000	114,000	5

VOCs --- Volatile Organic Compounds
SVOCs --- Semi Volatile Compounds
GW --- Groundwater
mg/l --- milligrams per liter (ppm)
ug/l --- microgram per liter (ppb)
ppm --- parts per million
ppb --- parts per billion
SCG --- Standards, criteria, guidance values
DNAPL --- Dense non-aqueous phase liquid
BTEX --- Benzene, Toluene, Ethylbenzene, Xylenes

TABLE 2

Standards, Criteria, and Guidance

Regulation/Policy	Title	Applicability
6 NYCRR Part 360	Solid Waste Management Facilities - Land Disposal Restrictions	Land disposal of solid waste
6 NYCRR Part 371	Identification and Listing of Hazardous Wastes	Defines hazardous waste for purposes of disposal
6 NYCRR Part 375	Inactive Hazardous Waste Disposal Site Remedial Program	Regulates the permitting of activities at the site, defines new uses, public participation and otherwise provides guidance to the hazardous waste clean up program
TAGM HWR-94-4046	Determination of Soil Cleanup Objectives and Cleanup Levels.	Guidelines for developing clean up goals
6 NYCRR Parts 700 -705	Water Quality Regulations for Surface Water and Groundwater	Sets standards for groundwater
TAGM HWR-89-4031	Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites.	Guidelines for remedial activities

Appendix A
Responsiveness Summary

Fourth Street Site
Buffalo, Erie County
Site # 915167

The responsiveness summary contains questions and comments received by the New York State Department of Environmental Conservation (NYSDEC) regarding the Proposed Remedial Action Plan (PRAP) for the subject site. A public meeting for the PRAP for the Fourth Street site was held on February 27, 2001 at the Waterfront School, Buffalo, NY beginning at 6:30 PM. The public comment period lasted from February 19 through March 21, 2001.

The information below summarizes questions received from the public and the NYSDEC's responses to the questions.

Please refer to Section 7 of the Record of Decision for a review of the elements of the selected remedy. **Responses to Public Comments and Concerns expressed at the public meeting on February 27, 2001 are as follows:**

1. **How will DEC accommodate the school schedule during the clean-up?**
During the engineering design of the remedy, engineers will take into account the fact that any work conducted at the site must be protective of the school and its environs. Attempts will be made to ensure that there is minimum disruption to the school when any work has to be done when the school is in session. In any event, a Health and Safety Plan will be in effect to protect both the school personnel, students and workers. Also a Contingency Plan will be developed with the Waterfront School officials to cover any unexpected emergency.

2. **In 1996 DEC stated that the waste material was ok where it was, and that it did not have to be dug up. Why dig it up now since it has not caused any problems in the last 100 years?**
In 1996 the extent of contamination was not known and potential remedial alternatives were not yet evaluated. After the site was properly investigated it became clear that the best way to minimize the threat posed by the buried waste next to the school, play ground, and residential areas was to excavate the waste and contaminated soil.

   The DEC and DOH recognize that the excavation will have some short term negative impacts such as noise and traffic, but we believe the long term benefit of removing the waste will outweigh the short term impacts. Long term benefits include possible re-use of the land and removal of the uncertainty that this hazardous waste might be impacting the school.

3. **Why did the Buffalo Urban Renewal Agency (BURA) test the soil in the first place?**
It is the DEC's understanding that BURA undertook the sampling in 1991-92 as part of a feasibility study for a townhouse development project.

4. **Does BURA currently have a buyer for the property?**
   It is not known whether or not BURA is planning to sell the property.

5. **Does NYSDEC have experience excavating this type of material, especially when there is a neighborhood nearby?**
   NYSDEC has conducted inspection oversight at many manufactured gas plant clean-up projects. Two examples in western New York include the Warsaw School project located in Warsaw, NY and the National Fuel Gas - Mineral Springs Road project located in West Seneca. Both projects included excavation activities with the Warsaw project being conducted on school and residential properties.

6. **Who would be responsible for post remedial landscaping?**
   As owner of the property, BURA would retain responsibility to maintain its property. It is expected that after the excavation activities have been completed the property would be graded similar to current conditions.

7. **What impact will our concerns have on the selection of a remedial alternative?**
   The DEC is required to solicit and respond to community concerns regarding the clean-up of hazardous waste sites. It is possible that information can be brought to our attention that would require a re-evaluation of the proposed remedy. Therefore, all comments will be reviewed and evaluated.

8. **After the comment period ends, when will the Record of Decision be issued?**
   The Record of Decision was expected to be issued in March 2001, however, due to the number of comment letters received after the public meeting, the ROD issuance was delayed.

9. **Where will the contaminated soil go?**
   The highly contaminated waste, such as the soils soaked with hazardous waste, will likely be transported to a permitted incineration or thermal desorption facility. The lesser contaminated soil and non-hazardous waste will be transported to a permitted landfill or other permitted facility that can treat the material.

10. **How will the contaminated water be treated during excavation?**
    The contaminated water from the excavation area will be pumped into holding tanks and pre-treated before being discharged to the Buffalo Sewer Authority for additional treatment. The exact treatment technology will be developed during the engineering design. Development of the treatment technology will occur after technical discussions with the Buffalo Sewer Authority.

11. **After putting the contaminated soils into the dump trucks, are you concerned that contaminated soils may be spilled onto the roads in our community?**
    During a hazardous waste clean-up, special precautions are taken to prevent material from leaving the site. The trucks will be backed up on a clean area to be loaded. Before the trucks leave the site, the waste in the trucks will be covered with a tarp and the tires on the trucks will be inspected and washed if necessary. At times, *clean* soil being brought into the site may be tracked onto roads. In this case, the roads would be cleaned on a routine basis.

12. **Who will pay for the cleanup and will the money be there ?**
The responsible parties are responsible for cleanup costs. Responsible parties are those parties that own the property, caused the contamination or otherwise contributed to the problem. The law requires NYSDEC to contact the responsible parties to undertake the clean-up. If the responsible parties are unable to pay for the cleanup, money will be expended from the State Superfund program for the cleanup.

The State Superfund Program has been financed by the $1.1 billion 1986 Environmental Quality Bond Act. DEC projects an approximately 800 sites will be cleaned up or completely funded when the Bond Act is fully allocated by the end of the current fiscal year, March 31, 2001. In his 2001-2002 Executive Budget, Governor Pataki has proposed refinancing of Superfund, which finances the Inactive Hazardous Waste Disposal Site Remedial Program, as well as the Oil Spill Prevention and Response Program and the State's Voluntary Cleanup Program (VCP) on an annual pay-as-you-go basis.

13. **Were any samples taken near apartments?**
Surface soil samples were collected near the apartments during the remedial investigation. The sampling locations are shown on Figure 3 of the PRAP and ROD.

14. **When school was built, did they envision future problems ?**
Apparently the problems associated with this former manufactured gas plant were not recognized during the development of the school property.

15. **Where is the list of chemicals found at this site ? What effect has time had on these chemicals?**
The major chemicals found at this site are given in Table 1 in the Record of Decision and consist of polycyclic aromatic hydrocarbons (PAHs), benzene, toluene, ethylbenzene, xylenes and phenols. These compounds are organic in nature and will bio-degrade under natural conditions. Unfortunately it would take many years to bio-degrade the highly contaminated wastes found at this site if left unattended. It is noted that the waste material is already over 70 years old.

16. **What is the time frame to get the site cleaned up?**
After the ROD is signed, the next step will be to determine if any potentially responsible parties are in a position to undertake the clean-up. This will be followed by the selection of an engineering consultant to prepare an engineering remedial design. The negotiation and design components are likely to take up to two years to complete. Construction activities would then be started and it is expected that construction would take approximately six months to complete.

17. **Who put the fence up ?**
In response to concerns from the community, BURA installed a temporary fence to limit trespassing on the area where the waste is most shallow.

18. **How large is the problem at the adjacent National Fuel Gas (NFG) site and what will they do ?**

NFG has agreed to investigate and remediate their property which is located on the southern side of the school. Currently, it is known that a manufactured gas plant also operated on property located on the south side of the school. Contamination similar to that found on the Fourth Street site has been found. NFG will be investigating the nature and extent of the contamination under their agreement with the DEC. The investigation is expected to start in the summer 2001 and results should be available later this year.

19. **Could tar material get into water lines ?**
Water lines are pressurized and it is highly unlikely that tar from the site would get into water carried by the pipes. If a break in a water line were to occur, the water would rush out of the pipe thereby keeping any possible wastes from entering the pipe. Standard procedures executed by the Water Department would ensure that broken pipes were clean before allowing unrestricted use of the water.

20. **Is it expected that residents will be re-located when NYSDEC cleans up the site?**
At this time it is not expected that temporary relocation of residents would be required. During the engineering design, special attention will be paid to the issue of protecting public health during the construction activities.

21. **Would you send your child to this school?**
The indoor quality of school air has been tested in the past and the school board has indicated that air inside the school is being monitored routinely. The water from the sumps was also tested. None of the data collected to date within the school indicate that the school has been impacted by the site. Therefore, there is no evidence that the children in the Waterfront School are being exposed to the contamination on the site.

Health Related Questions

22. **Are chemicals found at the site harmful to people?**
The most common contaminants found at the Fourth Street Site include PAHs and benzene. PAHs are a group of semi-volatile organic compounds that are associated with incomplete combustion, such as coking and steel making industries and automobile exhaust. Benzene is a volatile organic compound that is used in many industrial processes. Some PAHs and benzene are known to be cancer causing agents. Fortunately, the compounds are below the ground surface so there is little chance of exposure to them at the present time.

23. **When Pine Harbor apartments were built, perhaps children were exposed to waste, do you have any information on that?**
Available information indicates that the Pine Harbor apartments were not built in an area that has been identified as a former MGP. Consequently there would have been no waste material encountered during the apartments construction.

24. **Was any air testing done in the Pine Harbor Apartments?**
The information gathered during the Remedial Investigation has determined that groundwater is moving in the opposite direction of the Pine Hill Apartments. Consequently, the volatile organic components of the contaminated ground water would not impact the air quality of the

apartments. Because there is no exposure route, there is no need to sample the indoor air of the apartments.

25. **Will any medical testing be done to determine exposure to nearby residents during construction/remediation? Will the school personnel be safe during excavation of the waste?**
There will be a comprehensive Community Health and Safety Plan that will be developed and used during the proposed remediation. The plan will ensure that school personnel and residents of the nearby apartments will not be exposed to fugitive dust, odors, and vapors. Waste material will not be tracked off-site. As the Community Health and Safety Plan will ensure there is no exposure from contaminants to nearby residents and school personnel, no medical testing is planned.

26. **Was drinking water in the area tested?**
The school and the apartments are served by a public water supply. As the contaminants on-site would not impact the public water supply, the drinking water was not tested. However, the local Water Department, in accordance with State regulations, must monitor the quality of public drinking water. Currently, the water quality in the City of Buffalo meets all standards.

27. **Are you aware of any health problems to persons who worked in MGP Sites in 1900's.**
There is no information or studies on former MGP workers that we are aware of.

28. **In the Fact Sheet it says, air in the classrooms was within the range of background levels for these chemicals, please explain.**
There are certain concentrations of volatile organic compounds that are typically found in indoor air. These concentrations are from common household and/or office cleaners, copy machines, paints, hair sprays, etc. These concentrations are referred to as being background. When trying to determine potential impacts to indoor air from other sources (i.e. spills, inactive hazardous waste site), we compare any sampling with these established background levels. If the sampling data is similar to these background levels, it is an indication that the indoor air is not impacted by the spill or the waste site.

Written Comments Received by DEC:

A letter was received from a citizen residing at 701 Seneca Street dated March 16, 2001. Responses to the questions and concerns raised in the letter are as follows.

29. **Why were the soils directly under the Pine Harbor Apartments not tested for hazardous waste?**
Contaminated soil and groundwater were **not** identified close to the Pine Harbor Apartments. The information gathered during the Remedial Investigation determined that groundwater is moving in the opposite direction of the apartments (i.e. west toward Lake Erie). In addition, information gathered from maps of the area indicate that the apartments were not built in an area that had been utilized as a MGP. Please note that surface soil samples were collected near the apartments during the Remedial Investigation, which did not find any contamination

warranting remediation. Because of these factors, there is no need to sample the soil beneath the apartments.

30. **Please comment …on the ramifications of not conducting soil testing. Will this affect our health?**
Since there are no apparent exposure routes (see response to comment 23) there are no expected exposures to contamination at this time.

31. **Does NYSDEC, NYSDOH, EPA and BURA know or attempted to obtain information regarding the medical history of the tenants or children that were exposed during the seventies or up to the time the site was fenced in?**

The contaminated groundwater and waste material are below the ground surface, consequently no exposure has occurred to tenants or children.

32. **Does the NYSDEC, NYSDOH, EPA and BURA know the cause of death of the people that worked in these plants or neighboring people of that era ?**
That information is not known.

33. **Why allow a project to take place without monitoring or doing a study of birth defects, respiration problems or any other medical problem in the area.**
Based on the available information, the contaminants have been buried below the ground surface for nearly 75 years and remain inaccessible to the general public. Therefore, it is unlikely that nearby residents have been exposed to site wastes. There can be no health effects without an exposure to the wastes.

There will be a comprehensive Community Health and /Safety Plan that will be developed and used during the proposed remediation. The plan will ensure that school personnel and residents of the nearby apartments are not exposed to fugitive dust, odors, and vapors. Waste materials will not be tracked off-site. Since the Community Health and Safety Plan will ensure there is no exposure from contaminants to nearby residents and school personnel, no medical testing is planned.

34. **Why weren't the tenants in the area, parents of school children and school officials of the Waterfront School notified years ago? Why didn't a warning sign put up at the waste site?**
Tenants, parents and teachers were notified and have been invited to several public meetings since 1996 when the State first investigated the area. Informational fact sheets have also been provided. A warning sign was not considered necessary because the waste materials are inaccessible to the public.

35. **Was the toxic waste at the National Fuel Gas Company discovered before or after the demolition of the property? Were local residents exposed?**
The state was aware of the hazardous waste at the National Fuel Gas Site before the demolition of the property. The demolition did not impact known areas of waste disposal, consequently no exposure to the waste would have occurred.

36. Are there existing health codes addressing this matter regarding "the right to know"?

The Right-to-Know law covers employees that work in the environments where chemicals are used. The employees have the right to request information from their employers on chemicals that are used in the work place.

A letter was received from the Superintendent of the Buffalo Public Schools dated March 16, 2001 Below are responses to issues raised in the letter:

37. The Buffalo School District operates the Waterfront School adjacent to the Site and regularly invites students, teachers and other District employees and guests to the Waterfront School. The District's paramount concern is to protect and promote the health and welfare of our students, teachers, other employees and guests at the Waterfront School. Also, the District has invested substantial public funds to build and maintain the Waterfront School as a premier educational facility in Buffalo, New York. Accordingly, the District is keenly interested in preserving the integrity of the Waterfront School buildings and grounds to provide a safe and healthy environment for all persons who work, study at and visit the Waterfront School, now and in the future. In addition, the District has previously identified the Site as a potential area for a new educational facility to compliment or expand the Waterfront School. As a result, the Board wants to ensure that the Site does not adversely affect the Waterfront School with the contamination recently identified by the NYSDEC, and that the Site is appropriate for future reuse.

The selected alternative 3B will remove the source of contamination while ensuring that the School is not adversely affected during construction. Specifically, measures will be taken to protect students, faculty, staff and visitors such as:

-ambient air monitoring
-contingency plan
-engineering controls to control odors such as foam suppressants, enclosed structures
-fencing
-coordinated reviews with the School Administration

The Department is aware of the School Board's goal to re-develop the property after remediation occurs, however the re-use will be dependent upon the success of the removal program in terms of reaching clean-up goals throughout the entire area of the excavation.

38. In light of these concerns to preserve and protect the Waterfront School and to maximize the potential reuse of the Site, and in consideration of the NYSDEC's evaluation of various alternative remedies set forth in the PRAP, the District strongly endorses Alternative 3B: Complete Source Removal to meet NYSDEC TAGM-4046 clean up levels and off-site disposal as the best remedy for the Site. This selection is based on the conclusion that the remedy proposed in Alternative 3B would best meet all the remedial goals for the Site and best preserve and protect human health and the environment with respect to the Site and the Waterfront School.

The support of the School Board and Superintendent is acknowledged.

39. **The District recognizes that Alternative 3B involves a substantial investment of funds and human effort to remove buried coal tars and other wastes from the Site. As a result of such removal activity the District is concerned about the potential disruption of the daily operation of the Waterfront School due to excavation equipment, trucks hauling of wastes and fill material, the potential release of contaminants into the environment from such excavations, trucking and related removal and remediation activities. Accordingly, the District highly recommends that the NYSDEC design removal and remediation activities in cooperation with District personnel to minimize disruption and interference with Waterfront School operations. More specifically, the District urges the NYSDEC to schedule major removal, remediation and truck hauling operations during times when the Waterfront School is not in session, that is, July and August. In addition, the District recommends use of a protective dome or bubble over the Site during waste removal operations to minimize the potential release of air borne contaminates from the Site and minimize dust and possible odors. Other matters such as utility line relocation, parking availability and restoration of the grounds will need to be coordinated with the District. In the interim, the District requests that the NYSDEC install a secure fence, with warning signs, to prevent persons from entering upon contaminated surfaces that the NYSDEC has now identified.**

During the detailed engineering design phase, the Department will meet with school officials to coordinate scheduling and provide information. Attempts will be made to ensure that there is minimum disruption to the school when any work has to be done when the school is in session. A Community Health & Safety Plan will be developed to ensure the safety of the workers as well as the school personnel and students. With respect to the security fencing, the Department forwarded your request to the property owner - Buffalo Urban Renewal Agency.

40. **The NYSDEC has identified the Buffalo Urban Renewal Agency (the "BURA") as the owner of the Fourth Street Site. While the Board recognizes that under New York State Law BURA may be considered a party potentially responsible for the cost of the clean up of the Site, you have indicated that the contamination was caused by the Citizens Gas Works operation of manufactured gas plants at the Site. Based on our current information it does not appear that BURA caused or contributed to the contamination of the Site. In addition, BURA is a public benefit corporation which is completely dependent on federal and state funds to perform its duties to eliminate blight and bring about urban renewal in the City of Buffalo. It is our understanding that BURA does not have any funding to undertake the significant remedial action that you have proposed. Accordingly, the District recommends that the NYSDEC consider the Site as an "orphan site" under applicable law and expend State Superfund resources or other state funds to remove and remediate the Site. In addition, the District recommends that the NYSDEC further investigate and pursue all other parties who under applicable law are responsible for the contamination of the Site.**

New York State Environmental Conservation Law requires that prior to expending State money to remediate a site, reasonable efforts must be made to locate and induce responsible parties to pay for or conduct the clean-up. Therefore, DEC intends to investigate and pursue all other parties who, under applicable law, are responsible for contamination at this site.

41. **The District also highly recommends that the NYSDEC vigorously pursue the remedial investigation and, to the extent necessary, feasibility studies of the lands owned by National**

Fuel (the "NFG Site") located south of the Waterfront School. The proximity of the NFG Site to the Waterfront School and the indication that the NFG Site may be contaminated from former manufactured gas plant operations and wastes raises serious concerns of potential effects from such property to the Waterfront School persons and property and the potential reuse of the NFG Site. Accordingly, the District urges a prompt investigation and resolution of contamination issues and that you develop a plan similar to the Fourth Street Site that protects human health and the environment.

National Fuel Gas has entered the State's Voluntary Cleanup Program to study and remediate their former manufactured gas plant facility located south of the school. The Department expects a work plan to be submitted this summer that will study the site and ultimately recommend a clean up strategy.

42. **Since the time the NYSDEC issued its PRAP, the District and the City of Buffalo have received a proposal from Technae Ventures, LLC to acquire the Site and perform an *in situ* bioremediation of the Site. The PRAP does not consider such remediation as an alternative. Without diminishing our endorsement of the PRAP's alternative 3B, the District is interested in your comments on such a proposal, particularly because it would appear to be least disruptive of the Site and Waterfront School operations during the remedial activity. The District, however, is not in a position to determine the effectiveness of such a proposal and would appreciate your comments.**

No specific remediation plan has been submitted to this Department by BURA or Technae Ventures for our review. It appears that such a plan may be in the preliminary stages. The NYSDEC will be open to reviewing any new remedial alternative which can accomplish the goals set forth in the Record of Decision. The Feasibility Study conducted by Parsons Engineering-Science evaluated a number of treatment technologies including chemical oxidation, composting, CYAN-REM, extraction/soil washing, thermal desorption, IWT-Advanced Chemical Treatment, natural attenuation, passive bio-venting, slurry phase bioremediation, in-situ and ex-situ stabilization and the Sulchem Process. Through the Feasibility Study process, four remedial alternatives were developed for detailed analysis consistent with the regulations guiding remedial alternative evaluation efforts as described in New York State Regulations 6NYCRR Part 375 and the National Contingency Plan (40CFR Part 300). Cost is one of seven factors used in selecting the final alternative. The other six evaluation criteria encompass technical, institutional considerations as well as compliance with standards, criteria and guidance. In the Department's opinion, the alternative which could best satisfy all the criteria was Alternative 3B. It should be stated that it is the Department's experience that while bioremediation can be effective for dissolved phase groundwater and areas of lesser soil contamination, it has *not* been shown effective in highly contaminated source material.

A letter was received from Technae Ventures on March 21, 2001. Responses to the questions and concerns raised in the letter are as follows.

43. **The NYSDEC clean-up proposal may pose an increased risk of exposure during remediation**.

Section 7.2 of the Proposed Remedial Action Plan discusses the short term risks posed by excavation of the waste. Included in Section 7.2 is a discussion of possible impacts such as dust, noise and odors. All of the work will be performed according to a stringent Health & Safety Plan to protect school personnel, students, workers and the neighboring residents. Air monitoring will be performed to ascertain that no exposure occurs to odors from the waste or to dust. Strict decontamination procedures will be in place to ensure contaminated soils are not tracked off the site. Engineering controls such as using foam suppressants or enclosed structures for odor control will be evaluated during the engineering design to ensure exposures are prevented.

44. **The clean-up remedy is too expensive: effective alternatives exist which remediate the site to the same standards, but cost significantly less.**

Refer to response No. 42.

45. **The NYSDEC clean-up proposal has large unaccounted costs and is therefore incomplete**.

The need for special precautions to control odor and fugitive emissions is discussed in the Proposed Remedial Action Plan in Section 7.1. The costs associated with a stringent Community Health & Safety Plan which could include vented containment structures are also accounted for in the PRAP (section 7.1). The anticipated costs associated with re-routing underground utility lines will be addressed in the Remedial Design phase of the project. It is noted that the PRAP specifically states that re-routing of utilities *may* be required dependent upon the remedial design. The cost provided in the PRAP is estimated and a more detailed estimate will be calculated in the engineering design.

46. **The Waterfront School may have to be closed during clean-up**.

Attempts will be made to ensure that there is minimum disruption to the school when any work has to be done when the school is in session. Every attempt will be made to conduct excavation during the time periods when the school is not in session. Dependent upon the type of excavation technique used (e.g. under a covered structure), it may not be necessary to restrict work to when the school is closed. This coordination effort will take place during the engineering design of the remedy. However, it is the Department's intent to implement the remedy with minimal disturbance to the regular school activities.

47. **The proposed remedy runs against NYSDEC policy and practice regarding the remediation of MGP sites. NYSDEC has completed a large number of former MGP site remedial projects across New York State over the last four years. In the overwhelmingly number of cases, NYSDEC has preferred using less intrusive methods, including limited excavation of source contaminants, combined with thermal desorption, bioremediation and natural attenuation. Given NYSDEC's performance, practice and success rate on similar sites across New York, NYSDEC Region 9's selection of large-scale excavation is clearly out of step with best practices in New York. NYSDEC Technical Advisory Guidance Memorandum 4060 is instructional as to this point.**

It is the Department's position that a consistently applied strategy has been applied to both Superfund sites and in the MGP program to remove principal threat (source area) wastes, particularly when in close proximity to a school and/or a residential area. The Department has issued a number of Records of Decision to support the fact that removal of source area wastes is routinely a part of DEC's remedial strategy for MGP sites. The reference to TAGM 4060 is in error since the purpose of TAGM 4060 is to simply outline the criteria wherein soils and sediment that have been contaminated with coal tar waste from former MGPs may be remediated at non-hazardous thermal destruction facilities.

48. There is currently no funding for the proposed clean-up.

Upon issuance of the ROD, NYSDEC will approach all potentially responsible parties (PRPs) to implement the selected remedy. If PRPs cannot be found to undertake the remediation the site will be funded using monies from the State Superfund Program. It is recognized that the funding of the State Superfund program is the subject of pending legislation. The Department is confident that legislation to re-finance the program will be forthcoming and will provide the needed funds. It is the Department's position that the schedule to begin construction would be similar regardless of the remedy selected since it would still be necessary to approach the PRPs to undertake the engineering design.

49. An alternative offer has been presented to the Buffalo Urban Renewal Agency and City of Buffalo.

Contrary to the letter, a specific remedial alternative has not been presented to the NYSDEC. The Buffalo Urban Renewal Agency has not contacted NYSDEC indicating that they have reached any agreement with Technae Ventures to purchase and/ or remediate the site. Moreover, no specific remediation plan has been submitted to this Department by BURA or Technae Ventures for our review. It appears that such a plan may be in preliminary stages. The NYSDEC will be open to reviewing any new remedial alternative which can accomplish the goals set forth in the Record of Decision .

A letter was received from National Fuel Gas dated March 21, 2001 which contained comments from the law firm Phillips, Lytle, Hitchcock, Blaine & Huber LLP dated 3/21/01. Below are responses to issues raised in the letter:

50. Currently, no complete exposure pathways exist:

- **A. No one is using groundwater in the vicinity of the site;**
- **B. There is no ingestion of, or dermal contact with, contaminated soil because there is currently no exposed contaminated soil;**
- **C. The New York State Department of Health has determined that the Site does not pose a threat to human health as a consequence of the volatilization of organic compounds;**
- **D. To the extent utility work is required on the Site, appropriate health and safety precautions can be put in place to ensure the safety of such workers;**
- **E. Both the NYSDOH and Board of Education have sampled sumps located in the Waterfront School and independently concluded that there is no risk to students, faculty or visitors.**

Consequently, as it exists today, the Site poses no threat to human health and the environment. Accordingly, the Department's evaluation of remedial alternatives in the PRAP was performed based upon improper determinations as to current and future Site risk.

New York State regulation 6NYCRR Part 375-1.4 clearly identifies that a significant threat can be due to current adverse impacts or when disposal of hazardous waste " is reasonably foreseeable to result in adverse impacts". It is the opinion of both DEC and DOH that the site currently poses a significant threat, and will continue to pose such a threat because of the following conditions as outlined in New York State regulation 6NYCRR Part 375:

- the duration of time that the residential area and school would be potentially exposed, coupled with the areal extent of the waste (within 100 feet of the school building)
- the type, mobility, toxicity and quantity of source material. As an example, the source material contains concentrations of benzene of 3,300,000 parts per billion which has resulted in groundwater contamination of up to 21,000 ppb.
- proximity of the site to recreational facilities and school buildings.
- there is no mechanism currently in place to contain the hazardous waste.

The NYSDOH stated in a letter dated 1/28/00 that the "conclusions reached in 1996 were based on one sampling event and *does not imply* that contamination of soils and groundwater adjacent to the school are not of concern at this time or potentially in the future".

51. The Department Did Not Properly Identify/Evaluate the Remedial Goals for the Site.

Of the six remedial goal set out in the PRAP and identified as appropriate for the Site, four include the phrase "to the extent practicable". Reference to practicability requires the Department to consider the practical limitations of implementing a particular remedy. Implicit in such an analysis is cost. If cost is "no object" very little is technically impracticable. We note that the last 2 enumerated remediation goals (eliminate direct contact with impacted soils/waste and eliminate the long-term threat of exposure related to the school) do <u>not</u> reference practicability. The Department's failure to consider practicability in the context of these two factors impermissibly taints the remedy evaluation process and predetermines the selection of a "dig and haul" remedy.

The New York State regulation 6 NYCRR Part 375 specifies that "The goals of the program is to restore the site to predisposal conditions to the extent feasible and authorized by law. At a minimum, the remedy selected *shall eliminate or mitigate* all significant threats to the public health and to the environment presented by hazardous waste disposed at the site through the proper application of scientific and engineering principles". During the feasibility study the setting of remedial action goals was based on the fact that the criterion "Overall protection of human health and the environment" is a *requirement*. The following evaluation criteria: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume; short-term effectiveness; implementability and cost are considered to determine how they compare to one another and to identify tradeoffs between them. The final remedial action goals found in the Record of Decision (ROD) reflect this hierarchy. Although the concept of practicability can include cost, it is primarily intended to address technical practicability. The comment implies that cost effectiveness was not considered as an evaluation criterion. That is not correct and the ROD concludes that the close proximity of the site to the school, residential and recreational areas presents significant potentials for future exposures and justifies the higher cost of the selected remedy.

52. **The Department improperly failed to identify and consider a containment remedy which incorporated the removal or treatment of DNAPL. Such a logical alternative would (as will be shown below) meet the Department's criteria for an appropriate remedy. By failing to include a reasonable alternative in the PRAP, the Department has not complied with the ECL, the regulations promulgated thereunder or the Department's own guidances.**

The Feasibility Study (FS) and the PRAP did evaluate various containment remedies including an impermeable cap, subsurface barriers and groundwater collection (Section 7.3 of the FS). The FS also evaluated removal options including the two alternatives explored in the PRAP i.e. Partial Source Removal and Complete Source Removal. The FS also evaluated no less than 14 DNAPL treatment technologies before determining that they were not implementable and/or not effective at this particular site (see Section 7 of the FS). It is inherent in the selected remedy that if the DNAPL is removed then a containment remedy would not be necessary. Therefore, a combination of containment with source removal was not considered as a separate alternative. As evidence, please refer to the Remedial Investigation which states in Section 4.3.6 - "Sample locations indicating the presence of BTEX and PAHs *coincide* with the presence of DNAPL in subsurface soils (Figure 6 in the ROD). The area correlates with the location of the former MGP facilities, including the gas holder tanks, sulfur plant, retort house, purifying house, engine room, the underground storage tank and portions of the coal house." These MGP structures, or process areas, are typical source areas and are a target for removal even if residual contamination were to be contained.

53. **If the Department had included DNAPL removal or treatment with a containment remedy, clearly that remedy would have attained all of the enumerated remedy selection criteria:**

A. <u>Compliance with SCG's:</u>

The removal or treatment of the DNAPL would address the true source of contamination and, with a cap, would prevent future exposures from occurring.

B. <u>Protection of Human Health and the Environment:</u>

A containment remedy would protect human health and the environment. Exposure to surface soils (dermal and ingestion), which currently does not exist, would be eliminated. Potential subsurface exposure by utility workers could be readily addressed through signage/notice together with an appropriate HASP. No one is using the groundwater, therefore, it poses no current or future risk. Lastly, there is no evidence that contaminants from the site are migrating towards the school in concentrations that would pose a threat to human health; a cap (with or without DNAPL source removal or treatment) would significantly reduce the potential for future migration. Consequently, a containment remedy (with or without DNAPL removal or treatment) would adequately protect human health and the environment.

C. <u>Short-Term Effectiveness:</u>

A containment remedy would have only modest short-term impacts on the community, particularly in the context of disruption to the school.

D. Long-Term Effectiveness and Permanence:
A properly designed and constructed containment remedy has been determined by the Department, on hundreds of occasions, to achieve the requirements of a permanent remedy. The magnitude of the risk remaining after implementation of a containment remedy would be acceptable based upon the complete exposure pathways; obviously the remaining risks would be lower if DNAPL was treated or removed. A long-term operations and maintenance plan, together with deed notices and restrictions, would further ensure the permanence of the containment remedy.

E. Reduction of Toxicity, Mobility and Volume:
By its very nature, a containment remedy would reduce the mobility of contaminants. If removal/treatment of DNAPL were included with a containment remedy, both toxicity and volume would be materially reduced.

F. Implementability:
There is no question as to the implementability of a containment remedy at this Site.

G. Cost:
Among the alternatives identified, the containment remedy is the most cost-effective.

H. Community Acceptance:
The public has previously indicated that they would accept a containment remedy.

As described in the response to comment #52, the occurrence of soils containing contaminants that would require removal coincide with the DNAPL. By its nature, DNAPL strongly adsorbs to soil. Therefore, by removing the DNAPL, it will not be necessary to include a containment option. With respect to item (b) the New York State Department of Health and DEC do not agree that simply capping the area of DNAPL disposal will provide adequate safeguards to a public school that is within 100 feet of the waste (which contains 3,300,000 ppb of benzene) while recognizing that benzene has been found in basement sump water samples in the basement of the school. The comment suggests a cap over the waste material would be protective of human health and the environment. A cap would not address the migration pathways posed by underground utility lines, school foundations and other features of the geology. With respect to item (h) the Department is not aware that the community would support a containment remedy. In fact, the overwhelming majority of comments at the public meeting were in favor of a removal option. The Buffalo Public Schools have written comments on the PRAP and are on record as being in favor of the removal action.

54. The Department improperly evaluated alternative 3b in several material ways.

A. Short-Term Effectiveness:

The Proposed Remedy as set out in the PRAP[1] will pose a significant short-term threat to human health and the environment.

B. Implementability:

The Department has not fully considered the implementability concerns associated with alternative 3b. In order to undertake the remedy in the context of the location of the Site, proximity to the school and residences, and the restrictions on timing (related to the school year), the Department has ignored factors critical to implementability. These include: The potential need to implement such a remedy within a structure; the need to manage a work site with workers utilizing respirators[2], an eight week window in which to implement the remedy when the school is in summer recess; and implementing the remedy "around" an eight-foot diameter gravity sewer. It is clear from the PRAP that these factors, among others, were not adequately considered in evaluating the implementability of alternative 3b.

C. Cost.

Not only is alternative 3b the most costly remedy set out in the PRAP, the estimates fail to consider and include significant other costs.

- **A. The costs associated with working around/relocating the eight-foot diameter gravity sewer;**
- **B. The costs of a structure to house the excavation and its other associated costs (i.e., air handling, etc.);**
- **C. Cost impacts associated with labor using respirators; and**
- **D. Costs associated with implementing the remedy in a compressed time frame.**

Clearly, the most expensive remedy evaluated in the PRAP grossly underestimates its true costs.

D. Community Acceptance.

The community would not support a remedy that exposes them to significant short-term risks if a protective remedy is readily available with lower attendant short-term risks.

The ROD summarizes the feasibility study in Section 6.2 whereby short term effects and implementability are evaluated. Considerable consideration is given to the fact that the remedial work is being conducted near school children and residents. It is recognized that this type of remedial work has been conducted in similar situations in New York State with great success. Examples of projects include the Maestri site #734025, Niagara Mohawk -Gloversville MGP Site

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[1] We note that the PRAP does not mention the use of one or more structures to address exposure during remedy implementation. If this alternative is implemented, the exposure of nearby residents and students/faculty at the school to dust, odors and organic compounds would be of significant concern. The significant amount of truck traffic related to excavation, off-site transport and importation of clean fill was not adequately considered. In short, the Department has grossly underestimated the short-term impacts of the proposed remedy.

[2] We understand that a reduction in productivity of 50% is associated with the use of respirators.

#5-18-017, the NYSEG-Mechanicville Central Ave. MGP site #546033 and Warsaw Former MGP Site #961007. In addition to these sites where the work is complete, RODs have been issued at several other MGP sites requiring the excavation and treatment/disposal of significant volumes of contaminated soils and waste. These include: the Hudson Coal Tar Site, #4-11-005, a Class 2 site where 15,000 cubic yards of material is to be removed; the Troy-Water Street MGP Site, #4-42-029A, also a Class 2 site, where 20,000 cubic yards of tar are to be removed; and the Oneida MGP Site, #7-27-008, where 60,000 cubic yards of contaminated soil and sediments are to be removed. Special precautions to control odor and fugitive emissions are discussed in the ROD in Section 6.2. The costs associated with a stringent Community Health & Safety Plan which *could* include vented containment structures, etc is also accounted for in the ROD. Section 6.2 of the ROD discusses the need for air monitoring during excavation activities. The ROD certainly recognizes the difficulties involved with excavating near the sewer and other utilities. The ROD also states that re-routing of utilities *may* be required pending the engineering design phase of the project. It is the Department's position that the proper time to address the construction details is during the engineering design phase.

A letter was received from National Fuel Gas dated March 21, 2001 which contained comments from the IT Corporation dated 3/19/01. Below are responses to issues raised in the letter:

55. The PRAP concludes that the site poses a significant potential threat to human health associated with contaminated soils and groundwater, while the remedial investigation/feasibility study (RI/FS) showed that the site exhibited no significant increased risk to human health and the environment.

The conclusions in the RI/FS prepared by Parsons Engineering Science do not reflect DEC and DOH's position that the contamination at the site currently poses a significant threat. This position is articulated in correspondence to the Buffalo Urban Renewal Agency, the latest correspondence being a June 6, 2000 letter. An excerpt from that letter states "The Department maintains that there is a potential, perhaps likely, that the highly concentrated waste material can migrate and significantly impact the neighboring properties in the future. The DEC and DOH are in agreement that simple containment of the hazardous waste cannot give a high enough degree of confidence that it will be protective of the school and its environs". The Proposed Remedial Action Plan (PRAP) and the Remedial Investigation and Feasibility Study (RI/FS) conclude that in order to obtain remedial action objectives (Section 6.4 of the RI/FS) remedial action is warranted. Until remedial action is taken, the site will not meet objectives and the significant threat posed by the waste will remain. Remedial action technologies were evaluated that would facilitate the RAOs listed (Section 7.1 of the RI/FS).

56. The PRAP does not discuss issues such as unique engineering construction, sprung structure, health and safety, odor controls, exposure to residents, school personnel and workers, air monitoring, safety equipment, hauling capacity of trucks, sheeting, shoring, bracing, stabilizing soils prior to loading, etc.

The purpose of the Proposed Remedial Action Plan is to identify the preferred remedy, summarize the alternatives that were considered, and discuss the reasons for the Department's preference. The PRAP does appropriately outline the need for special attention during engineering design and many of the elements mentioned in the comment are noted in the PRAP in Section 7.2. It is also clearly stated that these issues will be addressed during the detailed engineering design phase of the project in Section 8.

57. The PRAP does not discuss any in-situ remedial alternatives.

The Feasibility Study conducted by Parsons Engineering-Science evaluated a number of treatment technologies including chemical oxidation, composting, CYAN-REM, extraction/soil washing, thermal desorption, IWT-Advanced Chemical Treatment, natural attenuation, passive bio-venting, slurry phase bioremediation, in-place and ex-situ stabilization and the Sulchem Process. Through the Feasibility Study process, four remedial alternatives were developed following regulations guiding remedial alternative evaluation efforts as described in New York State regulation 6NYCRR Part 375.

58. No consideration is given to the potential exposure to residents or school children during construction activities.

The ROD summarizes the feasibility study in Section 6.2 whereby short term effects and implementability are evaluated. Considerable consideration is given to the fact that the remedial work is being conducted near school children and residents. It is recognized that this type of remedial work has been conducted in similar situations in New York State with great success. Examples of projects include the Maestri site #734025, Niagara Mohawk -Gloversville Voluntary Cleanup Site, the NYSEG-Mechanicville Central Ave. MGP site #546033 and Warsaw Former MGP Site #961007. Special precautions to control odor and fugitive emissions are discussed in the ROD in Section 6.2. The costs associated with a stringent Community Health & Safety Plan which *could* include vented containment structures, etc is also accounted for in the ROD. Section 6.2 of the ROD discusses the need for air monitoring during excavation activities. It is the Department's position that the proper time to address the construction details is during the engineering design phase.

59. The movement of an 8 foot sewer main and related utility trenches is a much larger task than envisioned by the PRAP and should be considered and addressed as part of the planning stage of this project.

The PRAP certainly recognizes the difficulties involved with excavating near the sewer and other utilities. The PRAP also states that re-routing of utilities *may* be required pending the engineering design phase of the project. It is the Department's position that the proper time to address the construction details is during the engineering design phase.

60. The PRAP makes no concession for the use of sheeting, shoring or bracing that may be required to secure the excavation.

The actual construction technique used at the site will be decided during the engineering design. It is recognized that the use of sheeting, shoring or bracing will likely be used during construction.

61. The PRAP assumes that soils may be direct loaded without the use of amendments.

The PRAP does not necessarily assume direct loading of soils. It is recognized that soil amendments may be necessary and the type and condition of use will be evaluated in the engineering design.

62. **There is no discussion regarding where the construction water will be treated and discharged nor whether the local sewer authority is able to treat and manage the projected volume of water.**

    The PRAP discusses the issue of water management in section 7.1. It is recognized that water treatment may be required and approximately $100,000 is the estimated cost of water treatment and disposal (Appendix H of the FS). The water treatment (if required) will likely consist of filtering and carbon adsorption. The treatment location is expected to be on the site where a portable unit will be established and operated.

A letter was received from National Fuel Gas dated March 21, 2001 which contained comments from the Gas Technology Institute, dated 3/21/01. Below are responses to issues raised in the letter:

63. **Groundwater quality indicates that migration of benzene and other contaminants beyond the borders of the site is minimal. The concentrations of individual components is not broken out in the PRAP.**

    The Proposed Remedial Action Plan is a summary of the Remedial Investigation and Feasibility Study report dated January 2001 as well as other investigations which took place at the site. To gain a thorough understanding of the chemistry and migration pathways, it is necessary to evaluate the detailed RI/FS. It is correct that groundwater data indicates that migration of contaminants beyond the source area is minimal. The concentrations of individual constituents are given in Table 1 of the ROD.

64. **Subsurface soil concentrations at locations toward the boundaries of the site indicate that mobility of the DNAPL is not an issue.**

    This site contains features such as man-made pathways (sewer lines etc.) which can easily transport DNAPL and/or highly contaminated groundwater. In addition, the DNAPL contamination is known to be within two feet of the surface in areas of the site. When these factors are considered along with the close proximity to the public school, the Department regards the migration of DNAPL as one of the major concerns at this site.

65. **Since the benzene (BTEX) and PAHs are very low or at non-detect in the subsurface soils of many areas of the site, why would it be necessary to excavate the entire site to remove all unsaturated zone material as a part of the selected alternative (Alternative 3A), especially when the site would be covered with asphalt for use as the parking lot?**

    The area to be excavated under Alternative 3B is highly contaminated. The 1992 data indicates that the dense non-aqueous phase (DNAPL) material typically contains the following contaminants: benzene at 3,300 parts per million (ppm), toluene at 3,000 ppm, xylenes at 2,700 ppm, phenolic compounds at 3,000 ppm and total PAHs at 53,000 ppm. The Department considers this magnitude of contamination significant. The PRAP delineates the area where DNAPL was found (see figure 6). The PRAP only requires the areas where DNAPL is found and where soils contain levels above the clean-up goals to be removed. The Department would encourage that un-impacted overburden soils be stripped, stockpiled and used for backfill at the site.

66. **Using the SPLP Partioning Procedure described in USEPA SW846 Method 1312, it is possible to characterize soils and NAPL in various areas of the site for their likely mobility and potential impact to groundwater.**

The comment suggests that more information is necessary to delineate the potential groundwater impacts. As discussed in Comments #63 and #64; the presence of DNAPL in close proximity to the surface near a public school, coupled with the fact that many migration pathways may exist on the site led to the decision by DEC and DOH to remove the source strength material.

67. **Surface soil concentrations in five on-site samples ranged from 1 to 136 ppm. While these are low for total PAHs, the pathway for human contact can be effectively eliminated through capping and/or institutional controls.**

It is recognized that the pathway for human contact with surface soils can be mitigated through capping of the site. However, the selection of a remedy also must consider other criteria such as long term effectiveness, permanence, reduction of toxicity, volume and mobility among others in accordance with New York State regulation 6NYCRR Part 375. Selected remedies must not be inconsistent with the National Oil and Gas Contingency Plan of March 8, 1990 (40CFR300). Furthermore, the surface soil exposure pathway is only one of many pathways to consider at this site. Other pathways include exposure to utility workers and groundwater impacts on the school.

68. **More delineation of the source area is needed.**

The delineation of the source area is based upon the many observations made during installation of soil borings, borings along utility lines, and monitoring wells. The Department is satisfied that the source area has been characterized sufficiently to select a remedy. Any remaining uncertainties will be addressed during the Remedial Design.

69. **The limited land area of the site and its proximity to residential properties and a school would make it logistically very difficult to contain all of the operations that would be involved in Alternative 3B.**

The large surrounding properties are owned by the City of Buffalo and BURA. With their co-operation and proper planning the Department believes there is adequate area to conduct all the operations which will be involved during the implementation of Alternative 3B.

70. **In-situ remediation should be preferred over excavation. It will eliminate human exposures, emissions, risks due to excavation, etc.**

The Feasibility Study conducted by Parsons Engineering-Science evaluated a number of treatment technologies including chemical oxidation, composting, CYAN-REM, extraction/soil washing, thermal desorption, IWT-Advanced Chemical Treatment, natural attenuation, passive bio-venting, slurry phase bioremediation, in-place and ex-situ stabilization and the Sulchem Process. Through the Feasibility Study process, four remedial alternatives were developed following regulations guiding remedial alternative evaluation efforts as described in New York State Regulations 6NYCRR Part 375. Cost is one of seven factors used in selecting the final alternative. The other six evaluation criteria encompass technical, institutional considerations as well as compliance with standards, criteria and guidance. In the Department's opinion, the alternative which could best satisfy all the criteria was Alternative 3B.

71. It is very probable that portions of DNAPL will be dislodged in the groundwater during excavation and have potential to re-contaminate the clean fill.

The possibility of leaving behind DNAPL which could later mobilize and re-contaminate clean fill will be addressed during the remedial design. This factor was one of the primary reasons that Alternative 3A was not selected as the preferred course of action. As stated in the PRAP, groundwater encountered during excavation activities will be pumped out and treated prior to discharge.

72. There is no mention of monitoring air borne emission and dust during the excavation, which may add significant cost in Alternatives 3A and 3B.

Special precautions to control odor and fugitive emissions is discussed in the Proposed Remedial Action Plan in Section 7.1. The costs associated with a stringent Community Health & Safety Plan which *could* include vented containment structures, etc. is also accounted for in the PRAP. Section 7.2 of the PRAP discusses the need for air monitoring during excavation activities.

73. Proposed selected remedy (Alternative 3B) will not remove groundwater contamination. Therefore, spending $7,420,000 is not justifiable.

With removal of the source area and contaminated groundwater during the excavation activities, the Department expects the threat to groundwater to be greatly reduced. As discussed in the PRAP and reflected in GTI's letter, it is noted that groundwater contamination outside of the DNAPL area is significantly lower than the area inside the waste material. The Department acknowledges that this is due in part to natural attenuation. However, one must recognize that the source areas are significantly contaminated, and will continue to contribute to area groundwater contamination until removed. The preferred remedy will monitor groundwater to determine if additional groundwater remediation is required.

The Department's policy of removing source material, especially in close proximity to sensitive receptor such as a school, reflects the fact that remedy selection is based upon legal requirements such as New York State regulation 6NYCRR Part 375. In order to eliminate the significant threat to public health and the environment, the Department believes it is important to implement permanent remedies wherever practicable.

In the final analysis it is the Department's position given the location of this site next to a residential area, play grounds and a school; the benefits of removing the source strength material outweighs the cost in the long term. The removal of the significantly contaminated waste, soil and groundwater will provide a more permanent remedy than would a combination of containment and some in-situ treatment.

74. The site's capacity for natural attenuation should be studied.

The waste has been buried at this site for nearly 75 years and large quantities of tar still remain at the site. The waste is currently within 100 feet of the building and benzene has been found in sump water inside the school building albeit at low concentrations presently. Natural attenuation of coal tar material cannot be expected to mitigate the threats posed by this material in a reasonable time frame, however it is recognized that natural attenuation is relevant to the reduction in contaminants in the dissolved phase plume.

Appendix B

ADMINISTRATIVE RECORD
FOURTH STREET SITE
Site No. 915167

1.	Record of Decision	July, 2001
2.	Proposed Remedial Action Plan	February, 2001
3.	Remedial Investigation and Feasibility Study	January, 2001
4.	Work Plan - Remedial Investigation/Feasibility Study, amendment 2	July, 1999
5.	Work Plan - Remedial Investigation and Feasibility Study	February, 1998
6.	Consent Order (Index B9-0505-96-12)	July 24. 1997
7.	Waterfront School storm sump sampling results	August, 1996
8.	Phase II Environmental Investigation by Huntingdon Empire Soils	May, 1992

<u>Relevant Correspondence:</u>

G. Litwin to M. J. O'Toole - NYSDOH concurrence letter for Record of Decision, 7/2001.

G. A. Carlson to M. J. O'Toole - NYSDOH concurrence letter for Proposed Remedial Action Plan, 2/2001

Martin Doster(NYSDEC) to Michael McCarthy(BURA) - comments letter on RI/FS, 6/6/2000

Michael McCarthy to Martin Doster - BURA's response on NYSDEC comments on RI/FS, 2/2/2000

Anthony M. Masiello to Martin Doster - recommendation on Alternative 3B selection, 2/2/2000

Martin Doster to Dennis Sutton(BURA) - comments letter on RI/FS, 1/20/2000

Jaspal S. Walia(NYSDEC) to Mark Raybuck(Parsons Engineering) - approval of Work Plan amendment 2, 7/15/99

Jaspal S. Walia to Dennis Sutton - comments letter on RI/FS, 4/1/99

Jaspal S. Walia to James Smith(City of Buffalo) - comments letter on RI/FS, 3/20/98

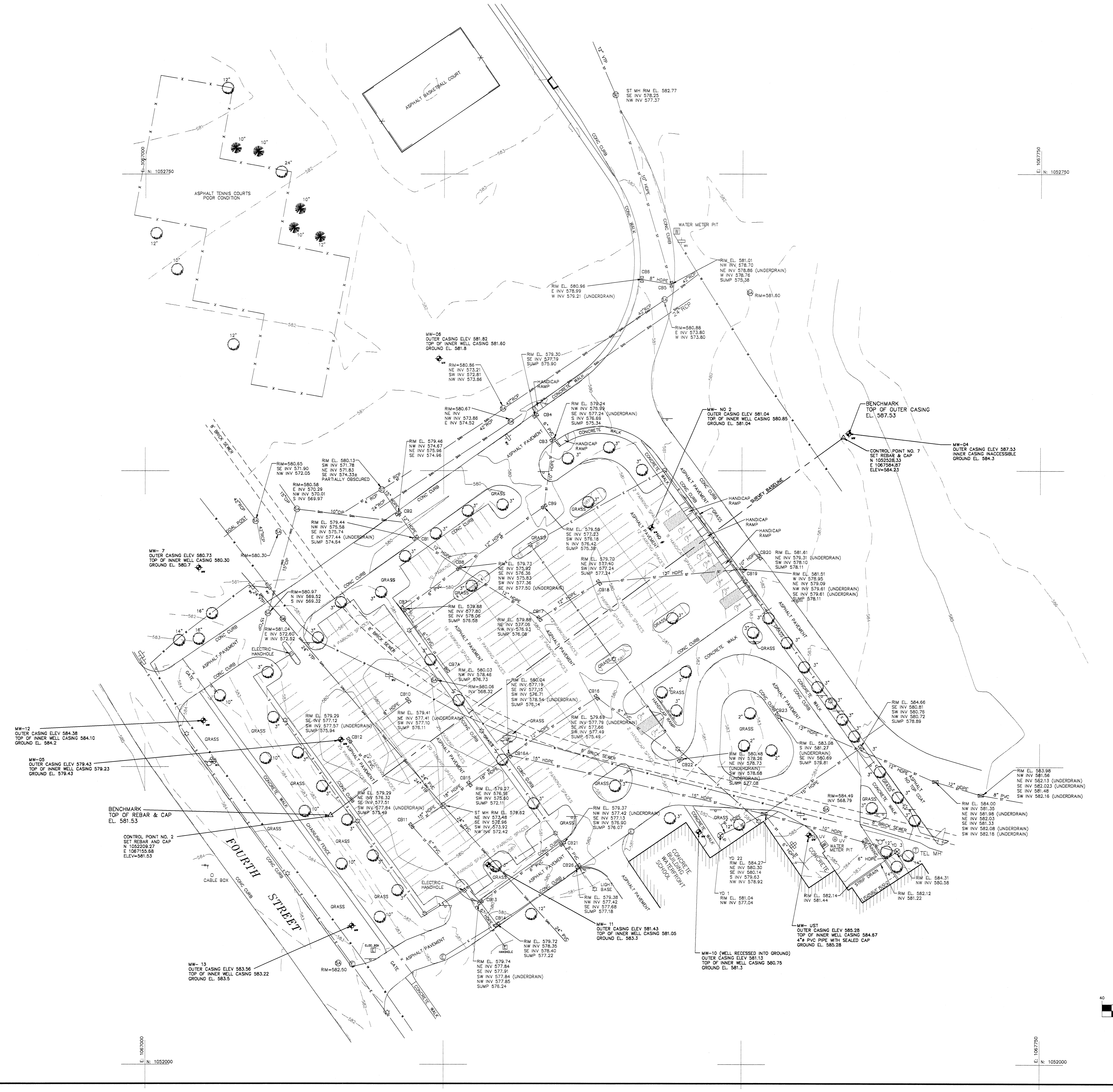
Robert Marino(NYSDEC) to Allan Delisle(BURA) - Listing of the site as class 2, 11/8/96

C

As-Built Drawings

PHASE	DATE	INITIALS
10		
20		
30		
40		
50		
60		
70		

FOR OFFICE USE ONLY



LEGEND:

▲	BENCHMARK
—— ℄ ——	CENTERLINE
○ CO	CLEANOUT
○ 3"	DECIDUOUS TREE & (TRUNK DIAMETER)
✳ 12"	CONIFEROUS TREE & (TRUNK DIAMETER)
(ST)	DRAINAGE MANHOLE (STORM)
⊠	DRAINAGE STRUCTURE (CATCH BASIN)
(E)	ELECTRIC MANHOLE
—— E ——	ELECTRIC (UNDERGROUND)
	FIRE HYDRANT
—— G ——	GASLINE (UNDERGROUND)
G	GAS LINE MARKER
GV ⋈	GAS VALVE
△	HORIZONTAL CONTROL POINT
MW	MONITORING WELL
☼	POLE w/LIGHT
—— SAN ——	SANITARY SEWER
(SA)	SEWER MANHOLE (SANITARY)
	SIGN 2 POSTS
	SIGN
—— ST ——	STORM SEWER
—— T ——	TELEPHONE (UNDERGROUND)
—— W ——	WATERLINE (UNDERGROUND)
W	WATER METER PIT
WV	WATER VALVE
⊡	ELECTRIC HANDHOLE
○	CABLE BOX
⊕ UV	UTILITY HANDHOLE
	UNKNOWN UTILITY VALVE

ABBREVIATIONS:

ASP	ASPHALT
CONC	CONCRETE
℄	CENTERLINE
CIP	CAST IRON PIPE
ELEV	ELEVATION
EP	EDGE OF PAVEMENT
HDPE	HIGH DENSITY POLYETHYLENE
INV	INVERT
PVC	POLY-VINYL CHLORIDE
RCP	REINFORCED CONCRETE PIPE
RCMP	ROUND CORRIGATED METAL PIPE
ROW	RIGHT OF WAY
TYP	TYPICAL
VTP	VITRIFIED TILE PIPE
MW- UST	MONITORING WELL UNDERGROUND STORAGE TANK

NOTES:

THE UNDERGROUND UTILITIES SHOWN ARE ONLY THOSE THAT WERE IDENTIFIED AND ENCOUNTERED OR CONSTRUCTED DURING THIS PROJECT. END POINTS OF INDICATED UTILITIES ARE ONLY SHOWN FOR LOCATION AND DIRECTION OF ASSUMED EXISTING AND/OR ABANDONED UTILITIES. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDER GROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. ALTHOUGH THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM RECORD INFORMATION AVAILABLE, THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.

ELEVATIONS ARE REFERENCED TO THE SITE VERTICAL DATUM AS SHOWN ON A MAP PREPARED BY 'ECOLOGY AND ENVIRONMENT ENGINEERING, P.C.,' ENTITLED "FOURTH STREET REMEDIATION PROJECT", SHEET 4 OF 5, DATED 2-11-05 AND ARE BASED ON NGVD 1929 DATUM.

COORDINATES ARE REFERENCED TO THE NEW YORK STATE PLANE COORDINATE SYSTEM WEST ZONE – NAD83/96 HORIZONTAL DATUM.

UNAUTHORIZED ALTERATION OR ADDITION TO ANY SURVEY, DRAWING, DESIGN, SPECIFICATION, PLAN OR REPORT IS A VIOLATION OF SECTION 7209, PROVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

THIS MAP IS BASED ON A FIELD SURVEY COMPLETED JUNE 22, 23, 26, 2006

ALL UNDERDRAIN ON SITE ARE CONSTRUCTED WITH 4" HDPE UNDERDRAINS WHICH DISCHARGE TO LOCALIZED CATCH BASINS

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

Consultant:

Earth Tech – Remediation Services
40 British American Blvd.
Latham, NY 12110
Phone: 518-951-2200
Fax: 518-951-2300

FOIT-ALBERT ASSOCIATES
Architecture, Engineering and Surveying, P.C.
763 Main Street
Buffalo, New York 14203
Phone: (716) 856-3933
Fax: (716) 856-3961

FINAL TOPOGRAPHIC SURVEY

FOURTH STREET REMEDIATION PROJECT
NYDEC SITE NUMBER: 9-15-167
DESIGN CONTRACT NUMBER: D005197
CITY OF BUFFALO, COUNTY OF ERIE, STATE OF NEW YORK

Seal:
MICHAEL JOSEPH POHL
No. 049978
Michael J Pohl

Revision Number	Revision Date
1	7/13/06 REVISED PER REQUEST
2	8/14/06 REVISED PER REQUEST
△	
△	

Scale: 1"=40'

Date: 6/29/06	Project Manager: M. POHL
Drawn By: G. McEWEN	Checked By: M. POHL

Project: 05033.00
File Name: 05033-FINAL AS-BUILT.DWG
Sheet: TS101

D

Geotechnical Logs and Monitoring Well Construction Logs

PARSONS ENGINEERING SCIENCE
DRILLING RECORD

BORING NO. MW-5 (SB-14)

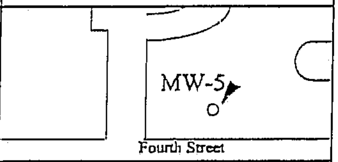
Contractor: SJB.Services Inc.
Driller: Don Butzer
Inspector: George Hermance
Rig Type: CME 75
Method: 4.25-inch HSA/SS

PROJECT NAME BURA - Fourth Street Site
PROJECT NUMBER 732260

Sheet 1 of 1
Location: Outside Fenced Area

Observations
Depth of Water
River Elevation
Top of Boring Elevation

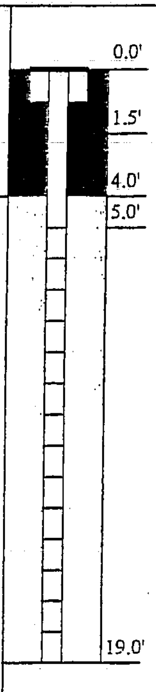
Weather Sunny, 70 degrees
Date/Time Start 5/6/98 0835
Date/Time Finish 5/6/98 0929



PID Reading	Sample Code	Sample Depth	Rec. (ft)	SPT	FIELD IDENTIFICATION OF MATERIAL	COMMENTS (Headspace)
		0				
0.00		1		8-11	Dark brown topsoil for .8', then black sandy fill with brick	0.0 ppm
	SS-1	2	1.5	13-28	cement and stone	Fill
0.00		3		38-24	Crushed stone, cement, brick	12.7 ppm
	SS-2	4	1.2	50/.4		Fill
513.00		5		4-4	Red brick for .2' then brown fine Sand and Silt for .6', then	2500 ppm
	SS-3	6	1.8	3-4	black woody peat, bottom .2' is black Silty Clay, moist, odor	Fill, SM, Pt
511.00		7		4-5	black woody peat for .2' then black stained Silty Clay, odor,	1120 ppm
	SS-4	8	2.0	5-5	grades to sandy to 8' depth, partings of Sand, moist	CL-SC
0.00		9		4-1	Gray Silty Clay to 8.3' then gray medium to fine Sand and	26.2 ppm
	SS-5	10	1.4	1-1	Silt, wet, Dilatent.	CL-SM
0.00		11		1-2	Gray fine Sand and Silt, wet, dilatent, peat in last .2'	30.2 ppm
	SS-6	12	1.4	4-4	of the spoon	SM-Pt
0.00		13		4-5	black and Gray Silty Clay, wet, changes to red gray Silty	12.1 ppm
	SS-7	14	1.3	8-8	Clay at 13.8'	CL
0.00		15		4-4	Red gray Silty Clay to 14.4', then red gray Sandy Silt, trace	0.0 ppm
	SS-8	16	1.9	6-8	Clay, trace Gravel, wet	CL-SM
0.00		17		21-24	Gray Sandy Silt, trace Gravel, trace Clay, wet, changes to	4.6 ppm
	SS-9	18	1.6	28-17	fine Sand and Silt at 17'	SM
		19		50/.4	No Recovery Auger Refusal at 19'	
	SS-10	20	0.0		Top of Rock at 18.4'	

Samples collected: MW5C - 4'-6'; MW5I - 16'-18'

(Well Construction)



STANDARD PENETRATION
SS = SPLIT SPOON
ST = SHELBY TUBE
W = WOH = WEIGHT OF HAMMER
R = WOR = WEIGHT OF RODS

SUMMARY:
2" ID Schedule 40 PVC Well Riser (5'-0.5')
2" ID Schedule 40 PVC, 0.010" slotted Well Screen (19'-5.0')
Filter Sand (19.1'- 4.0')
Bentonite Chips (4.0'-1.5') Cement Bentonite Grout, Curb Box, and pad (1.5'-0.0')

PARSONS ENGINEERING SCIENCE
DRILLING RECORD

BORING NO. MW-7 (SB-17)

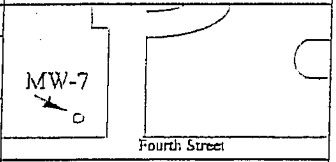
Contractor: SJB.Services Inc.
Driller: Don Butzer
Inspector: George Hermance
Rig Type: CME 75
Method: 4.25-inch HSA/SS

PROJECT NAME BURA - Fourth Street Site
PROJECT NUMBER 732260

Sheet 1 of 1
Location: Outside Fenced Area

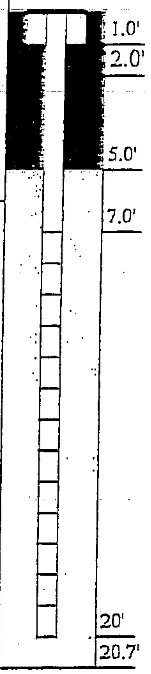
Observations
Depth of Water
River Elevation
Top of Boring Elevation

Weather Sunny, 70 degrees
Date/Time Start 5/8/98 1156
Date/Time Finish 5/8/98 1545



PID Reading	Sample Code	Sample Depth	Rec. (ft)	SPT	FIELD IDENTIFICATION OF MATERIAL	COMMENTS (Headspace)
		0				
0.00		1		1-3	topsoil then Tan medium to fine Sand, salt and pepper	0.0 ppm
	SS-1	2	2.0	4-4	Sand, slag moist, some Silt and Clay	Fill
0.00		3		4-4	black sandy Slag to 2.5' then brown and tan fine Sand and	0.0 ppm
	SS-2	4	1.7	5-6	Silt mixed with brick, cement, roots, moist	Fill
0.00		5		4-4	Brown Tan medium to fine SAND, some Silt with brick to	0.0 ppm
	SS-3	6	2.0	4-3	5.6', then black Silty fine Sand, trace(+) Clay, wood moist	Fill
0.00		7		1-2	Mixed black tan and gray Sand, Silt and Clay, then.5' stiff	0.0 ppm
	SS-4	8	1.3	2-3	black Clay, then mottled green Silty Clay, tr(+) fSand, moist	SC-SM
0.00		9		w-w	Gray fine SAND and SILT, trace roots, wet dilatent	0.0 ppm
	SS-5	10	1.7	w-2		SM
0.00		11		1-1	Gray fine Sand and Silt, trace(-) Clay, Trace (-) roots, wet	0.0 ppm
	SS-6	12	1.2	1-1	dilatent	SM
0.00		13		2-2	Gray fine Sand and Silt to 13' then .4' of Peat, then .2' dark	0.0 ppm
	SS-7	14	1.2	2-1	gray Clay, some Silt, wet	SM
0.00		15		1-3	Grayish red Silt and fine Sand, little (-) Clay, wet, dilatent	0.0 ppm
	SS-8	16	1.5	5-7		SM
0.00		17		3-5	Reddish gray Silt and fine Sand, trace (-) very fine Gravel,	0.0 ppm
	SS-9	18	2.0	7-4	wet, dilatent	SM
0.00		19		6-10	Red gray Silt and fine Sand to 19.5' then red Silty Clay,	0.0 ppm
	SS-10	20	1.6	5-Aug	trace fine Sand, trace very fine gravel, wet	SM
0.00		21		4-50/.2	Gray silt and Clay, wet, stiff, Auger refusal at 20.7'	CL
	SS-11	22	0.4		Top of rock at 20.7'	

COMMENTS (Well Construction)



Samples collected: MW07D - 6'-8'; MW07I - 16'-18'

STANDARD PENETRATION
SS = SPLIT SPOON
ST = SHELBY TUBE
W = WOH = WEIGHT OF HAMMER
R = WOR = WEIGHT OF RODS

SUMMARY:
2" ID Schedule 40 PVC Well Riser (7'-0.5')
2" ID Schedule 40 PVC, 0.010" slotted Well Screen (20'-7.0')
Filter Sand (20.7- 5.0')
Bentonite Chips (5.0'-2.0') Cement Bentonite Grout, Curb Box, and pad (1.0'-0.0')

PARSONS ENGINEERING SCIENCE
DRILLING RECORD

BORING NO. MW-8 (SB-18)

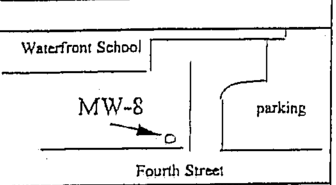
Contractor: SJB.Services Inc.
Driller: Don Butzer
Inspector: George Hermance
Rig Type: CME 75
Method: 4.25-inch HSA/SS

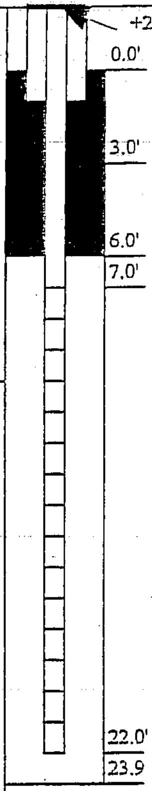
PROJECT NAME BURA - Fourth Street Site
PROJECT NUMBER 732260

Sheet 1 of 1
Location: Outside Fenced Area

Observations
Depth of Water
River Elevation
Top of Boring Elevation

Weather Sunny, 70 degrees
Date/Time Start 5/11/98 0836
Date/Time Finish 5/11/98 0955



PID Reading	Sample Code	Sample Depth	Rec. (ft)	SPT	FIELD IDENTIFICATION OF MATERIAL	COMMENTS (Headspace)	COMMENTS (Well Construction)
							
		0					
0.00		1		3-3	Brown topsoil for 1' then Black Sand and Silt, slag, concrete	0.0 ppm	
	SS-1	2	1.8	4-3	red brick, moist	Fill	
0.00		3		8-11	fill black slag, gray slag brick to 3', then brown Silty Clay	0.0 ppm	
	SS-2	4	1.3	3-7	with fill intermixed	Fill	
0.00		5		4-5	Black and gray Slag, silt, sand, wood, some medium to	0.0 ppm	
	SS-3	6	1.2	3-3	fine sand, moist to wet	Fill	
0.00		7		3-3	No Recovery		
	SS-4	8	0.0	3-4	Chunks of wood in spoon		
0.00		9		2-2	No Recovery		
	SS-5	10	0.0	2-2			
0.00		11		1-1	Gray Sandy Silt, little Clay, wet dilatent	0.0 ppm	
	SS-6	12	2.0	1-1		SM	
0.00		13		w-w	Same as 10'-12'	0.0 ppm	
	SS-7	14	2.0	w-1		SM	
0.00		15		4-7	Red brown Gray SILT and fine SAND, wet dilatent	0.0 ppm	
	SS-8	16	1.8	8-10		SM	
0.00		17		11-3	Tan , Gray SILT and fine SAND, wet dilatent	0.0 ppm	
	SS-9	18	1.7	2-5		SM	
0.00		19		w-1	Red brown Silt and fine Sand for 1' then red brown	0.0 ppm	
	SS-10	20	2.0	3-3	Silty Clay with .1' thick laminae	SM-CL	
0.00		21		5-13	Same as 18' to 20' to 20.8' thengray Silty fine Sand, little	0.0 ppm	
	SS-11	22	2.0	13-10	fine Gravel, wet, hard	CL-SM	
0.00		23		23-50/.4	Same as 20.8' -22 feet then to 23'		
	SS-12	24	0.5		Top of rock at 22.9'		
					Samples collected: MW08F - 10'-12'; MW08I - 16'-18'		

STANDARD PENETRATION
SS = SPLIT SPOON
ST = SHELBY TUBE
W = WOH = WEIGHT OF HAMMER
R = WOR = WEIGHT OF RODS

SUMMARY:
2" ID Schedule 40 PVC Well Riser (7'-+2.5')
2" ID Schedule 40 PVC, 0.010" slotted Well Screen (20'-7.0')
Filter Sand (20.7- 5.0')
Bentonite Chips (5.0'-2.0') Cement Bentonite Grout, Curb Box, and pad (1.0'-0.0')

PARSONS ENGINEERING SCIENCE
DRILLING RECORD

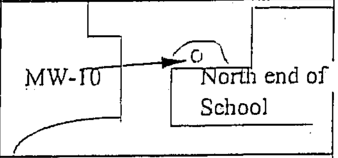
Contractor: SJB.Services Inc.
Driller:
Inspector: Dan Lipp
Rig Type: CME 75
Method: 4.25-inch HSA/SS

PROJECT NAME BURA - Fourth Street Site
PROJECT NUMBER 732260

BORING NO. MW-10 (SB-20)
Sheet 1 of 1
Location: Outside Fenced Area

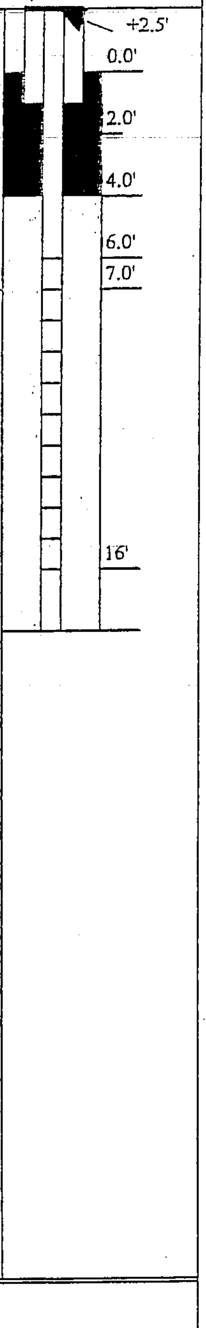
Observations
Depth of Water
River Elevation
Top of Boring Elevation

Weather Partly Cloudy, cold
Date/Time Start 11/13/98 0954
Date/Time Finish 11/13/98 1240



PID Reading	Sample Code	Sample Depth	Rec. (ft)	SPT	FIELD IDENTIFICATION OF MATERIAL	COMMENTS (Headspace)
		0				
0.00		1		3-5	Topsoil for 1', brown, dry	1.5 ppm
	SS-1	2	1.0	4-7		Fill
0.00		3		7-8	Brown, black topsoil, trace brick, trace fine gravel, trace wood, dry	3.9 ppm
	SS-2	4	1.2	9-6		Fill
0.00		5		4-9	Dark brown fine sand and fine gravel, some concrete, Moist	5.6 ppm
	SS-3	6	0.8	5-4		Fill
0.00		7		1-2	8" black Peat, then dark brown fine sand and fine gravel, Trace clay, trace silt, wet at 7'	6.2 ppm
	SS-4	8	0.6	2-4		SM-CL
0.00		9		1-2	Gray Clay, some Silt, moist	6.1 ppm
	SS-5	10	1.5	2-3		SM
0.00		11		2-3	same as above from 10' to 11', 11' to 12' brown Clay, some fine Sand and fine gravel, moist	2.8 ppm
	SS-6	12	1.6	7-7		SM
0.00		13		13-16	Brown Clay and Silt, trace fine gravel and sand.	3.5 ppm
	SS-7	14	2.0	14-16		SM-CL
0.00		15		8-10	Brown Clay, trace fine sand , some coarse gravel.	4.7 ppm
	SS-8	16	1.6	50-21		SM
0.00		17		9-9	Same as 14'-16'	18.5 ppm
	SS-9	18	15.0	50/3"		SM
0.00		19		50/0		
	SS-10	20	0.0		Auger refusal at 18'	
					Top of rock at 18'	

COMMENTS (Well Construction)



Samples collected: MW10I -16'-18'; MW10D - 6'-8'

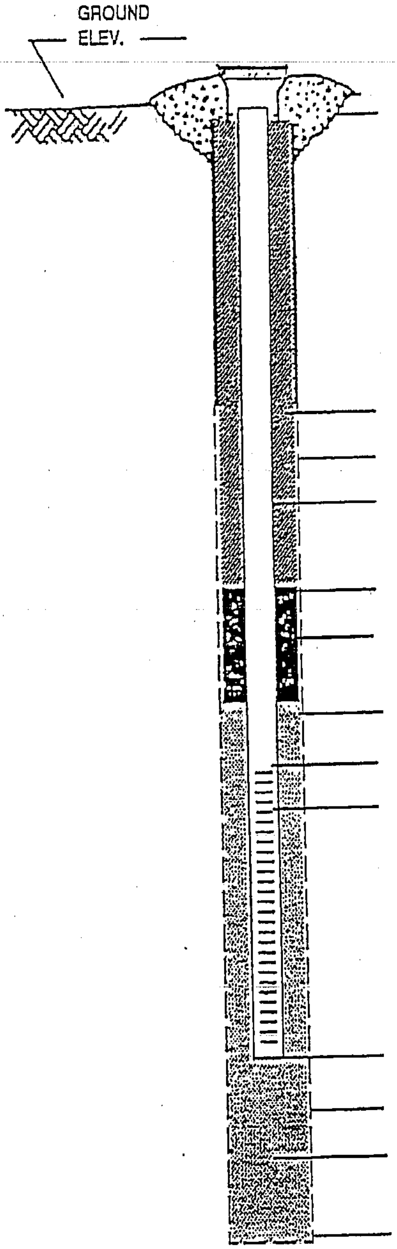
STANDARD PENETRATION
SS = SPLIT SPOON
ST = SHELBY TUBE
W = WOH = WEIGHT OF HAMMER
R = WOR = WEIGHT OF RODS

SUMMARY:
2" ID Schedule 40 PVC Well Riser (7'-+2.5')
2" ID Schedule 40 PVC, 0.010" slotted Well Screen (19'-7.0')
Filter Sand (20.7'- 5.0')
Bentonite Chips (5.0'-2.0') Cement Bentonite Grout, Curb Box, and pad (1.0'-0.0')

MONITORING WELL COMPLETION RECORD

SJB SERVICES, INC.

WELL NUMBER: MW-2	
PROJECT: 4TH STREET	**DRILLING METHOD:** HSA
PROJECT NUMBER:	**GEOLOGIST:**
DRILLER: KEN FULLER	**INSTALLATION DATE(S):** 4/21/06



TYPE OF SURFACE SEAL: CONCRETE

TYPE OF BACKFILL: CEMENT/BENTONITE GROUT

BOREHOLE DIAMETER: 8"

I.D. OF RISER PIPE: 2"

TYPE OF RISER PIPE: PVC

DEPTH OF SEAL: 1.5'

TYPE OF SEAL: BENTONITE

DEPTH OF SAND PACK: 3.0

DEPTH OF TOP OF SCREEN: 4.0

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: .010 x10

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1

DEPTH BOTTOM OF SCREEN: 14.0

DEPTH BOTTOM OF SAND PACK: 14.0

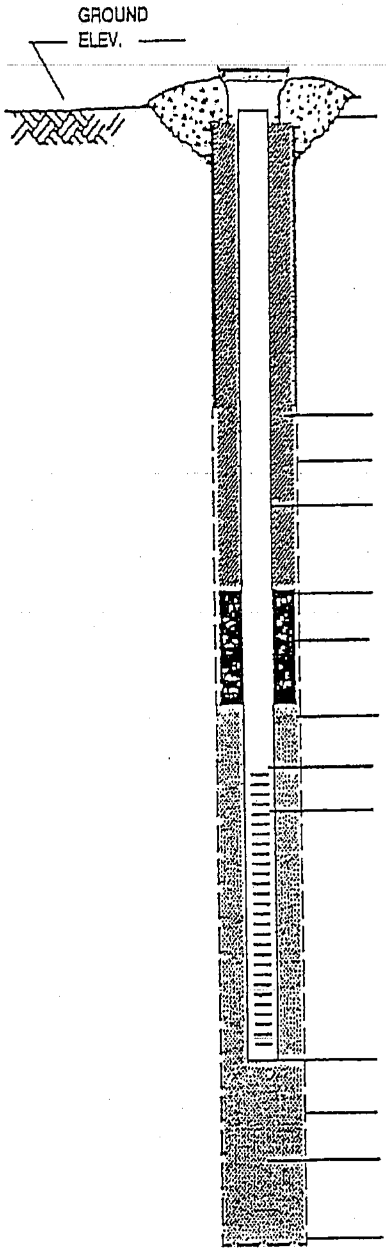
TYPE OF BACKFILL BELOW OBSERVATION WELL:

ELEVATION/ DEPTH OF HOLE: 14.0

MONITORING WELL COMPLETION RECORD

SJB SERVICES, INC.

WELL NUMBER: MW-11	
PROJECT: 4th STREET	**DRILLING METHOD:** HSA
PROJECT NUMBER:	**GEOLOGIST:**
DRILLER: KEN FULLER	**INSTALLATION DATE(S):** 4/21/06



TYPE OF SURFACE SEAL: CONCRETE

TYPE OF BACKFILL: CEMENT/BENTONITE GROUT

BOREHOLE DIAMETER: 8"

I.D. OF RISER PIPE: 2"

TYPE OF RISER PIPE: PVC

DEPTH OF SEAL: 6.0'

TYPE OF SEAL: BENTONITE

DEPTH OF SAND PACK: 8.0'

DEPTH OF TOP OF SCREEN: 10'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: .010 x 10

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1

DEPTH BOTTOM OF SCREEN: 20'

DEPTH BOTTOM OF SAND PACK: 20'

TYPE OF BACKFILL BELOW OBSERVATION WELL:

ELEVATION/ DEPTH OF HOLE: 20'

MONITORING WELL COMPLETION RECORD

SJB SERVICES, INC.

WELL NUMBER: MW-12

PROJECT: 4TH STREET

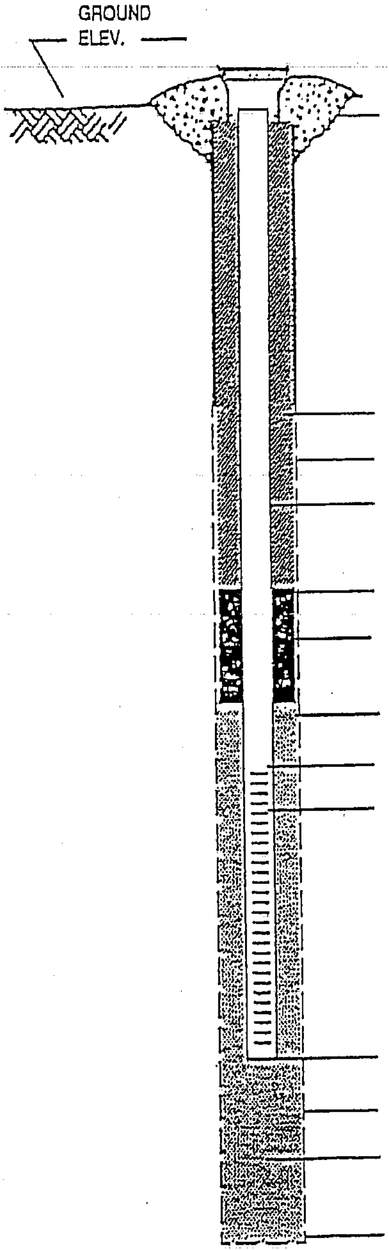
PROJECT NUMBER:

DRILLER: KEN FULLER

DRILLING METHOD: HSA

GEOLOGIST:

INSTALLATION DATE(S): 4/20/06



TYPE OF SURFACE SEAL: CONCRETE

TYPE OF BACKFILL: CEMENT/BENTONITE GROUT

BOREHOLE DIAMETER: 8"

I.D. OF RISER PIPE: 2"

TYPE OF RISER PIPE: PVC

DEPTH OF SEAL: 12.0

TYPE OF SEAL: BENTONITE

DEPTH OF SAND PACK: 14.0'

DEPTH OF TOP OF SCREEN: 16.0'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: .010 x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1

DEPTH BOTTOM OF SCREEN: 26.0'

DEPTH BOTTOM OF SAND PACK: 26.0'

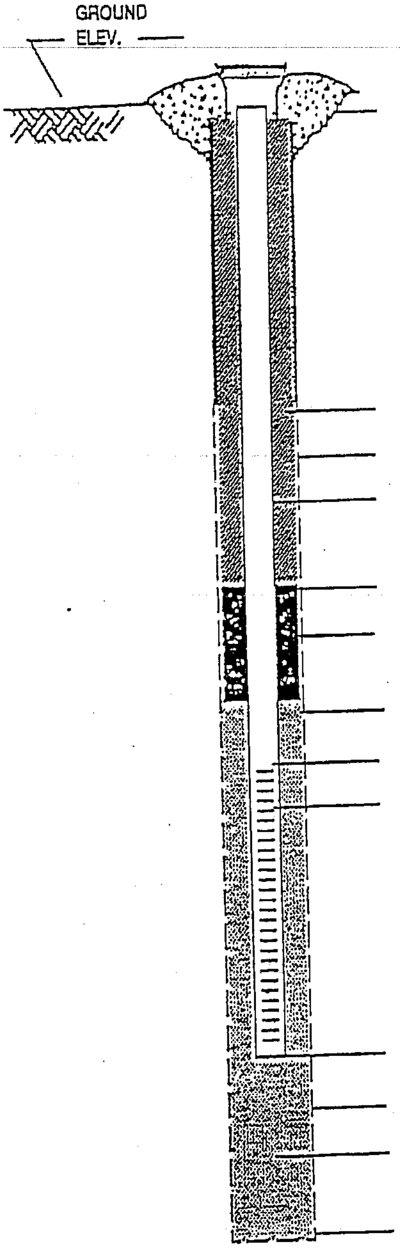
TYPE OF BACKFILL BELOW OBSERVATION WELL: SAND

ELEVATION/ DEPTH OF HOLE: 26.4

MONITORING WELL COMPLETION RECORD

SJB SERVICES, INC.

WELL NUMBER: MW-13	
PROJECT: 4TH STREET	**DRILLING METHOD:** HSA
PROJECT NUMBER:	**GEOLOGIST:**
DRILLER: KEN FULLER	**INSTALLATION DATE(S):** 4/20/06



TYPE OF SURFACE SEAL: CONCRETE

TYPE OF BACKFILL: CEMENT / BENTONITE GROUT
BOREHOLE DIAMETER: 8"
I.D. OF RISER PIPE: 2"
TYPE OF RISER PIPE: PVC

DEPTH OF SEAL: 10.0'
TYPE OF SEAL: BENTONITE

DEPTH OF SAND PACK: 12.0'
DEPTH OF TOP OF SCREEN: 14.0'

TYPE OF SCREEN: PVC
SLOT SIZE X LENGTH: .010 x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: #1

DEPTH BOTTOM OF SCREEN: 24.0

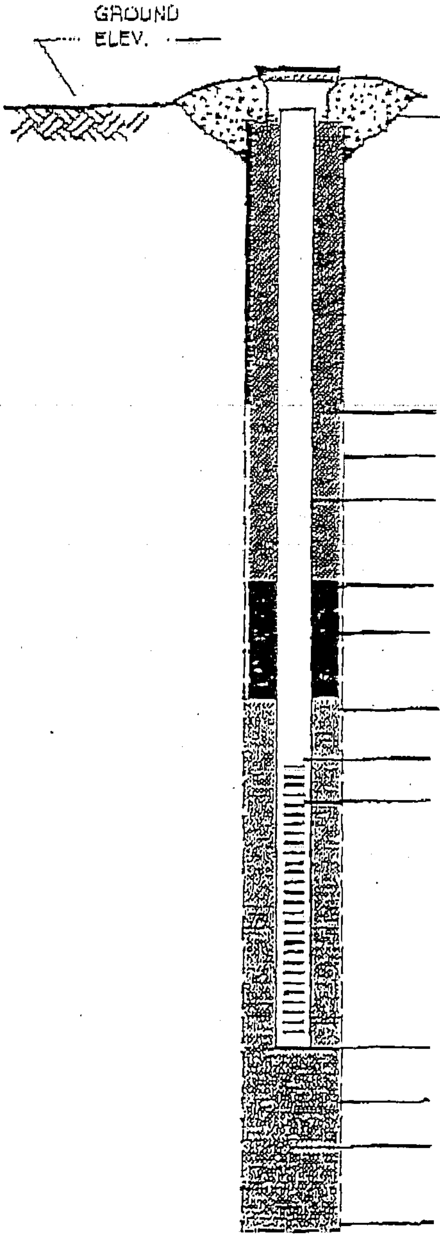
DEPTH BOTTOM OF SAND PACK: 24.5
TYPE OF BACKFILL BELOW OBSERVATION WELL: #1 SAND

ELEVATION/ DEPTH OF HOLE: 26.5

MONITORING WELL COMPLETION RECORD

SJB SERVICES, INC.
Contract Drilling and Testing

Well Number: MW-6R
Project: 4th STREET
Project Number:
Driller:
Drilling Method: HSA
Geologist:
Installation Date(s):



Type of Surface Seal: ROAD BOX

Type of Backfill: BENTONITE/CEMENT GROUT
Borehole Diameter: 8"
I.D. of Riser Pipe: 2"
Type of Riser Pipe: PVC
Depth of Seal: 6
Type of Seal: BENTONITE CHIPS
Depth of Sand Pack: 8
Depth Top of Screen: 10
Type of Screen: PVC
Slot Size x Length: .010
I.D. of Screen: 2" PVC
Type of Sand Pack: #0 SAND

Depth Bottom of Screen: 20.0
Depth Bottom of Sand Pack: 20.0
Type of Backfill Below Observation Well: NA

Elevation/Depth of Hole: 20.0

Soils Management Plan
Fourth Street Inactive Hazardous Waste Site
NYSDEC Site No. 9-15-167

August 2006

Prepared for:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Prepared by:

ECOLOGY AND ENVIRONMENT ENGINEERING, P.C.
368 Pleasant View Drive
Lancaster, New York 14086

Table of Contents

Section **Page**

Appendix

List of Figures

List of Abbreviations and Acronyms

BSA	Buffalo Sewer Authority
BTEX	benzene, toluene, ethylbenzene, and xylenes
COPCs	constituents of potential concern
EEEPC	Ecology & Environment Engineering, P.C.
MGP	Manufactured Gas Plant
NYSDEC	New York State Department of Environmental Conservation
NYSDOH ELAP	New York State Department of Health Environmental Laboratory Accreditation Program
PAH	polycyclic aromatic hydrocarbon
RA	remedial action
RCRA	Resource Conservation and Recovery Act
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RSCO	recommended soil cleanup objectives
SCGs	standards, criteria, and guidance values
SMP	Soils Management Plan
SSALs	site-specific action limits
SVOC	semivolatile organic compound
TAGM	Technical and Administrative Guidance Manual
TAL	Target Analyte List
TCL	Target Compound List
VOC	volatile organic compound

1

Overview and Objectives

The objective of this Soils Management Plan (SMP) is to address environmental concerns related to future soils management and set guidelines for management of potentially contaminated soil material encountered during any future activities such as development and/or utility construction and maintenance at the Fourth Street Inactive Hazardous Waste Site.

2

Site Background

The site is the former Citizens Gas Works Manufactured Gas Plant (MGP) located near the corner of Fourth and Carolina Streets in the City of Buffalo, Erie County, New York. The site is currently owned by the City of Buffalo and the Buffalo Urban Renewal Agency. The site location is shown in Figure 2-1. A portion of the site was also used by the Greyhound Bus Company from 1934 to 1958. Until 1915 the Citizens Gas Works operated a MGP at the site. This plant produced gas for heating and lighting by "heat-treating" coal and petroleum products. The by-products from the MGP operations included coal tar, coke, and ammonia. Large quantities of ash were also produced. Substantial amounts of tar typically escaped collection and were spilled or dumped onto the land.

A Phase II Environmental Investigation was done in May 1992 for the Waterfront Redevelopment Project by Huntingdon - Empire Soils Investigations, Inc. A remedial investigation/feasibility study (RI/FS) was completed in January 2001 for Buffalo Urban Renewal Agency by Parsons Engineering Science, Inc. Based on the results of the RI in comparison to standards, criteria, and guidance values (SCGs) or remediation goals in subsurface soil and groundwater and potential public health and environmental exposure rates, the FS identified the areas and media of the site that required remediation. A record of decision (ROD) was signed in August 2001 calling for complete source removal and off-site disposal.

The site contamination and general excavation area for the remedial action (RA) was based on analytical data from previous soil-boring investigations performed during RI activities. The excavation and removal limits given in the contract drawings were prepared using data from pre-design investigation activities performed in 2003 and 2004 by Ecology & Environment Engineering, P.C. (EEEPC) for New York State Department of Environmental Conservation (NYSDEC). These limits were further confirmed at the start of construction by the remediation contractor through pre-mobilization borings located around the designed excavation limits.

As part of the RA, the site was backfilled with clean off-site (approximately 90-95%) and on-site (approximately 5-10%) soils and restored with a surface parking lot and driveways for use by the adjacent Waterfront Elementary School (Public School No. 95). The parking lot and driveway areas typically consist of 10 to 12 inches of crushed stone sub-base beneath 3 to 4 inches of asphalt paving at the surface. The parking area also contains landscaped islands and concrete sidewalks.

The RA is further detailed in “Fourth St. Inactive Hazardous Waste Site, Final Remediation Report” (EEEPC 2006).

As of August 2006, the site is still considered a Class 2 inactive hazardous waste site. Because all contamination was removed from the subject area (with the exception of the utility corridor), it is anticipated that the site will be re-classified to a Class 4 inactive hazardous waste site to reflect a one-year groundwater monitoring program. NYSDEC will conduct the groundwater monitoring and, provided that the groundwater achieves remediation goals as expected, the inactive hazardous waste site will likely be redefined to only include the area along the utility corridor. The remainder of the inactive hazardous waste site will be re-classified to a Class 5 inactive hazardous waste site, and the remediated areas will be removed from the registry description. NYSDEC will require that an Environmental Easement be filed.

02:002700_DC05_05-B1968\Fig2-1.cdr-7/17/06-GRA

SOURCE: Map Works, Inc. 2001

SCALE

0 .5 Mile

Figure 2-1 Fourth Street Inactive Hazardous Waste Site Location Map

3

Nature and Extent of Contamination

The constituents of potential concern (COPCs) for soil consist primarily of volatile organic compounds (VOCs): benzene, toluene, ethylbenzene, and xylenes (BTEX) and semivolatile organic compounds (SVOCs): polycyclic aromatic hydrocarbons (PAHs) and phenols.

The proposed excavation limits included in the remediation contract drawings dated February 2005 prepared by EEEPC included excavation and removal of soils over a section of the Swan trunk up to its spring line. Drawings 4 and 5 of this set are included in Appendix A. These proposed excavation limits were based on preliminary conversations with representatives of Buffalo Sewer Authority (BSA) during the design phase and presented during a utility coordination meeting held November 4, 2004 (see Appendix B). However, during the course of the RA, the excavation limits were modified as directed by representatives of the BSA at the pre-construction meeting held June 22, 2005, prior to the start of work to address concerns regarding the stability of the Swan trunk (see Appendix C). As a result, the RA contractor (Earth Tech, Inc.) submitted an Excavation Work Plan to BSA for areas around the Swan trunk (see Appendix D). This plan proposed leaving soils in place above and sloping away (a slope of approximately 2H:1V) from the Swan trunk. This plan was also submitted to Niagara Mohawk Power Company (now National Grid) and used to excavate around a large electrical duct bank that exists in the former Court Street utility corridor, as directed by the power company.

Because of the potential for the remaining soils along the Swan trunk to be contaminated, the excavation side-slopes adjacent to the Swan trunk were covered with a demarcation layer of orange construction fencing in accordance with Proposed Change Order No. 3 (see Appendix E) to identify where soils within the proposed excavation limits along the Swan trunk were left in place. In addition, three verification soil samples were collected to identify the types and levels of contamination that remain along the excavation side-slopes along the Swan trunk ("VS-006," "VS-007," and VS-008"). The locations of the verification samples are presented in the as-built drawings included in Appendix F. The analytical data is presented in Appendix G.

To avoid undermining active utilities, NYSDEC approved that soils be left in place in applicable areas along the perimeter of the excavation where utilities existed or were encountered. Conversely, soils outside the proposed excavation limits and not impeded by utilities were removed only if free NAPL was observed along the excavation sidewall. The actual limits of excavation and the proposed excavation limits are both shown in the RA contractor's as-built drawings included in Appendix F for comparison purposes.

The primary areas of concern for the site, now that the RA has been completed, are any areas within the limits of the inactive hazardous waste site that lie outside of the actual RA excavation limits. This includes the side-slope area that was left in place to protect the Swan trunk, as discussed above, as well as soils left in place along the utility corridor between the main excavation area and the isolated "hazardous contamination area" shown in Appendix A on sheet 4 of 5, "Excavation Plan".

In addition, fill materials containing brick, concrete, and metal debris may be present within the inactive hazardous waste site limits but outside the RA excavation limits. Although these soils do not appear to be associated with the MGP operations (i.e., outside the MGP boundary with no tar present), their source is unknown, and they may also contain levels of contamination above Technical and Administrative Guidance Manual (TAGM) 4046 that would require special handling and disposal.

The approximate limits of the inactive hazardous waste site are provided as Figure 3-1. The inactive hazardous waste site limits presented in Figure 3-1 are approximate and are intended for administrative and illustrative purposes only. The inactive hazardous waste site limits do not necessarily coincide with either the proposed or actual RA excavation limits, as shown in Appendix A and Appendix F, and may exist within and outside the proposed or actual RA excavation limits. NYSDEC representatives should be contacted if the site limits need to be further defined.

NYSDEC shall continue to perform future groundwater sampling at the site to assess groundwater quality and the effectiveness of the RA.

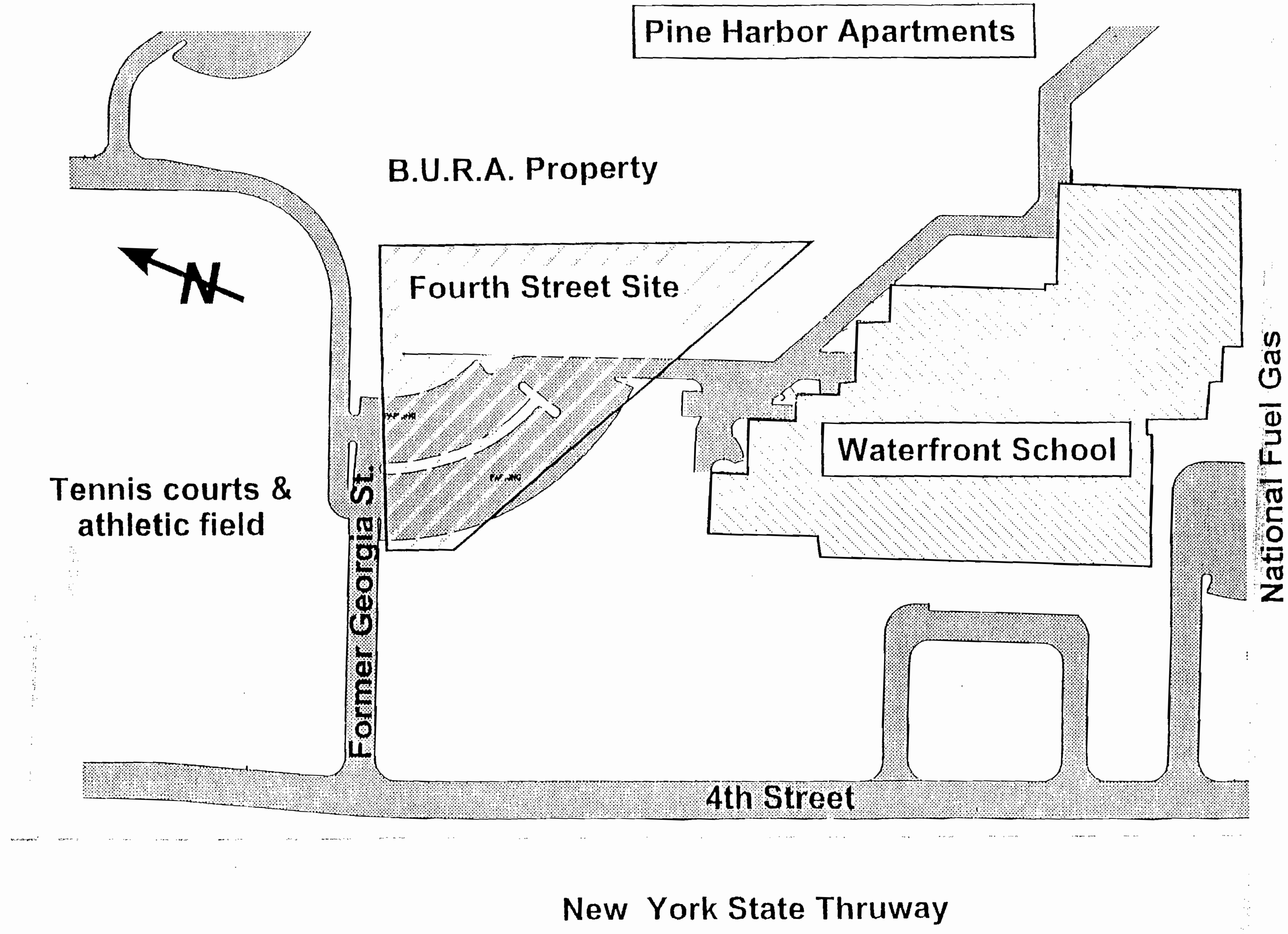


Figure 3-1 Approximate Limits of Fourth Street Inactive Hazardous Waste Site

4

Management of Soils/Fill

Soil disturbances may occur as utility owners and current and future property owners perform future maintenance, replacement, and other activities. As stated above, the primary areas of concern for the site, now that the RA has been completed, are any areas within the limits of the inactive hazardous waste site that lie outside of the actual RA excavation limits.

At the time of remediation, utility owners included:

- Buffalo Sewer Authority;
- City of Buffalo Division of Water;
- National Grid (formerly Niagara Mohawk Power Company); and
- National Fuel.

Current site owners include:

- City of Buffalo; and
- Buffalo Urban Renewal Agency.

The purpose of this section is to provide environmental guidelines for management of subsurface soils/fill and the long-term maintenance of the site during any future intrusive work that may occur in potentially impacted soils remaining on-site, including repair or replacement of utilities. Other non-intrusive maintenance activities that do not involve excavation or contact with soils outside the scope of the RA, such as sewer cleaning and inspections, should not be affected by any restrictions or other special procedures associated with the RA.

The SMP includes the following conditions:

- Compliance with this SMP is solely the responsibility of the property owner or utility owner. Any and all project costs or delays that result from implementing this SMP will be borne solely by the property owner or utility owner performing work on rights-of-way.

- Future buildings that may be installed on or adjacent to the inactive hazardous waste site may require a soil vapor investigation and sub-slab depressurization system to address residual contamination. It is recommended that designers evaluate this possibility and contact NYSDEC to properly address these considerations.

- Soil that is excavated and is intended to be removed from the inactive hazardous waste site must be managed, characterized, and properly disposed of in accordance with NYSDEC regulations and directives. This is discussed in more detail in section 4.1.

- Groundwater encountered during excavation activities may be contaminated and should be handled and disposed of in accordance with all local, state, and federal regulations.

- Soil excavated at the site may be reused as backfill material on-site provided it contains no visual or olfactory evidence of contamination, and it is placed at a depth greater than 12 inches below the finished ground surface and covered with at least 12 inches of suitable material meeting NYSDEC-recommended soil cleanup objectives (RSCOs) included in TAGM 4046.

- Any off-site fill material brought to the site for filling and grading purposes shall be from a permitted borrow source free of industrial and/or other potential sources of chemical or petroleum contamination. Off-site borrow sources should be subject to collection of one representative composite sample per source. The sample should be analyzed for Target Compound List (TCL) VOCs, SVOCs, pesticides, PCBs, and Target Analyte List (TAL) metals plus cyanide. The soil shall be acceptable for use as cover material provided that all parameters meet the NYSDEC RSCOs included in TAGM 4046.

- Prior to any construction activities at the site, workers are to be notified of the site conditions with clear instructions regarding how the work is to proceed. In addition to this SMP, invasive work performed at the property must be performed in accordance with all applicable local, state, and federal regulations to protect worker health and safety.

- In the event that intrusive activities are necessary within the limits of the inactive hazardous waste site, the property owner, utility owner, or developer performing the intrusive work shall contact:

Mr. Gerald Rider (or other)
NYSDEC - Division of Environmental Remediation
Remedial Bureau D, Remedial Section B
625 Broadway, 12th Floor
Albany, NY 12233-7013
(518) 402-9640

NYSDEC shall be contacted at least 14 days prior to the start of activities to ensure that the conditions at the site during intrusive activities are fully protective of public health and the environment and so that NYSDEC may observe sampling activities, if necessary.

4.1 Excavated and Stockpiled Soil/Fill Disposal

Soil/fill material that is excavated as part of future site development, utility construction, or maintenance outside the RA excavated areas as indicated on the RA contractor's as-built drawings in Appendix F must be assessed for potential contamination and be handled accordingly to protect the environment and public health. Soil/fill materials that cannot be used as fill at a depth greater than 12 inches below finished grade shall be further characterized prior to transportation and disposal off-site. For excavated soil/fill with visual evidence of contamination (i.e., staining or elevated measurements using a photo-ionization detector [PID]), one composite sample and a duplicate sample shall be collected for each 100 cubic yards of stockpiled soil/fill. For excavated soil/fill that does not exhibit visual evidence of contamination, one composite sample and a duplicate sample shall be collected for every 2,000 cubic yards of stockpiled soil, and a minimum of one sample shall be collected for volumes less than 2,000 cubic yards to determine whether soils may be reused or must be disposed of off-site.

The composite sample shall be collected from five locations within each stockpile. A duplicate composite sample shall also be collected. PID measurements shall be recorded for each of the five individual locations. One grab sample shall be collected from the individual location with the highest PID measurement. If none of the five individual sample locations exhibits PID readings, one location shall be selected at random. The composite sample shall be analyzed by a New York State Department of Health Environmental Laboratory Accreditation Program (NYSDOH ELAP)-certified laboratory for:

- Polyclyclic Aromatic Hydrocarbons (PAHs);
- Resource Conservation and Recovery Act (RCRA) Metals; and
- Total cyanide.

The grab sample shall also be analyzed for BTEX.

Soil samples shall be composited by placing equal portions of fill/soil from each of the five composite sample locations into a pre-cleaned, stainless steel (or Pyrex glass) mixing bowl. The soil/fill shall be thoroughly homogenized using a stainless steel scope or trowel and transferred to pre-cleaned jars provided by the laboratory. Sample jars shall then be labeled and a chain-of-custody form shall be prepared.

Additional characterization sampling for off-site disposal may be required by the disposal facility. To potentially reduce off-site disposal requirements/costs, the utility owner or site developer may also choose to characterize each stockpile individually. If the analytical results indicate that concentrations exceed the standards for RCRA characteristics, the material shall be considered a hazardous waste and must be properly disposed of off-site at a permitted disposal facility within 90 days of excavation. If the analytical results indicate that the soil is not a hazardous waste, the material shall be properly disposed of off-site at a non-hazardous waste facility or other NYSDEC-approved destination. If the analytical results indicate that the soil is below recommended cleanup objectives presented in TAGM 4046, the soils may be used as fill off-site, as approved in writing by NYSDEC. Stockpiled soil cannot be transported on- or off-site until the analytical results are received.

4.2 Subgrade Material

Subgrade material used to backfill excavations or placed to increase site grades or elevation must be approved in writing by NYSDEC and shall meet the following criteria:

- Excavated on-site soil/fill that appears to be visually impacted shall be sampled and analyzed. The soil/fill can be used as backfill on-site, upon approval by NYSDEC, if analytical results indicate that the contaminants, if any, are present at concentrations below site-specific action limits (SSALs) or TAGM 4046, as follows:

Reuse Area	Reuse Criteria
Surface soil (1 - 12 inches BGS)	Must meet TAGM 4046 requirements
Subsurface soil (greater than 12 inches BGS)	10 mg/kg total BTEX
	1 mg/kg individual BTEX compounds (or TAGM 4046 RSCO, whichever is greater)
	50 mg/kg individual PAHs
	1,000 mg/kg total cyanide
	No NAPL

- Any off-site fill material brought to the site for filling and grading purposes shall be from an acceptable borrow source free of industrial and/or other potential sources of chemical or petroleum contamination that meets TAGM 4046 requirements.

- Off-site soils intended for use as site backfill cannot otherwise be defined as a solid waste in accordance with 6 NYCRR Part 360-1.2(a).

- If the utility owner, site developer, or contractor designates an off-site fill source as “virgin” soil, it shall be further documented in writing to be native soil material from areas not having supported any known prior industrial or commercial development or agricultural use.

- Off-site virgin soils should be subject to collection of one representative composite sample per source. The sample should be analyzed for TCL VOCs, SVOCs, pesticides, PCBs, arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, and cyanide. The soil shall be acceptable for use as backfill provided that all parameters meet TAGM 4046.

- Off-site non-virgin soils shall be tested via collection of one composite sample per 500 cubic yards of material from each source area. If more than 1,000 cubic yards of soil are borrowed from a given off-site non-virgin soil source area and both samples of the first 1,000 cubic yards meet TAGM 4046, the sample collection frequency may be reduced to one composite for every 2,500 cubic yards of additional soils from the same source, up to 5,000 cubic yards. For borrow sources greater than 5,000 cubic yards, sampling frequency may be reduced to one sample per 5,000 cubic yards, provided all earlier samples met TAGM 4046.

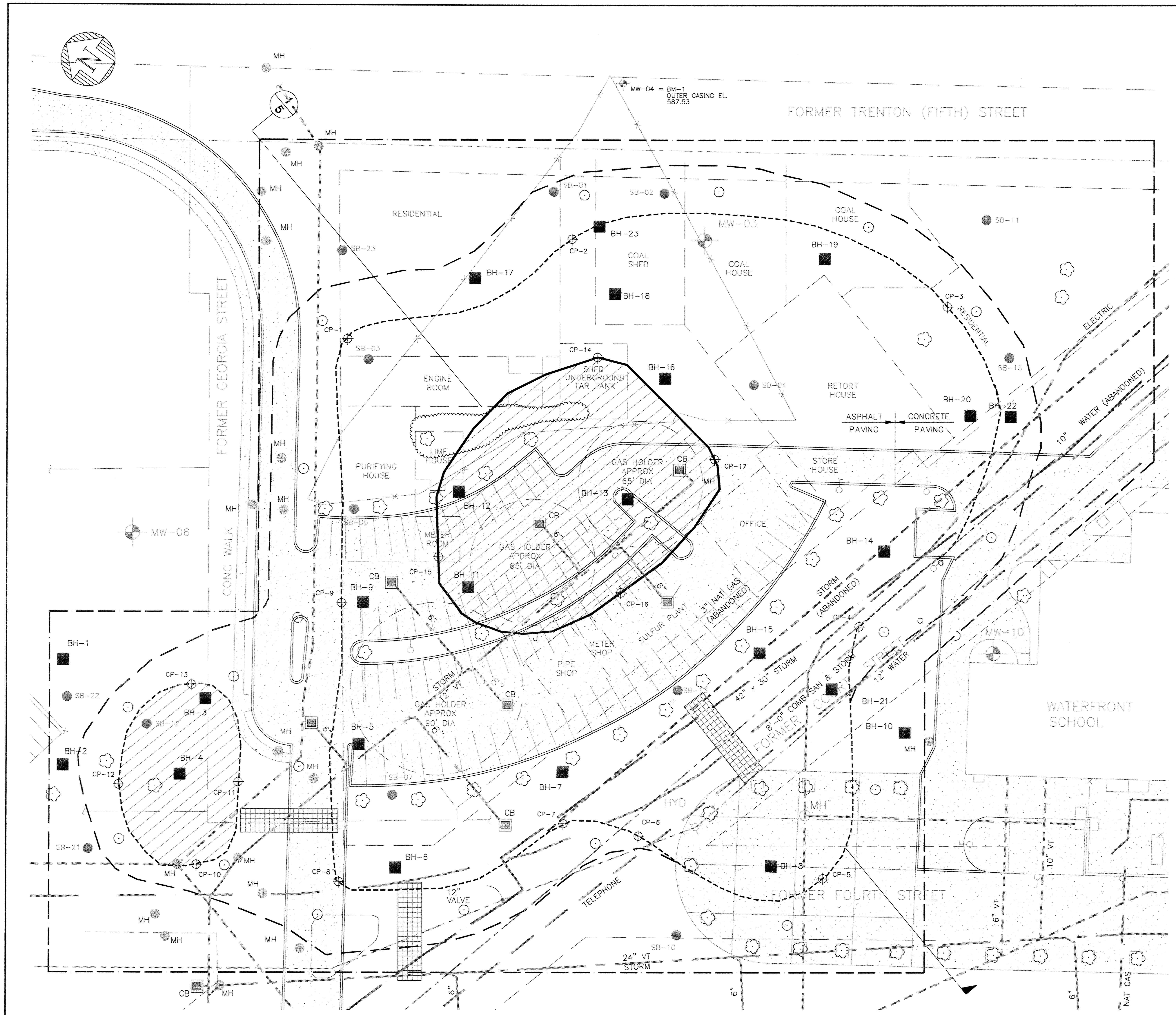
5 References

Ecology and Environment Engineering, P.C., 2004, “Final Pre-Design Investigation and Engineering Design Report for the Fourth Street Inactive Hazardous Waste Site.”

Department of Environmental Conservation, Division of Environmental Remediation, Record of Decision, Fourth Street Site Buffalo (C), Erie County, New York, Site Number 9-15-167, August 2001.

A

Contract Drawings, Sheets 4 and 5



SOIL BORING DATA TABLE		
BORING #	COVER DEPTH TO BE REUSED (*)	DEPTH TO BEDROCK (*)
BH-1	0'	19'
BH-2	0'	16'
BH-3	1.2'	17'
BH-4	4'	19.5'
BH-5	2.5'	16'
BH-6	5'	21.5'
BH-7	4'	15'
BH-8	0'	16.4'
BH-9	0.9'	15'
BH-10	0'	15'
BH-11	1'	17.7'
BH-12	1.7'	15.3'
BH-13	4'	16.3'
BH-14	4'	17'
BH-15	3.7'	15'
BH-16	0'	18'
BH-17	0'	14'
BH-18	0'	13.5'
BH-19	0.3'	13'
BH-20	1.6'	14.5'
BH-21	4'	11.5'
BH-22	0'	15.5'
BH-23	0'	13.5'

NOTE:

ALL DEPTHS ARE PROPOSED AND SHALL BE VERIFIED DURING EXCAVATION.
BH-1, BH-2, BH-10, BH-17 AND BH-22 ARE NOT WITHIN THE PROPOSED EXCAVATION LIMITS.

* - ESTIMATED

COORDINATE POINTS FOR ESTIMATED EXCAVATION LIMIT LINE		
POINT NUMBER	NORTHING	EASTING
CP-1	-134.35	-143.40'
CP-2	-81.98'	-26.42'
CP-3	-117.34'	169.18'
CP-4	-282.95'	132.32'
CP-5	-413.89'	104.69'
CP-6	-391.97'	8.53'
CP-7	-385.59'	-30.68'
CP-8	-415.65'	-147.53'
CP-9	-146.23'	-270.72'
CP-10	-406.54'	-221.49'
CP-11	-364.06'	-199.89'
CP-12	-365.45'	-262.19'
CP-13	-313.16'	-224.26'
CP-14	-143.86'	13.02'
CP-15	-247.17'	95.81'
CP-16	-265.47'	0.86'
CP-17	-196.77'	-47.92'

NOTE:

COORDINATE DATA SHOWN ON THIS DRAWING BASED ON LOCAL CONTROL AND IS INTENDED FOR LAYOUT PURPOSES ONLY. CONTRACTOR IS RESPONSIBLE FOR ESTABLISHMENT OF CONTROL ON THE SITE DURING CONSTRUCTION. BM-1 = 0.00

GENERAL NOTES:

1. ALL EXISTING SITE FEATURES, UNLESS OTHERWISE NOTED, ARE TO BE DEMOLISHED. LIMIT DEMOLITION TO MINIMIZE DISRUPTION OF FEATURES IN AREAS ADJACENT TO THE DEMOLITION LIMIT THAT ARE TO REMAIN INTACT. (SEE RESTORATION DRAWINGS BY OTHERS FOR FINAL DEMOLITION LIMITS.)
2. CONTRACTOR SHALL PRESUME ALL UNDERGROUND UTILITIES ENCOUNTERED DURING EXCAVATION OPERATIONS TO BE FUNCTIONAL AND "IN SERVICE" UNLESS SPECIFICALLY DETERMINED AS SUCH BY UTILITY HAVING JURISDICTION. INADVERTENT INTERRUPTION OF SERVICE CAUSED DURING EXCAVATION IS THE RESPONSIBILITY OF THE CONTRACTOR. CONTACT ("DIG SAFELY NEW YORK") BEFORE EXCAVATING OR BORING, PHONE 1.800.962.7962. REFER TO PROJECT SPECIFICATIONS FOR FURTHER INFORMATION. EXERCISE CARE IN HYDRANT WORK TO PREVENT DAMAGE.
3. LOCATIONS OF SITE FEATURES AS SHOWN ARE APPROXIMATE AND SHOULD BE USED FOR INFORMATIONAL PURPOSES ONLY.
4. DE-ENERGIZE ELECTRICAL POWER AND REMOVE LIGHT FIXTURES.
5. REMOVE ALL MONITORING WELLS WITHIN THE EXCAVATION LIMITS. REFER TO PROJECT SPECIFICATIONS FOR ADDITIONAL DEMOLITION NOTES.
6. LOCATIONS OF SITE FEATURES SHOWN HERE AS FORMER MANUFACTURED GAS PLANT OR LOCAL RESIDENTIAL AREAS ARE PROVIDED FOR INFORMATION ONLY AND SHOULD NOT BE PRESUMED AS ACTUAL LOCATIONS.
7. TEST PIT LOCATIONS ARE PROPOSED TO IDENTIFY LOCATION, DEPTH, AND CONDITION OF UNDERGROUND UTILITIES. COORDINATE FINAL PIT LOCATIONS WITH ENGINEER PRIOR TO EXCAVATION.
8. CONTRACTOR TO PERFORM SOIL BORINGS AT PROPOSED LOCATIONS TO IDENTIFY PRESENCE AND DEPTH OF CONTAMINATION IN ORDER TO DEFINE LIMITS OF EXCAVATION. SAMPLES SHALL BE COLLECTED AT 5-FOOT INTERVALS TO BEDROCK AND SUBMITTED FOR ANALYTICAL TESTING AS DETERMINED IN THE PROJECT SPECIFICATIONS.

LEGEND

▭	ASPHALT OR CONCRETE PAVING
CB ▣	CATCH BASIN
═	EDGE OF CURB
—×—	FENCE
HYD	FIRE HYDRANT
● SB-04	SOIL BORING FROM RI/FS, PARSONS ENGINEERING SCIENCE, 1999.
MH ●	MANHOLE
⊕ MW-03	MONITORING WELL
✲	TREE OR SHRUB
δ	UTILITY POLE/LIGHT STANDARD
- - - - -	ESTIMATED EXCAVATION LIMIT
— — —	ESTIMATED TOP OF SIDE SLOPE
— — —	ESTIMATED BUFFER ZONE
— — —	HISTORICAL FEATURES SEE NOTE 6
BM-1 ⊕	ESTABLISHED SITE BENCHMARK
CP-1 ⊕	COORDINATE POINT
BH-22 ■	BOREHOLE LOCATIONS FROM PRE-DESIGN INVESTIGATION, EEEPC, 2004
▦	PROPOSED TEST PIT LOCATION
▨	APPROXIMATE HAZARDOUS CONTAMINATION AREA
⊙	PROPOSED BORING LOCATIONS TO VERIFY EXISTENCE OF CONTAMINATION
7/6	DETAIL NO / SHEET NO

SCALE IN FEET
0 30 60 90

F:\W13 4TH ST\Dec 04\4.dwg
BUFFplot: 2\9\05 KMK

IT IS A VIOLATION OF NEW YORK STATE EDUCATION LAW TO ALTER THIS DOCUMENT BY MEANS INCONSISTENT WITH SECTION 7209 OF SAID LAW.

DWG. NO.	DATE	DESCRIPTION
32260C05.dwg	2/3/99	FIGURE 1.3 LOCATION OF HISTORICAL STRUCTURES AND UTILITIES
		PARSONS ENGINEERING SCIENCE WILLIAMSVILLE NY

REFERENCE DRAWINGS

NO.	DATE	DWN	APP'D	DESCRIPTION
C	2/11/05	KMK	DJM	ISSUED FOR BIDDING
B	9/30/04	KMK	DJM	ISSUED FOR 95% DESIGN REVIEW
A	5/21/04	JJK	DJM	ISSUED FOR 90% DESIGN REVIEW

REVISIONS

ecology and environment engineering, p.c.

DESIGNED BY SP GARDNER PE	CHECKED BY DP ALBERS PE
DRAWN BY JJ KOHLER	APPROVED BY D.J. MILLER P.E.

GERALD A. STROBEL
LICENSE NO. 044479-1

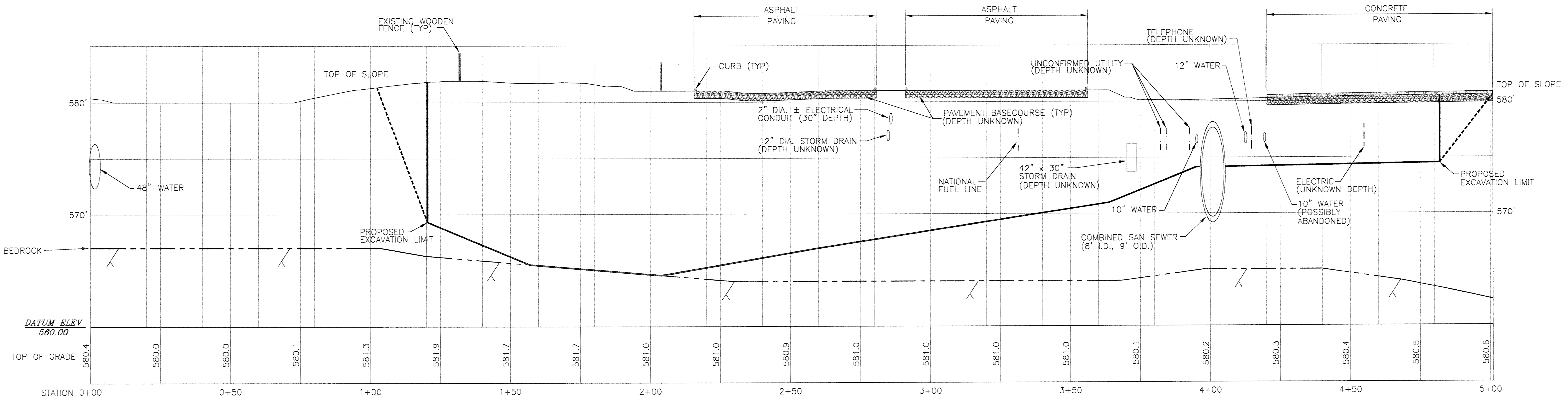
FOURTH STREET REMEDIATION PROJECT

NYSDEC CONTRACT No. D005197

BUFFALO ERIE COUNTY NEW YORK

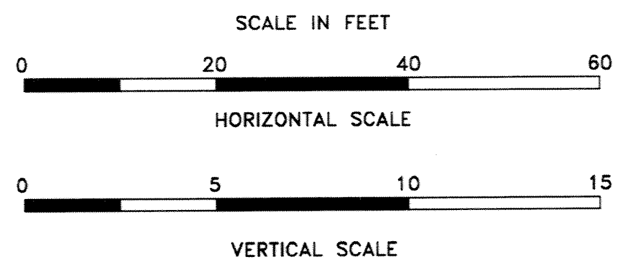
EXCAVATION PLAN

SCALE	DATE ISSUED	C.A.D. FILE NO.	DRAWING NO.	REV.
1"=30'-0"	2/11/05	4.dwg	Sheet — 4 of 5	C



1/5 ESTIMATED CROSS SECTION

NOTE:
PROPOSED EXCAVATION DEPTHS BASED ON INTERPRETATION OF SOIL ANALYTICAL DATA. UTILITY LOCATIONS ARE ESTIMATED AND SHALL BE FIELD VERIFIED. DETAILS OF THIS CROSS SECTION SHOULD NOT BE PRESUMED ACCURATE OR INCLUSIVE OF ALL KNOWN OR UNKNOWN FEATURES.



F:\NV13 4TH ST\Dec 04\5.dwg
BUFFplot: 2\9\05 KMK

DWG. NO.	DATE	DESCRIPTION
32260C05.dwg	2/3/99	FIGURE 1.3 LOCATION OF HISTORICAL STRUCTURES AND UTILITIES
		PARSONS ENGINEERING SCIENCE WILLIAMSVILLE NY

REFERENCE DRAWINGS

NO.	DATE	DWN	APP'D	DESCRIPTION
C	2/11/05	KMK	DJM	ISSUED FOR BIDDING
B	9/30/04	KMK	DJM	ISSUED FOR 90% DESIGN REVIEW
A	5/21/04	JJK	DJM	ISSUED FOR 90% DESIGN REVIEW

REVISIONS

ecology and environment engineering, p.c.

DESIGNED BY SP GARDNER PE	CHECKED BY DP ALBERS PE
DRAWN BY J LASKOWSKI	APPROVED BY D.J. MILLER PE

LICENSE NO. 044479-1

FOURTH STREET REMEDIATION PROJECT
NYSDEC CONTRACT No. D005197
BUFFALO ERIE COUNTY NEW YORK

EXISTING SITE CROSS SECTION

SCALE	DATE ISSUED	C.A.D. FILE NO.	DRAWING NO.	REV.
NOTED	2/11/05	5.dwg	Sheet – 5 of 5	C

B

Utility Coordination Meeting Minutes

Fourth Street Utilities Coordination Meeting

Place: Buffalo City Hall, Room 502
Time: November 4, 2004, 10:00 AM

Attendees:	Michael Zera	City of Buffalo – Construction	716/851-5864
	David Hehr	Buffalo School Attorney	716/856-5400
	Teresa Rizzone	National Fuel	716/857-7998
	Gerald Scott	National Fuel	716/857-7076
	Joe Poltorak	City of Buffalo – Traffic	716/851-5366
	Roger Vullo	Buffalo Sewer Authority	716/851-4664
	Joe Staats	S & E Engineering	716/633-9950
	Dennis Sutton	City of Buffalo	716/851-6587
	Kim Wendt	City of Buffalo – Street Lighting	716/847-4385
	Kevin Glaser	NYSDEC – Region 9	716/851-7220
	Ray Bednarski	Kideney Architects	716/636-9700
	Jim Rathmann	Kideney Architects	716/636-9700
	Ken Hapke	City of Buffalo – Division of Water	716/851-4767
	Dan Kreuz	City of Buffalo – Engineer	716/851-5631
	Vivek Nattanmai	NYSDEC - Albany	518/402-9812
	Don Miller	E & E	716/684-8060
	Shawn Gardner	E & E	716/684-8060

Note: Utility companies invited but not present include:
Niagara Mohawk
Verizon

V. Nattanmai began the discussion by providing background of the former Manufactured Gas Plant (MGP) site located in Buffalo adjacent to the Waterfront School (School #95). Soil and groundwater contamination consists of volatile organic compounds, poly aromatic hydrocarbons, and coal tars (dense non-aqueous phase liquid [DNAPL]). The Record of Decision is to perform complete excavation and backfill with clean material.

V. Nattanmai then described the phased approach of completing the excavation one area at a time while under a temporary structure to provide vapor and odor control. The structure would be moved to the next adjacent area after completion of the current area. During excavation activities, the importance of communication and coordination with utilities will become a key issue. When a utility is encountered, it is desirable to be able to contact a corresponding utility representative and have them on site to verify whether the utility is abandoned or active. It is hoped that a representative would be able to be on site quickly to prevent lengthy interruptions in the excavation activities. Nattanmai also identified that the school would be temporarily closed and students and activities relocated for a year beginning July 2005. He also identified that the plans were near completion other than the proposed reconfiguration of the parking area that is being redesigned by architects (Kideney) representing the school. This parking lot final design will dictate the final document dates. Bidding for the project is anticipated in February 2005.

S. Gardner then discussed the proposed excavation limits and impacted areas as shown on the handouts. He summarized the investigative work previously performed to identify the presence of utilities by visiting with Buffalo Sewer Authority and Division of Water to review plans showing locations of utilities. Gardner also emphasized that the sewer and water maps were very old and some information was difficult to confirm even after talking with department representatives. Gas, electric, and telephone utility location information was obtained from "Call-before-you-dig" contacts and subsequent coordination with utility representatives in the field. Prior to actual excavation, it is proposed to perform test pits in anticipated utility locations to identify the location and the characteristics of utilities. Gardner then restated the need for field coordination when utilities are encountered. Coordination will be important to confirm type of utility and whether the utility is abandoned or active. If the utility is determined to be abandoned, guidance from utility department representatives to decommission the utility will be requested. At the present time, the specifications require the Contractor to cut and remove abandoned utilities to the excavation limits. Sediment, liquids, etc. will be removed from the abandoned utility to the extent possible at the excavation limits and then plugged with grout or concrete.

Nattanmai asked if there are specific decommissioning procedures for utilities, that these be submitted for review and inclusion within the specifications.

K. Hapke asked what plans were in place to handle excavation around utilities to prevent any damage. He mentioned that the water lines (in particular the 48" line) have lead joints and have approximately 10-12 foot length sections. Water lines left unsupported by removal of soils or could cause damage to joints and interrupt service. Gardner explained that excavation around a utility would be dictated by the presence of contamination. If no contamination exists, soils around the utility will be left in place. The intention is to leave soils near utilities whenever possible. If not possible because of heavy contamination, soil will be removed evenly and additional shoring or support will be considered as necessary. Analytical results suggest that contamination around the utilities is low or non-existent and therefore removal may not be required. If excavation is required, coordination with utilities will be conducted.

Another consideration regarding protecting utilities is that the identified excavation is anticipated to reach the former Court Street area where the Swan Trunk exists; but elevated soil contamination was not found around the Swan Trunk, possibly because it's size has acted as a barrier to contaminant migration. The former Court Street is considered a utility corridor containing most of the utilities. Therefore, since contamination levels indicate that excavation may not be necessary in this area, this should reduce any interference with the existing utilities. However, shallow contamination was found on the other side of the Swan Trunk and therefore, it is expected that excavation will occur up to the Swan Trunk and then jump over the pipe to the shallow excavation area. Limiting excavation within and around the utility corridor should reduce any impact to the utilities.

R. Vullo asked if there was consideration of replacing damaged or unstable piping if findings warrant or if damaged during excavation. Nattanmai stated that when necessary, utilities would be reviewed for integrity and repaired if necessary. The responsibility will be placed on the contractor to ensure no utilities are damaged. Each situation will require review to determine responsibility and whether repairs are made and by whom. If lines are found to have been damaged before excavation activities, the responsible utility will be contacted and allowed to make the decision of replacing/repairing the damage at no expense to the Department.

J. Staats recommended removing abandoned pipes as excavation occurs to remove the uncertainty of pipes during future excavations/construction. Gardner stated that the intention is to remove all abandoned pipes. Existing pipes or utilities to remain in-place will be surveyed and included as part of the Record Drawings for future reference.

The opportunity to comment was then presented to each group that had not made comment to this point.

Kim Wendt – Stated no street lighting utilities or systems were anticipated within the areas.

Joe Poltorak – Did not anticipate any construction activities to involve City of Buffalo Traffic.

G. Scott – Stated they did not anticipate any concerns other than what was currently shown on the drawing. However, he was not certain the gas line continued north-west past the service line to the school, as shown on the drawing. Regardless, this is outside the excavation area for this project. He also stated that he may be able to obtain archived drawings showing possible abandoned line along former Court Street and anywhere else around the site. He will forward any findings to S. Gardner.

R. Vullo – Suggested contacting Buffalo Sewer Plant to make them aware of the project and the expectations of discharging to the local sewer lines of pre-treated groundwater. S. Gardner identified that Jim Overholdt, Jim Eagan, and Leslie Sedita have been contacted and have provided information and guidance for discharging to the local treatment plant. Obtained information has been integrated into the specifications for the project. This will be discussed further prior to the contract bidding phase. Discussion was then held regarding the existence of an actual sanitary sewer line as opposed to a combination storm/sewer line. Pre-treated water would probably not be allowed to be discharged to any line that may discharge directly to surface water. S. Gardner stated that this would be investigated further and that there is no intention of discharging pre-treated water to surface water without going through treatment at the plant first. Nattanmai stated that if anyone would like a copy of the design after it is final, NYSDEC would send it out. Vullo stated that he would like a copy.

J. Staats – Restated the importance of mapping existing utilities as excavation occurs to prevent future questions. This is particularly useful since current files are old. The contractor will be specified to perform mapping as Record Drawings are developed.

Regarding previous conversation about backfill material (clayey silts to replace current contaminated clayey silts, appropriately placed in lifts and verified compaction), Staats identified a flowable fill material that could be considered in place of soil material. This particular flowable fill was not the type of flowable fill that Gardner was aware of. Further research will be performed on this material (VSI GeoServices) to determine potential use at this site.

At the conclusion of the meeting, it was stated that a Pre-Construction meeting would be held with all utility owners and the contractor to cover the scope of work and obtain everyone’s agreement. This meeting is anticipated to occur in June 2005. All present agreed

Meeting ended approximately 11:30 am.

Action Items:

Utility representatives to submit specific decommissioning procedures for abandoned utilities.

These procedures will be reviewed for inclusion within the specifications.

G. Scott to review archived drawings for possible abandoned lines along former Court Street and anywhere else around the site. Forward any findings to S. Gardner or contact him to let him know information does not exist. (Note: G. Scott sent information to S. Gardner on November 11. This action item complete.)

Nattanmai to submit copy of the final design to R. Vullo.

Gardner to conduct research on flowable fill material (VSI GeoServices) to determine potential use at this site.

Schedule a Pre-Construction meeting with the utilities and the contractor to cover the scope of work and get everyone on board prior to construction, once the contractor is selected.

C

Preconstruction Meeting Minutes

Fourth Street Inactive Hazardous Waste Site
NYSDEC Site #9-15-167, Contract #D001597

Preconstruction Meeting Minutes
Wednesday, June 22, 2005

1. Mike Cruden of NYSDEC convened the meeting at approximately 9:00 a.m. Copies of the meeting agenda and a sign-in sheet were passed around the room.

2. Representatives and Responsibilities. Meeting attendees introduced themselves and stated their responsibilities to the project.

   Ecology & Environment Engineering, PC (EEEPC) and their subcontractor, Watt's Engineering, responsible for providing construction inspection and management services for the Department. M. Cruden responsible for resolving disputes between Contractor and Engineer. George Harris (NYSDEC) responsible for resolving disputes between Contractor and Department's project manager. Vincente Alfonso is responsible for determining Earth tech's compliance with the M/WBE requirements. All communication by Contractor is to go through Engineer (EEEPC).

3. Contract times and liquidated damages. NYSDEC granted Notice to Proceed on July 1, 2005. Substantial Completion date will be May 27, 2006 and Final Completion date will be June 26, 2006. Liquidated damages will be assessed in accordance with Article 6 of the Agreement.

4. Schedule (per Article 1 of the General Conditions) should provide first three months in detail, balance in summary form.

   > Department looking for Earth Tech to 1) accurately as possible estimate work 2 weeks into future, 2) provide reasonably accurate master schedule for the project to be updated as necessary, and 3) provide reasonable explanation for changes in schedule and outline proposed efforts to make up time (if necessary).

   Comprehensive up to date schedule is required for coordination. Progress Schedule must be maintained by Earth Tech. Schedule must be updated for discussion at biweekly progress meetings.

5. Article 5 of the General Conditions.
   - Keith Decker of Earth Tech stated that they will work 8 hours per day, 5 days per week. Actual working hours will be dependent on the activities scheduled for the day, but they will typically start each day at 7:00 a.m.
   - Earth Tech must submit a complete list of subcontractors (name, cost, M/WBE status, work to be performed, etc. per Specification Section 01041, Article 2.01) and a Uniform Contracting Questionnaire (UCQ) for each subcontract over $10,000. UCQs are not required for disposal facilities.

_ Earth Tech must maintain current Record Drawings onsite for review at all times.

_ Shop Drawings - Shop drawings must be reviewed and certified by Earth Tech prior to submission. For each shop drawing, Earth Tech must submit 1 copy to M. Cruden, 1 copy to Kevin Glaser (Region 9 NYSDEC) and 4 copies to EEEPC. M. Cruden will review shop drawings for completeness and to ensure that the shop drawing submission/review process is satisfactory. EEEPC will be responsible for technical review and has 14 days to perform their review. EEEPC is responsible for 2 reviews of each shop drawing. Any additional review time by EEEPC shall be at Earth Tech's expense.

_ Off-hours emergency contact - Keith Decker stated that off-hours phone numbers were included in the project work plan for all Earth Tech project personnel. Mike Chase, Earth Tech's site superintendent, will be the designated off-hours emergency contact. Earth Tech will have 24-hour security onsite.

_ Biweekly progress meetings - the first biweekly progress meeting will be held onsite on July 21, 2005 at 11:00 a.m.

6. Changes in the Work

_ M. Cruden directed attendees attention to Articles 9, 10 and 11 of the General Conditions of the Contract Documents.

_ Field Orders will be issued by EEEPC for direction or clarification of issues that do not involve any changes to contract cost or time.

_ Proposed Change Orders can be initiated by Contractor or NYSDEC for additional work that involves any changes to contract cost or time. All costs must be justified for using BlueBook rates or RSMeans cost data. Time and Materials work must be agreed to by Earth Tech and EEEPC in writing at the end of each work day.

_ Change Orders must be approved by the New York State Comptroller and may take 60 - 90 business days, similar to the construction contract.

7. Payment applications must be submitted on the NYS Division of Management and Budget payment application form. Change orders cannot appear on payment applications until approved by the Comptroller. Certified payrolls, progress schedule and record drawings must be up-to-date and onsite for inspection at all times.

8. Completion of Work

Substantial completion must be by May 27, 2006. However, when Earth Tech is complete, an inspection will be performed by EEEPC and a punch list generated for outstanding issues. Punch list items must be completed before final payment can be issued. Department will issue a satisfactory completion letter to Earth Tech.

9. Disputes

Claims (Article 15) - Department noted certification language and time constraints contractor must be aware of.

Contract (Appendix B) outlines steps taken to the Contract Review Committee and to resolve disputes.

10. M/WBE - EEO Requirements

Vincente Alfonso discussed M/WBE -EEO Requirements and M/WBE Utilization Plan. Keith Decker provided a draft M/WBE Utilization Plan. V. Alfonso stated that M/WBE utilization by subcontractors counts towards Earth Tech's M/WBE utilization goals. Earth Tech was provided a document which details minimum requirements for good faith efforts.

11. Project Plans

_ Shawn Gardner presented comments on Earth Tech's Health and Safety Plan, including:
   1. There are a few unsigned signoff sheets, (e.g. Spill Response Plan and some of Chemtech's revised analytical methods).
   2. Air Monitoring Plan table of contents do not match the text. Work Zone Air Monitoring section has been deleted from revised copy.
   3. Did not define FM in Section 9.1.5 of original (and revised) HASP.
   4. Health and Safety Technician has not been identified in Section 3.1.2 of Spill Response Plan. Earth Tech has not finalized the on-site Health and Safety Officer position yet, either.
   5. There are numerous references to Earth Tech's SOPs in the HASP. S. Gardner requested a copy of these for review. K. Decker will provide them on CD to S. Gardner.
   6. The break down of Attachment D, Health and Safety Plan Supplements, should be included within the HASP Table of Contents for easy reference.

_ S. Gardner noted that the number of structure moves has increased according to the most recent schedule submitted by Earth Tech and inquired if Earth Tech was comfortable with this. K. Decker and Will Lindheimer were comfortable with and said they agree with the revised schedule.

_ S. Gardner requested further explanation of Earth Tech method to load trucks. A discussion followed regarding Earth Tech's proposed method of loading trucks. Earth Tech's goal is to keep the trucks clean and maintain a clean worksite within the structure to avoid decontamination with the power washer. If trucks are soiled, they will be cleaned with the power washer. Trucks will typically be tarped outside of the structure due to the tarping mechanism of the trucks and the height restrictions within the structure. However, tarping inside the structure is preferred due to odor concerns. If odors become an issue as a result, other odor mitigation measures such as cover trucks in the structure, using plastic, bio-solve, or stopping activities, must be implemented. Any trucks that can be tarped inside will be.

_ S. Gardner had no further comments on the Work Plan.

12. Contractor's Activities over Next 2 Weeks

Will Lindheimer stated that Earth Tech will begin mobilizing next week. Surveyors will be onsite Monday, 6/27, to stake out excavation perimeter and boring locations. Geoprobe will be onsite 6/28 for 2-3 days. Earth Tech will perform work zone air monitoring with a PID during borings. Earth Tech will also install fencing. The first week in July Earth Tech will start installing trailers, scale and temporary utilities, begin to prepare the roadway, and begin mobilizing equipment, materials and the structure (i.e., the water treatment system, decontamination station, staging areas, etc.) The third week in July, Earth Tech will begin to erect the structure, which may take 2-3 weeks.

13. Open Discussion

_ M. Cruden stated that Governor Pataki is planning on visiting the adjacent National Fuel site as part of the Brownfields initiative on or about July 20, 2005 and may be at the Fourth St. site.

_ M. Cruden stated that any odor complaints should be shared with all concerned parties as soon as they occur or as soon as possible (NYSDEC - Albany, NYSDEC - Region 9, NYSDOH, EEEPC, Earth Tech) to minimize response time. Cameron O'Connor inquired when the baseline community air monitoring was to be performed. K. Decker stated that they will have to schedule it before intrusive work (i.e., test-pitting).

_ M. Cruden inquired whether the striking operators union would impact the project. K. Decker stated that they will be performing this work using their own personnel but do not anticipate any conflicts.

_ M. Cruden requested that Earth Tech provide the adjacent apartment complex manager with a CD of their final project plans. Earth Tech was directed to include the apartment complex manager in an upcoming utilities coordination meeting also. The apartment complex manager had some concerns with drains and storm sewers associated with the apartments that Earth Tech should resolve prior to excavation work.

_ M. Cruden inquired as to the status of the Carolina St. waiver from City of Buffalo Dept. of Public Works. S. Gardner stated that nothing has been received to date.

- Roger Vullo of the Buffalo Sewer Authority expressed concerns over excavations near the Swan Trunk. R. Vullo stated that it is an 8-foot diameter, combined flow brick sewer line built in 1882. Because of the age of the structure, excavation near it may cause significant damage. BSA will hold the Department solely responsible for any damage to the Swan Trunk. Frank DiMascio (sp?) is the principal engineer at the BSA and would like to see a detailed excavation plan with a description of means and methods and drawings for activities near the Swan Trunk. No vibratory rollers are to be used near the swan trunk. R. Vullo will act as the primary contact for matters relating to the BSA. The BSA offices are on the 10th floor of City Hall. Roger is willing to help and can provide information and drawings. John Kinney is the BSA's chief inspector and can also provide information. Roger stated that BSA has a number of ideas on how the work can be accomplished safely including minimizing the amount of exposed trunk at any one time. There is a concern that the excavated trunk can be at risk during a storm event from internal pressures - Earth Tech should account for this in its detailed plan (i.e., backfill prior to major storm events). K. Decker stated that Earth Tech has already submitted a temporary industrial discharge permit application to BSA.
- Dennis Sutton with the City of Buffalo requested 2 days notice before activities take place onsite. S. Gardner will provide D. Sutton notification of any activities.
- Ray Bednarski of Kideney Engineers stated that they will have a part-time inspector onsite during restoration work. Kideney has re-designed the site drainage and will forward the changes to NYSDEC and EEEPC.
- Don Miller stated that Earth Tech's work plan should be updated to include the compaction limitations being imposed by BSA for work over/near the Swan Trunk.

14. M. Cruden concluded the meeting by reviewing action items:

- EEEPC
    1. Prepare meeting minutes.
    2. Provide Earth Tech with AutoCAD drawings.
    3. Coordinate utilities meeting with Earth Tech and NYSDEC Region 9 (Glaser).

- Earth Tech
    1. Submit complete list of subcontractors and Uniform Contracting Questionnaire for all subcontractors over $10,000 to M. Cruden.
    2. Submit project schedule per article 1 of the General conditions to NYSDEC and EEEPC.
    3. Update all project plans, as necessary.
    4. Provide E&E, NYSDEC and BSA with an excavation plan for work near the Swan Trunk.
    5. Coordinate utilities meeting with EEEPC.

_ NYSDEC

1. Send electronic version of Payment Application to Earth Tech.
2. Vincente Alfonso will review M/WBE Utilization Plan and get back to Earth Tech. Mike Cruden and Shawn Gardner will be copied on all correspondence.

_ Kideney

1. Furnish revised drawings to DEC through EEEPC for review prior to issuing final to the DEC who will provide ET with copies

D

Swan Trunk Excavation Work Plan

RECEIVED
BY Amm DATE 7/22/05

Excavation Work Plan Around Swan Trunk Sewer Fourth Street MGP Site Buffalo, New York

Prepared For:

NYSDEC/Ecology & Environment

Prepared By:

Earth Tech, Inc.
40 British American Boulevard
Latham, New York 12110

July 21, 2005
Project No. 87025

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

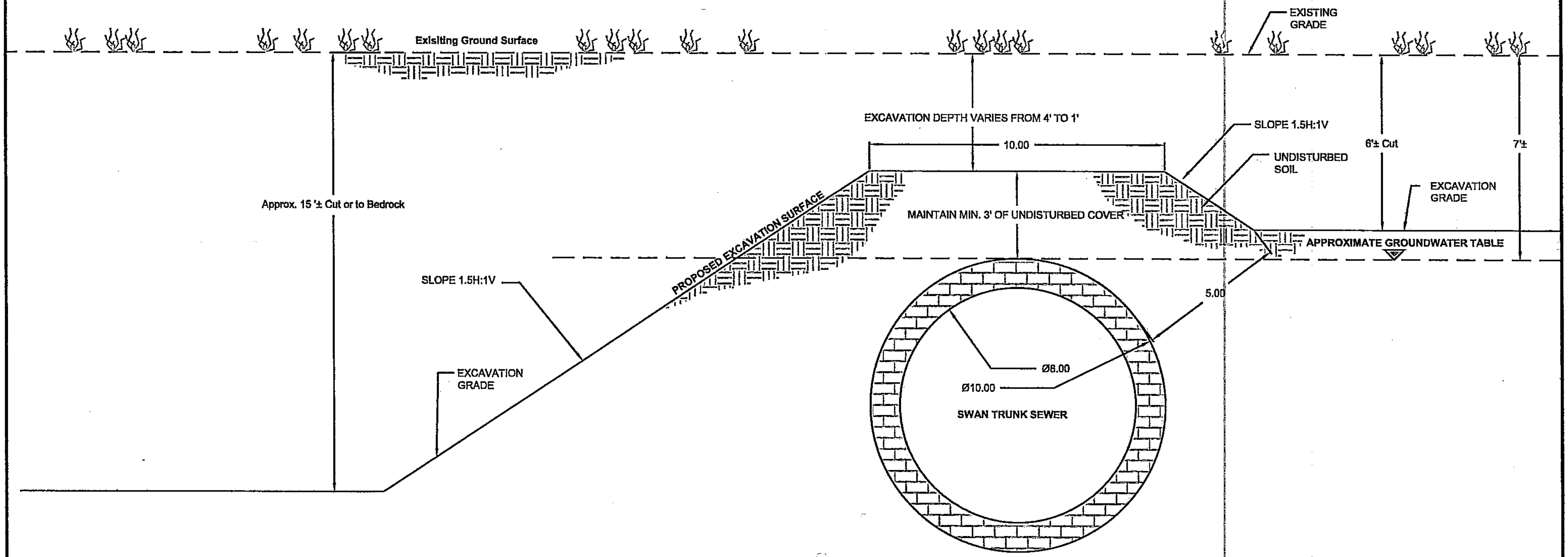
1.0 EXCAVATION PLAN AROUND UTILITY STRUCTURE(S)

Due to various constraints placed on the excavation of utilities at the site, Earth Tech has developed the attached in conjunction with the Buffalo Sewer Authority (BSA). There will be three different types of excavation that will occur along the alignment of the trunk sewer. The first excavation will involve the test pitting to determine the exact location and depth of the trunk sewer at three locations. These locations will be added to the base survey map and recorded on the as-built drawings. The intent of the excavations will be to provide the depth of soil cover over the top of the sewer and the potential soil contamination adjacent to the sewer. The excavations will be performed using either a small tracked excavator or a backhoe. The excavations will remain narrow and hand digging and probing will be performed near the sewer. Once encountered, the sewer excavation will proceed to either side of the sewer exposing only a small section. Once complete the exposed sewer will be covered with flowable fill and the remaining soil will be compacted using non-vibratory compaction.

The second type of excavation will be for installation of new utilities during restoration activities and as previously approved by BSA for Kideney Architects. These excavations will be similar to the test pits and will include shallow excavations and limited trenches required for drainage piping under the parking lot and construction of concrete curbing.

The third method will be for bulk excavation. The excavation methods during bulk soil removal will be performed as shown on the attached drawing. Due to concerns regarding the age of the sewer and the potential hydraulic pressures placed on the sewer the BSA would like to maintain three (3) feet of cover over the top of the sewer and to maintain a cover on the sides as the excavation slopes away from the sewer. Due to shallow groundwater it is important to maintain enough cover so that sloughing off of soil does not occur. The excavation will be performed with a CAT 330 or similar equipment. Earth Tech will set up designated crossings over the trunk sewer for the equipment and truck traffic in order to add additional protection. The crossings will include only areas with a minimum of three (3) feet of undisturbed soil cover This additional protection will include the placement of crane mats over the crossing areas for the CAT 330 and any overweight vehicles. The backfill operation will be performed in 6" lifts over and next to the sewer with a static roller.

CAD FILE NAME: L:\WORK\87025\CADD\Swan Trunk Sewer Excavation.dwg



NOTES:

1. MAINTAIN A MINIMUM OF 3' OF UNDISTRUBED SOIL AROUND THE SWAN TRUNK SEWER.

2. ONLY CROSS THE SWAN TRUNK SEWER WITH EQUIPMENT ON TIMBER CRANE MATS (APPROX 4' X 14') PLACED ON UNDISTURBED SOIL.

3. COMPACTION OF BACKFILL WILL BE CONDUCTED IN 6" LIFTS WITH STATIC ROLLING, NO VIBRATION.

4. NO TRUCK TRAFFIC OVER THE SEWER.

5. CROSS SECTION IN THE CONTRACT DRAWINGS DOES NOT SHOW THE ENTIRE EXCAVATION BEING PERFORMED TO BEDROCK. THIS CROSS SECTION ONLY INDICATES THAT APPROXIMATELY 20% OF THE EXCAVATION BOTTOM WILL BE TO BEDROCK.

Sectional View
Scale in Feet
0 2.5 5.0

EarthTech
A Tyco International Ltd. Company

FIGURE 1
NYSDEC
4th Street Remediation Project
BUFFALO, NEW YORK
July 2005 **Proposed Swan Trunk Sewer Excavation** 87025

E

Proposed Change Order No. 3

Proposed Change Order (PCO)

Project: Fourth St. Inactive Hazardous Waste Site

PCO No. 3

From: S. Gardner

To: Keith Decker, Project Director, Earth Tech
40 British American Drive, Latham, NY 12110

Date: 8/9/05

Site No. 9-15-167

Re: Installation of separation barrier between backfill/swan trunk

Contract No. D005197

This PCO is requested for the purpose of a potential change order on a specific item(s) in the project work from the Contract Documents. The PCO for review should be specific to the Contract Documents by indicating the location in the specifications or drawings where potential change is occurring.

Once the Contractor has knowledge of a potential PCO, it should be submitted within three days to the Site Representative with follow-up documentation (costs or time) due in 15 days. Provide adequate information for discussion and determination. All project PCOs submitted shall be consecutively numbered and will request a determination on only one issue.

If the Department and Contractor agree that the work is a change to the project scope, but cannot agree on price, the Contractor is still required to carry on with the work involved and adhere to the progress schedule. The Contractor has 30 days from issuance of Department response to submit a notice of intent to appeal. After that time the Department's position becomes final.

Specification Section: 02222 Backfill **Paragraph:** n/a **Drawing Ref.** n/a **Detail:** n/a

Description:

Provide all labor, equipment, and materials to install a separation barrier between the backfill and the soils left in place around the swan trunk. The separation barrier shall consist of orange snow fencing and shall be placed over the soils remaining in place around the swan trunk. The snow fencing shall butt end to end and continue the full length of the excavation over the swan trunk soils.

Costs:

Provide costs for labor, equipment and material with appropriate markups to perform the installation of the separation barrier.

Payment:

Payment will be a lump sum in accordance with Articles 9 and 13 of the General Conditions of the Contract Documents.

☐ **Attachments:** None

Accepted and Signed By:____________________ **Date:**__________

Not Accepted and Reasons for Non-Acceptance: ____________________

Date:__________

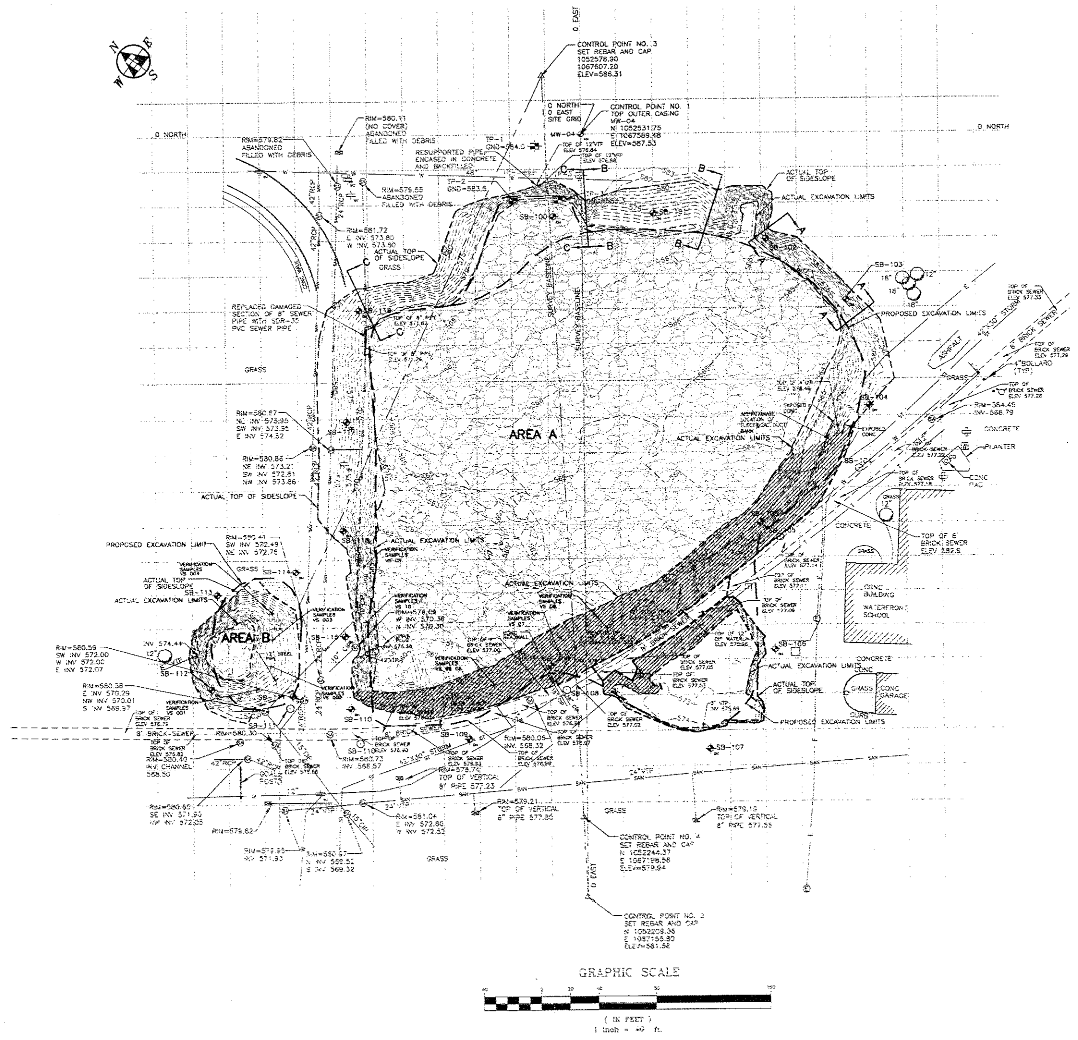
Copies: ☒ **M. Cruden - NYSDEC** ☒ **S. Gardner – E&E** ☒ **K. Decker - Earth Tech** ☒ **W. Lindheimer - Earth Tech**

F

As-built Drawing

PHASE	DATE	INITIALS
10		
20		
30		
40		
50		
60		
70		

FOR OFFICE USE ONLY



LEGEND:

▲	BENCHMARK
—— ℄ ——	CENTERLINE
○ CO	CLEANOUT
○	DECIDUOUS TREE
Ⓢ	DRAINAGE MANHOLE (STORM)
▭	DRAINAGE STRUCTURE (CATCH BASIN)
Ⓔ	ELECTRIC MANHOLE
—— E ——	ELECTRIC (UNDERGROUND)
— — — —	PROPOSED EXCAVATION LIMIT
- - - - - -	ACTUAL TOP OF SIDESLOPE
- - - - - -	ACTUAL EXCAVATION LIMITS
▽	FIRE HYDRANT
—— G ——	GASLINE (UNDERGROUND)
→	GAS LINE MARKER
⋈	GAS VALVE
△	HORIZONTAL CONTROL POINT
⊕	MONITORING WELL
☼	POLE w/LIGHT
—— SAN ——	SANITARY SEWER
Ⓢ	SEWER MANHOLE (SANITARY)
⊤⊤	SIGN 2 POSTS
⊤	SIGN
SB ⊕	SOIL BORE LOCATION (ACTUAL)
SB-110 ⊙	SOIL BORE LOCATION (PROPOSED)
+ 579.00	SPOT ELEVATION
—— ST ——	STORM SEWER
—— T ——	TELEPHONE (UNDERGROUND)
⊞	TEST PIT LOCATION (ACTUAL)
⊞	TEST PIT LOCATION (PROPOSED)
⊕	UNKNOWN UTILITY VALVE
—— W ——	WATERLINE (UNDERGROUND)
▣	WATER METER PIT
⊥	WATER VALVE
Ⓦ	WASTE CHARACTERIZATION POINT
░	APPROXIMATE UNEXCAVATED AREA
▒	BEDROCK
▨	ORANGE NOTIFICATION LAYER DENOTING POTENTIALLY IMPACTED MATERIAL LEFT IN PLACE

ABBREVIATIONS:

ASP	ASPHALT
CONC	CONCRETE
℄	CENTERLINE
CIP	CAST IRON PIPE
DIP	DUCTILE IRON PIPE
ELEV	ELEVATION
EP	EDGE OF PAVEMENT
GND	GROUND
HDPE	HIGH DENSITY POLYETHYLENE
INV	INVERT
RCP	INVERT
PVC	POLY-VINYL CHLORIDE
RCP	REINFORCED CONCRETE PIPE
RCMP	ROUND CORRIGATED METAL PIPE
ROW	RIGHT OF WAY
TYP	TYPICAL
VTP	VITRIFIED TILE PIPE

NOTES:

THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY AND RECORD INFORMATION. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. ALTHOUGH THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM RECORD INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.

ELEVATIONS ARE REFERENCED TO THE SITE VERTICAL DATUM AS SHOWN ON A MAP PREPARED BY 'ECOLOGY AND ENVIRONMENT ENGINEERING, P.C.' ENTITLED "FOURTH STREET REMEDIATION PROJECT", SHEET 4 OF 5, DATED 2-11-05.

COORDINATES ARE REFERENCED TO THE NEW YORK STATE PLANE COORDINATE SYSTEM WEST ZONE - NAD83/96 HORIZONTAL DATUM.

UNAUTHORIZED ALTERATION OR ADDITION TO ANY SURVEY, DRAWING, DESIGN, SPECIFICATION, PLAN OR REPORT IS A VIOLATION OF SECTION 7209, PROVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

PHONE LINE WAS PREVIOUSLY ABANDONED. ALL OTHER ABANDONED UTILITIES BY EARTH TECH.

VOLUMES

11-02-05

CUMULATIVE TOTAL VOLUME OF EXCAVATED MATERIAL IN AREA 'A'	35,276 CY
RELOCATED SIDESLOPE VOLUME A-A	442 CY
RELOCATED SIDESLOPE VOLUME B-B	919 CY

12-02-05

CUMULATIVE TOTAL VOLUME OF EXCAVATED MATERIAL IN AREA 'A'	53,725 CY
CUMULATIVE TOTAL VOLUME OF EXCAVATED MATERIAL IN AREA 'B'	1,864 CY

1-09-06

CUMULATIVE TOTAL VOLUME OF EXCAVATED MATERIAL IN AREA 'A'	57,260 CY
CUMULATIVE TOTAL VOLUME OF EXCAVATED MATERIAL IN AREA 'B'	1,864 CY
RELOCATED SIDESLOPE VOLUME C-C	955 CY

TOTAL VOLUME OF EXCAVATED MATERIAL (INCLUDING RELOCATED SIDESLOPE SOILS)	59,124 CY
TOTAL VOLUME OF RELOCATED SIDESLOPE SOILS	2,327 CY

△11	REVISED AREA & VOLUME 03-24-06 MJP
△10	REVISED PER COMMENTS 01-25-06 TJM
△9	REVISED PER COMMENTS 01-06-06 TJM
△8	REVISED PER COMMENTS 01-16-06 TJM
△7	REVISED PER COMMENTS 01-13-06 TJM
△6	UPDATED 01-09-06 TJM
△5	UPDATED 12-02-05 TJM

Consultant:

Earth Tech - Remediation Services
40 British American Blvd.
Latham, NY 12110
Phone: 518-951-2200
Fax: 518-951-2300

FOIT-ALBERT ASSOCIATES
Architecture, Engineering and Surveying, P.C.
763 Main Street
Buffalo, New York 14203
Phone: (716) 856-3933
Fax: (716) 856-3961

EXCAVATION AS-BUILT SURVEY

FOURTH STREET REMEDIATION PROJECT
NYDEC SITE NUMBER: 9-15-167
CONTRACT NUMBER: D005197
CITY OF BUFFALO, COUNTY OF ERIE, STATE OF NEW YORK

RECEIVED

Seal:
MICHAEL JOSEPH
LICENSED LAND SURVEYOR

Revision Number	Revision Date
△1	ADDED HOLDING TANKS 9-13-05 TJM
△2	ADDED TOP SEWER ELEV 9-14-05 TJM
△3	UPDATED 10-21-05 TJM
△4	UPDATED 11-02-05 TJM

Scale: 1"=40'

Date: 8-23-05	Project Manager: M. POHL
Drawn By: T. MOORE	Checked By: M. POHL

Project: 05033.00
File Name: EXCAVATION-AS-BUILT.DWG

Sheet: TS101

G

Verification Sampling Data

CHEMTECH
284 Sheffield Street, Mountainside, NJ 07092 (908) 789-8900 Fax: (908) 789-8922 www.chemtech.net

SDEC 95 Fourth Street Inactive Hazardous Waste Site
Site #9-15-167
Contract #D005197
City of Buffalo
Erie County

Post Excavation Verification Results

Sample ID		Partition Coefficient, Koc	Groundwater Standards/ Criteria, Cw (ug/l or ppb)	a Allowable soil conc., Cs (ppm)	b ** Soil cleanup objectives to protect GW quality (ppm)	USEPA Health Based (ppm) Carcin-ogens	USEPA Health Based (ppm) Systemic Toxicants	CRQL (ppb)	*** Rec. Soil Cleanup Objective (ppm)	V.S.-001	V.S.-002	V.S.-003	V.S.-003RE	V.S.-004	V.S.-004DL	V.S.-005	VS-006	VS-006RE	VS-007	VS-007RE	VS-008	VS-008DL
Lab Sample Number										T5851-01	T5851-02	T5851-03	T5851-03RE	T5851-04	T5851-04DL	T5851-05	T6054-01	T6054-01RE	T6054-02	T6054-02RE	T6054-03	T6054-03DL
Sampling Date										11/21/05	11/21/05	11/21/05	11/21/05	11/21/05	11/21/05	11/21/05	12/07/05	12/07/05	12/07/05	12/07/05	12/07/05	12/07/05
Matrix										SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Dilution Factor										1.0	1.0	1.0	5.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0	5.0	1.0
Units										mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
COMPOUND	CAS #																					
Benzene	71-43-2	83	0.7	0.0006	0.06	24	N/A	5	0.06	0.01 J	0.0021 J	0.023	0.053 JD	2.9 E	0.058 D	0.0017 U	0.037	0.027	0.028 U	0.028 U	14 E	2 D
Toluene	108-88-3	300	5	0.015	1.5	N/A	20000	5	1.5	0.0011 J	0.0019 U	0.00092 J	0.077 U	0.033	0.0038 JD	0.0019 U	0.0057 J	0.0033 J	0.002 J	0.028 U	0.45	1.7 U
Ethyl Benzene	100-41-4	1100	5	0.055	5.5	N/A	8000	5	5.5	0.017	0.11	0.07	0.18 D	0.7 E	0.24 D	0.0017 J	0.0042 J	0.0034 J	0.028 U	0.028 U	18 E	8.1 D
m/p-Xylenes	126777-61-2	240	5	0.012	1.2	N/A	200000	--	1.2	0.018	0.1	0.11	0.29 D	1.3 E	0.46 D	0.0029 J	0.0024 J	0.0018 J	0.0019 J	0.028 U	11 E	11 D
o-Xylene	95-47-6	240	5	0.012	1.2	N/A	200000	--	1.2	0.007 J	0.16	0.27	0.38 D	0.44 E	0.17 D	0.0018 U	0.022 U	0.022 U	0.028 U	0.028 U	11 E	5.1 D
Total Confident Conc. VOC										0.0531	0.3721	0.47392	0.903	5.373	0.9318	0.0046	0.0493	0.0355	0.0039	0	54.45	26.2
Total TICs										0	0	0	0	0	0	0	0	0	0	0	0	0

Sample ID		Partition Coefficient, Koc	Groundwater Standards/ Criteria, Cw (ug/l or ppb)	a Allowable soil conc., Cs (ppm)	b ** Soil cleanup objectives to protect GW quality (ppm)	USEPA Health Based (ppm) Carcin-ogens	USEPA Health Based (ppm) Systemic Toxicants	CRQL (ppb)	*** Rec. Soil Cleanup Objective (ppm)	V.S.-001	V.S.-002	V.S.-003	V.S.-004	V.S.-005	VS-006	VS-006DL	VS-007	VS-008	VS-008DL
Lab Sample Number										T5851-01	T5851-02	T5851-03	T5851-04	T5851-05	T6054-01	T6054-01DL	T6054-02	T6054-03	T6054-03DL
Sampling Date										11/21/05	11/21/05	11/21/05	11/21/05	11/21/05	12/07/05	12/07/05	12/07/05	12/07/05	12/07/05
Matrix										SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Dilution Factor										2.0	1.0	1.0	1.0	1.0	1.0	5.0	1.0	1.0	10.0
Units										mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
COMPOUND	CAS #																		
Phenol	108-95-2	27	1	0.0003	0.03	N/A	50000	330	0.03 or MDL	0.13 J	0.1 J	0.5 U	0.47 U	0.55 U	0.73 U	3.7 UD	0.91 U	0.19 J	4.4 UD
Naphthalene	91-20-3	1300	10	0.13	13	N/A	300	330	13	0.72 J	0.084 J	0.18 J	0.065 J	0.36 J	1.7	1.1 JD	0.91 U	9.4 E	18 D
Acenaphthylene	208-96-8	2,056 *	20	0.41	41	N/A	N/A	330	41	1.1 U	0.56 U	0.5 U	0.47 U	0.55 U	0.89	0.51 JD	0.91 U	0.29 J	4.4 UD
Acenaphthene	83-32-9	4600	20	0.9	90	N/A	5000	330	50.0 ***	0.81 J	0.12 J	0.5 U	0.47 U	0.06 J	0.61 J	3.7 UD	0.91 U	2.4	1.7 JD
Fluorene	86-73-7	7300	50	3.5	350	N/A	3000	330	50.0 ***	0.93 J	0.17 J	0.057 J	0.47 U	0.085 J	0.59 J	3.7 UD	0.91 U	1.6	1.1 JD
Phenanthrene	85-01-8	4,365 *	50	2.2	220	N/A	N/A	330	50.0 ***	5.7	0.87	0.55	0.24 J	0.92	2	1.2 JD	0.91 U	4.7 E	4.4 D
Anthracene	120-12-7	14000	50	7	700	N/A	20000	330	50.0 ***	1.7	0.39 J	0.14 J	0.064 J	0.18 J	1.1	0.65 JD	0.91 U	1.7	1.2 JD
Fluoranthene	206-44-0	38000	50	19	1900	N/A	3000	330	50.0 ***	4.3	0.76	0.61	0.37 J	0.94	4.3	2.8 JD	0.91 U	2	1.5 JD
Pyrene	129-00-0	13,295 *	50	6.65	665	N/A	2000	330	50.0 ***	3.2	0.69	0.47 J	0.28 J	0.72	6.9 E	6.1 D	0.91 U	3	2.6 JD
Benzo(a)anthracene	56-55-3	1380000	0.002	0.03	3	0.224	N/A	330	0.224 or MDL	2.2	0.63	0.32 J	0.17 J	0.38 J	3.2	1.9 JD	0.91 U	1.3	0.87 JD
Chrysene	218-01-9	200000	0.002	0.004	0.4	N/A	N/A	330	0.4	2.2	0.61	0.33 J	0.18 J	0.38 J	3.1	2 JD	0.91 U	1.2	0.78 JD
Benzo(b)fluoranthene	205-99-2	550000	0.002	0.011	1.1	N/A	N/A	330	1.1	2.1	0.65	0.35 J	0.2 J	0.38 J	3.6	2.1 JD	0.91 U	0.87	0.62 JD
Benzo(k)fluoranthene	207-08-9	550000	0.002	0.011	1.1	N/A	N/A	330	1.1	0.93 J	0.19 J	0.14 J	0.07 J	0.15 J	0.74	0.7 JD	0.91 U	0.31 J	4.4 UD
Benzo(a)pyrene	50-32-8	5500000	0.002 (ND)	0.11	11	0.0609	N/A	330	0.061 or MDL	1.9	0.58	0.29 J	0.15 J	0.3 J	4.5	2.8 JD	0.91 U	1.3	0.86 JD
Indeno(1,2,3-cd)pyrene	193-39-5	1600000	0.002	0.032	3.2	N/A	N/A	330	3.2	0.82 J	0.23 J	0.16 J	0.077 J	0.13 J	2.1	1.5 JD	0.91 U	0.52	4.4 UD
Dibenz(a,h)anthracene	53-70-3	33000000	50	1650	165000	0.0143	N/A	330	0.014 or MDL	1.1 U	0.062 J	0.5 U	0.47 U	0.55 U	0.27 J	3.7 UD	0.91 U	0.17 J	4.4 UD
Benzo(g,h,i)perylene	191-24-2	1600000	5	8	800	N/A	N/A	330	50.0 ***	0.55 J	0.18 J	0.13 J	0.064 J	0.11 J	2.9	1.9 JD	0.91 U	0.78	0.49 JD
Total Confident Conc. SVOC										28.19	6.316	3.727	1.93	5.095	38.5	25.26	0	31.73	34.12
Total TICs										0	0	0	0	0	0	0	0	0	0

Qualifiers

a	Allowable Soil Concentration Cs = f x Cw x Koc
b	Soil Cleanup Objective = Cs x Correction Factor (CF)
N/A	Not available
MDL	Method Detection Limit
*	Partition coefficient is calculated by using the following equation: log Koc =-0.55 log S + 3.64, where S is solubility in water in ppm.
	Other Koc values are experimental values.
**	Correction Factor (CF) of 100 is used as per TAGM #4046
***	As per TAGM #4046, Total VOCs < 10 ppm., Total Semi-VOCs < 500ppm. and Individual Semi-VOCs < 50 ppm.
****	Koc is derived from the correlation Koc = 0.63 Kow (Determining Soil Response Action Levels......

CHEMTECH

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SDEC 95 Fourth Street Inactive Hazardous Waste Site
Site #9-15-167
Contract #D005197
City of Buffalo
Erie County

Post Excavation Verification Results

Sample ID				a	b **	USEPA Health Based (ppm)			***	VS-009	VS-009RE	VS-0010	VS-0010RE	CATCHBASIN VERIFICATION SAMPLE EAST01	CATCHBASIN VERIFICATION SAMPLE EAST01RE	CATCHBASIN VERIFICATION SAMPLE WEST02	CATCHBASIN VERIFICATION SAMPLE WEST02RE
Lab Sample Number		Partition Coefficient, Koc	Groundwater Standards/ Criteria, Cw (ug/l or ppb)	Allowable soil conc., Cs (ppm)	Soil cleanup objectives to protect GW quality (ppm)	Carcinogens	Systemic Toxicants	CRQL (ppb)	Rec. Soil Cleanup Objective (ppm)	T6080-01	T6080-01RE	X1101-01	X1101-01RE	X1340-01	X1340-01RE	X1340-02	X1340-02RE
Sampling Date										12/08/05	12/08/05	01/09/06	01/09/06	01/23/06	01/23/06	01/23/06	01/23/06
Matrix										SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Dilution Factor										1.0	10.0	1.0	1.0	1.0	2.0	1.0	1.0
Units										mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	ug/Kg	mg/Kg	mg/Kg
COMPOUND	CAS #																
Benzene	71-43-2	83	0.7	0.0006	0.06	24	N/A	5	0.06	0.057	0.036 J	0.042	0.039	0.012 U	0.023 U	0.014 U	0.014 U
Toluene	108-88-3	300	5	0.015	1.5	N/A	20000	5	1.5	0.0047 J	0.13 U	0.0016 J	0.002 J	0.012 U	0.023 U	0.014 U	0.014 U
Ethyl Benzene	100-41-4	1100	5	0.055	5.5	N/A	8000	5	5.5	0.095	0.021 J	0.0052 J	0.004 J	0.012 U	0.023 U	0.014 U	0.014 U
m/p-Xylenes	126777-61-2	240	5	0.012	1.2	N/A	200000	--	1.2	0.059	0.019 J	0.03	0.019	0.012 U	0.023 U	0.014 U	0.014 U
o-Xylene	95-47-6	240	5	0.012	1.2	N/A	200000	--	1.2	0.037	0.039 J	0.036	0.025	0.012 U	0.023 U	0.014 U	0.014 U
Total Confident Conc. VOC										0.2527	0.115	0.1148	0.089	0	0	0	0
Total TICs										0	0	0	0	0	0	0	0

Sample ID				a	b **	USEPA Health Based (ppm)			***	VS-009	VS-0010	CATCHBASIN VERIFICATION SAMPLE EAST01	CATCHBASIN VERIFICATION SAMPLE WEST02	CATCHBASIN VERIFICATION SAMPLE WEST02RE
Lab Sample Number		Partition Coefficient, Koc	Groundwater Standards/ Criteria, Cw (ug/l or ppb)	Allowable soil conc., Cs (ppm)	Soil cleanup objectives to protect GW quality (ppm)	Carcinogens	Systemic Toxicants	CRQL (ppb)	Rec. Soil Cleanup Objective (ppm)	T6080-01	X1101-01	X1340-01	X1340-02	X1340-02RE
Sampling Date										12/08/05	01/09/06	01/23/06	01/23/06	01/23/06
Matrix										SOIL	SOIL	SOIL	SOIL	SOIL
Dilution Factor										1.0	1.0	1.0	1.0	1
Units										mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
COMPOUND	CAS #													
Phenol	108-95-2	27	1	0.0003	0.03	N/A	50000	330	0.03 or MDL	0.42 U	0.41 U	0.38 U	0.48 U	0.48 U
Naphthalene	91-20-3	1300	10	0.13	13	N/A	300	330	13	3.1	1.7	0.38 U	0.1 J	0.1 J
Acenaphthylene	208-96-8	2,056 *	20	0.41	41	N/A	N/A	330	41	0.1 J	0.052 J	0.38 U	0.13 J	0.48 U
Acenaphthene	83-32-9	4600	20	0.9	90	N/A	5000	330	50.0 ***	0.53	0.63	0.38 U	0.48 U	0.23 J
Fluorene	86-73-7	7300	50	3.5	350	N/A	3000	330	50.0 ***	0.39 J	0.23 J	0.38 U	0.25 J	0.2 J
Phenanthrene	85-01-8	4,365 *	50	2.2	220	N/A	N/A	330	50.0 ***	1.6	0.49	0.23 J	2.2	2.2
Anthracene	120-12-7	14000	50	7	700	N/A	20000	330	50.0 ***	0.45	0.15 J	0.08 J	0.52	0.45 J
Fluoranthene	206-44-0	38000	50	19	1900	N/A	3000	330	50.0 ***	0.98	0.34 J	0.41	3.6	2.6
Pyrene	129-00-0	13,295 *	50	6.65	665	N/A	2000	330	50.0 ***	1.3	0.51	0.37 J	2.2	2.6
Benzo(a)anthracene	56-55-3	1380000	0.002	0.03	3	0.224	N/A	330	0.224 or MDL	0.61	0.21 J	0.26 J	1.6	1.6
Chrysene	218-01-9	200000	0.002	0.004	0.4	N/A	N/A	330	0.4	0.59	0.21 J	0.23 J	1.5	1.5
Benzo(b)fluoranthene	205-99-2	550000	0.002	0.011	1.1	N/A	N/A	330	1.1	0.75	0.25 J	0.25 J	1.8	2
Benzo(k)fluoranthene	207-08-9	550000	0.002	0.011	1.1	N/A	N/A	330	1.1	0.23 J	0.075 J	0.11 J	0.59	0.55
Benzo(a)pyrene	50-32-8	5500000	0.002 (ND)	0.11	11	0.0609	N/A	330	0.061 or MDL	0.64	0.25 J	0.21 J	1.4	1.4
Indeno(1,2,3-cd)pyrene	193-39-5	1600000	0.002	0.032	3.2	N/A	N/A	330	3.2	0.36 J	0.17 J	0.1 J	1.5	1.2
Dibenz(a,h)anthracene	53-70-3	33000000	50	1650	165000	0.0143	N/A	330	0.014 or MDL	0.42 U	0.042 J	0.38 U	0.3 J	0.1 J
Benzo(g,h,i)perylene	191-24-2	1600000	5	8	800	N/A	N/A	330	50.0 ***	0.3 J	0.13 J	0.051 J	0.44 J	0.35 J
Total Confident Conc. SVOC										11.93	5.439	2.301	18.13	17.08
Total TICs										0	0	0	0	0

Qualifiers

a Allowable Soil Concentration Cs = f x Cw x Koc

b Soil Cleanup Objective = Cs x Correction Factor (CF)

N/A Not available

MDL Method Detection Limit

* Partition coefficient is calculated by using the following equation: log Koc =-0.55 log S + 3.64, where S is solubility in water in ppm.
Other Koc values are experimental values.

** Correction Factor (CF) of 100 is used as per TAGM #4046

*** As per TAGM #4046, Total VOCs < 10 ppm., Total Semi-VOCs < 500ppm. and Individual Semi-VOCs < 50 ppm.

**** Koc is derived from the correlation Koc = 0.63 Kow (Determining Soil Response Action Levels......

E

Selected Pages from NYSDEC Sampling Guidance

SAMPLING GUIDELINES AND PROTOCOLS

Technological Background and Quality Control/Quality Assurance For NYS DEC Spill Response Program

Preparer : Simon Wu

Project Manager : Tom McClane

Section Chief : Tom Plesnarski

Bureau Director : Tom Quinn

BUREAU OF SPILL PREVENTION AND RESPONSE

DIVISION OF WATER

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

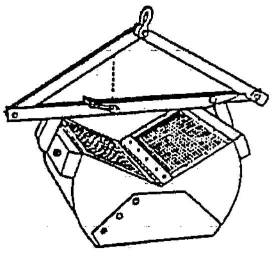
MARCH 1991.

The sample can be trowled out of the cup, or a plastic cup liner can be used for allowing the sample to fall directly into the the cup liner and be removed. The unit may be washed with a solvent or cleaned with steam to decontaminate it.

3.2.8 Bottom Sampling Dredge or Ponar Grab for Sludges or Sediments

This device (Figure 3-8) is a clamshell type scoop activated by a counter lever system. The shell is opened, latched in place and slowly lowered to the bottom. When tension is released on the lowering cable, the latch releases and the lifting action of the cable on the lever system closes the clamshell. This grab type dredge is capable of sampling most types of sludges and sediments from silts to granular materials. The drawbacks for the system are that it cannot penetrate more than several centimeters and can not collect undisturbed samples.

Figure 3-8 Ponar Grab for Sludges



3.3 EQUIPMENT FOR LIQUID MATERIAL AND WATER SAMPLING

Liquids include both aqueous and nonaqueous solutions, and are subdivided as surface waters, containerized liquids, and groundwaters. Containerized liquids can be any size of sealed and unsealed containers varying from drums to large tanks. To meet a variety of situations, one should be familiar with the available tools to make a job easier and to assure the job is done properly.

3.3.1 Dipper or Pond Sampler for Surface Water

The dipper (Figure 3-9) consists of a glass or plastic beaker clamped to the end of a two or three piece telescopic aluminum or fiberglass pole that serves as the handle. Sometimes, instead of the beaker, a sample container itself can be strapped to the clamp directly. This is particularly good for analyses of volatile organics.

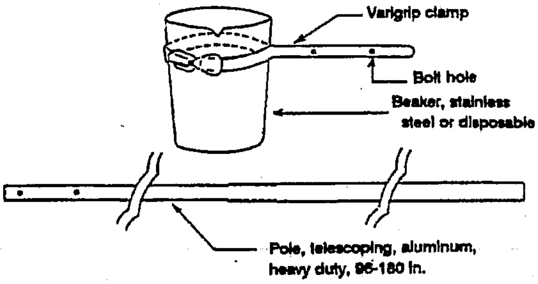
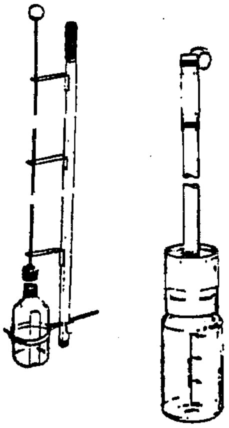


Figure 3-9 Dipper/Pond Sampler

3.3.2 Extended Bottle Sampler for Surface Water

Figure 3-10 Bottle Sampler



These bottle samplers (Figure 3-10) consist of a 6 foot long metal tube or reinforced plastic holder and a sample container. One of the designs is a stainless steel clamp that is attached to the end of the tube and can be adjusted to hold a sample jar of desired size. The jar cap can be remotely removed and replaced while the bottle is submerged by turning the handle grip rod, which is attached to the cap by means of a screw clamp or a suction cup. In the second design, the sample bottle is screwed onto the sampling head, and the sampler lowered to the desired sampling location and depth. The ring at the top is then pulled, opening the spring-loaded plunger in the head assembly and allowing liquid to flow in. When the bottle is observed to be full, the ring is released to stop liquid flow.

Since the sampler is exposed to the sampled medium, it must be decontaminated before shipment or reuse.

3.3.3 Weighted Bottle or Bacon Bomb Sampler for Surface or Well Water

The weighted Bottle Sampler (Fig.3-11, Right) consists of a glass or plastic bottle, sinker, stopper, and a line that is used to lower, raise, and open the bottle to sample liquid or free-flowing slurries. The bomb sampler (Figure 3-11 left) uses the same principle as the weighted bottle sampler. It consists of a cylindrical chamber, a line, and a removable cover. The cylindrical chamber has an internal tapered plunger that acts as a valve to admit the sample. The line attached to the top of the plunger is used to open and close the valve. The removable cover provides a point of attachment for the sample line and has a locking mechanism to keep the plunger closed after sampling. These samplers are suited for collecting viscous materials or water in storage tanks, tank cars, ponds, lagoons and wells at different depths. The material used to construct these samplers are brass, bronze, and stainless steel.

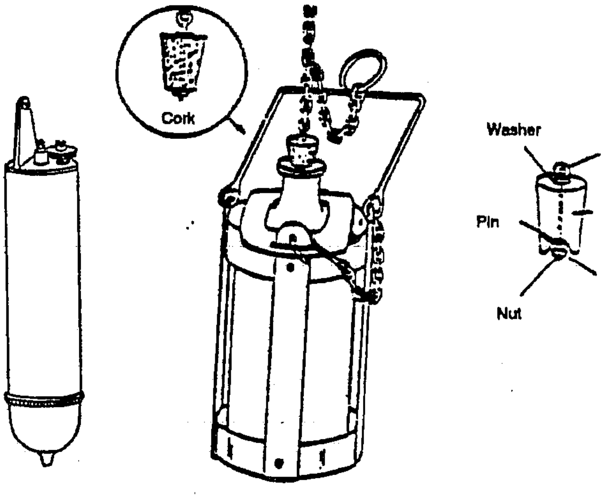
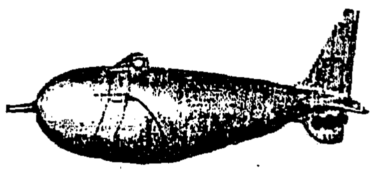


Figure 3-11 Weighted Bottle(right)/Bacon Bomb(left)Sampler

3.3.4 Suspended-Sediment Sampler for Surface Water in River or Stream

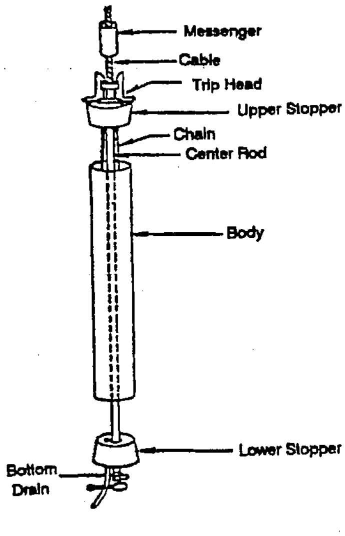
Figure 3-12 Suspended-Sediment Sampler



This sampler (Figure 3-12) contains glass or plastic sample bottle sealed in the sampler head, an intake nozzle oriented upstream for filling, and a rear port for air to escape. It samples at the vertical points of river or stream cross-sections and can continue to take its sample throughout the time of submergence, or start and stop the sampling process by an electrically operated valve in the sampler head.

3.3.5 Kemmerer Sampler for Surface and Subsurface Water

Figure 3-13 Kemmerer Sampler

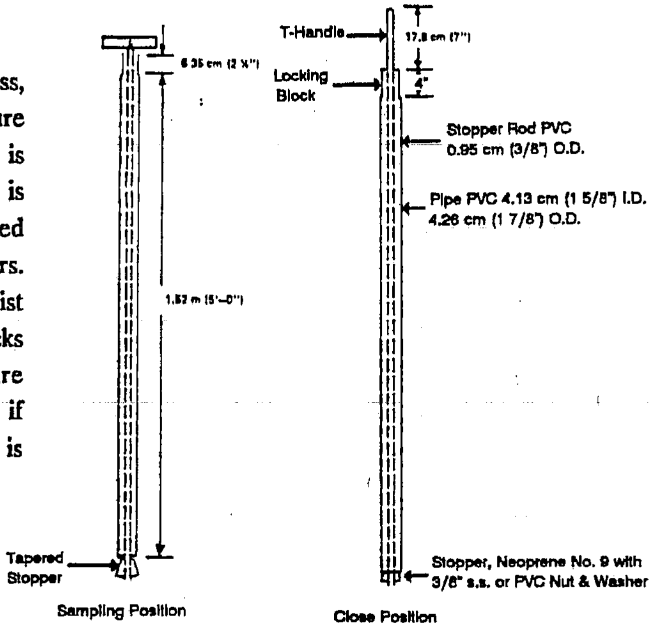


The Kemmerer sampler (Figure 3-13) is a mechanically operated depth-specific sampler. It consists of a short length of tubing and each end is fitted with a spring activated rubber stopper. End stoppers are locked open before lowering the unit into the water. When the sampler reaches the desired depth, the operator activates the spring mechanism by dropping down the messenger, and the rubber stoppers are pushed against each end of the tube, thereby entrapping the liquid sample. This sampler is very practical for collecting discrete, at-depth samples from surface water or vessels where the collection depth exceeds the lifting capacity of pumps. Samples may be obtained by using the Kemmerer sampler for depths up to 300 feet. Use of the rubber stopper and spring assembly could cause bias in the analysis of trace organics and metal constituents of the sample. Selection of other assemblies, i.e. all metal for organic analysis or all plastic for trace element analysis, will avoid this problem.

3.3.6 Composite Liquid Waste Sampler (COLIWASA) for Liquids and Slurries

The COLIWASA (Figure 3-14) consists of a glass, plastic, or metal tube equipped with an end closure that can be opened and closed while the tube is submerged in the material to be sampled. It is primarily used to sample liquids and slurries contained in drums, shallow tanks, pits, and similar containers. It is especially useful for sampling wastes that consist of several immiscible liquid phases. The drawbacks associated with using a COLIWASA are decontamination and cost. The sampler is difficult, if not impossible, to decontaminate in the field, and it is a high cost apparatus.

Figure 3-14 Composite Liquid Waste Sampler (COLIWASA)



3.3.7 Bailers for Surface Water and Groundwater

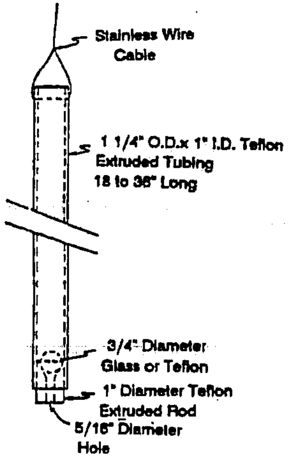


Figure 3-15 Teflon Bailer

The bailer (Figure 3-15) consists of a length of tube fitted at the bottom end with a check valve that allows liquid to flow into the tube as it is lowered into the liquid, and keeps the liquid from flowing out as the tube is brought back to the surface. Other bailers, referred to as "point source" bailers, also have a check valve at the top, which reduces the possibility of mixing the liquid sample with the liquid contained in the installation while the bailer is withdrawn. The advantages of the bailer are: 1) simple construction and economical; 2) available in a wide variety of structural materials; and 3) with minimal sample disturbance if handled carefully. Their disadvantages are: 1) aeration during transferring from bailer to sample bottle; 2) inability to collect discrete samples; 3) inefficiency with deep water table; and 4) cross-contamination from an inadequately cleaned bailer and its rope or cable.

3.3.8 Suction Lift Pumps for Liquids or Water

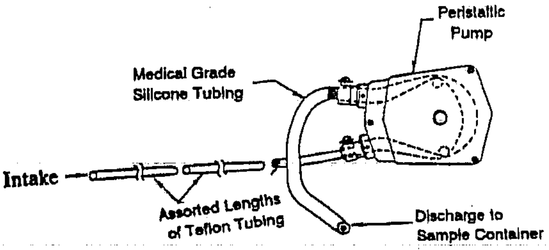
As the name implies, suction pumps are operated, generally in a low volume, by a partial vacuum in a sampling tube. The vacuum allows the pressure exerted by the atmosphere on the water in the well to force water up the tube to the surface. Because of this, the practical limit of suction lift is approximately 25 feet. In addition, these pumps may result in degassing and volatilization caused by the negative pressure that is applied, and atmospheric contamination at the surface. In spite of these drawbacks, suction pumps are readily available, relatively portable, and inexpensive. Two types of suction lift pumps are introduced below.

3.3.8.1 Non-Submersible Centrifugal Pumps--In the centrifugal pump, the fluid is displaced by the action of an impeller rotating inside the pump chamber. This discharges water by centrifugal force. The resulting pressure drop in the chamber creates a suction and causes water to enter the intake pipe or tube in the well.

These pumps can provide substantial yields, and are readily available and inexpensive.

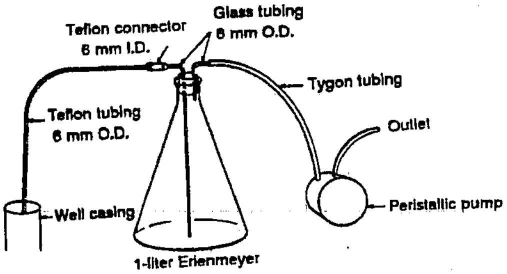
The disadvantages are that they require a foot or check valve on the end of the suction pipe to aid in maintaining a prime and may be difficult to clean between sampling events. In addition, the materials with which these pumps are constructed may frequently be incompatible with certain sample constituents.

Figure 3-16 Peristaltic Pump



3.3.8.2 Peristaltic Pumps (Figure 3-16)--The major components of this apparatus are the peristaltic pump, which consists of a rotor and several ball bearing rollers within a pump head, and a flexible tubing. The peristaltic pump can be battery operated and portable for a wide range of applications in the field. Since it works by squeezing the flexible tubing which creates a vacuum and draws the water sample through the intake line, the only contact between the pump and sample is the tubing. The tubing can be easily changed to avoid cross-contamination. In addition, these pumps sample with little agitation.

Figure 3-17 System for Grab Sampling for organics from a monitoring well



The disadvantages are: 1) low pumping rates make it difficult to evacuate the well bore in a reasonable amount of time, 2) the choice of appropriate materials for flexible tubing is restrictive. Also the commonly used silicone tubing has a propensity for absorbing many organic compounds and inert flexible tubing is not flexible enough to be used in these pumps. An alternative sampling arrangement, suggested by Scalf et al. (1981) as a method for sampling for organic contaminants, utilizes a peristaltic pump and a two-way stoppered bottle with Teflon tubing as shown in Figure 3-17.

Hand operated diaphram pumps are also available and can be used over a wide range of pumping rates, which facilitates rapid evacuation of a well bore initially and lowers the controlled pumping rate for subsequent sampling.

3.3.9 Positive Displacement Pumps for Water

Positive displacement pumps use positive pressure, generated from a pumping mechanism which is placed in the well, to drive the water from the sampling installation to ground surface. This minimizes the potential for aerating or stripping volatile organic from the sample during removal from the well. Positive displacement pumps include submersible centrifugal pumps, gear-drive pumps, gas operated submersible piston pumps, gas-squeeze pumps, and gas drive pumps. Other pumping systems such as air lift and jet pumps use positive pressure as well, but only to drive a carrier gas or fluid.

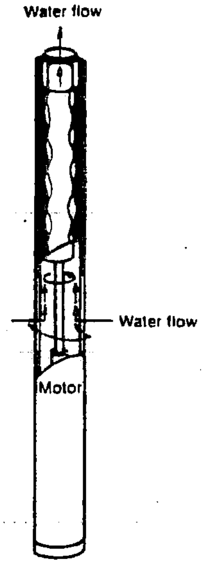
The chemical alteration produced in the water as a result of positive pressure are small compared to the alterations from negative pressure; for this reason, positive displacement pumps are commonly preferred over suction-lift pumps. In addition, positive displacement pumps can lift a sample from a depth which far exceeds the limits of suction-lift pumps and a depth at which bailers become laborious or impractical. It should also be noted that degassing occurs as a result of a decrease in pressure. Raising a sample from its natural position at a depth of a hundred or a few hundred feet and subjecting it to atmospheric pressure can mean a change in pressure of several atmospheres in a sample. Thus, although the application of positive pressure pump does not cause degassing directly, a sample would undergo a decreasing pressure as it moves up the well column and degassing could occur. Therefore, even with positive displacement techniques, for gas sensitive parameters, care should be taken in the manner in which the sample is taken from the outflow.

To further understand these positive displacement sample collection techniques, several types of positive displacement pumps are introduced below.

3.3.9.1 Submersible Centrifugal Pumps--These work in a manner similar to the centrifugal suction-lift pump previously explained, except that in this case, both the pump and electric motor are lowered into the well. As the impeller rotates and fluid is brought into the pump chamber, fluid is displaced up the well.

Until recently, most submersible centrifugal pumps were developed for or by the water well industry, and were designed for wells having a diameter of four inches or bigger. They were frequently constructed with materials and used lubricants which interfered with sample analysis, particularly of organics. At present, there are two small diameter submersible centrifugal pumps available: the helical rotar pump and the Johnson-Keck Pump.

Figure 3-18 Helical Rotor Pump



3.3.9.1A Helical Rotor Pump (Figure 3-18)--The helical rotor pump consists of a sealed electrical motor, which drives a helical rotor. An electric power cord provides 12-volt DC power to the pump from a battery pack at the surface. Water enters the pump through a screened intake in the middle of the pump and is drawn upward through a rotor-stator assembly via centrifugal force. The pump itself is 1.75 inches in outside diameter and 33 inches in length. It is capable of pumping lifts up to 125 feet with maximum flow rates of approximately 0.3 gpm. The housing is stainless steel with inner workings fabricated of inert or nearly inert materials. The pump itself is lightweight, less than ten pounds, but the supporting battery pack and hose reel are typically in excess of 50 pounds. Other disadvantages are that the pump must be cycled on and off approximately every 20 minutes to avoid overheating of the motor. It is somewhat difficult to clean between sampling events because it is moderately difficult to disassemble.

3.3.9.1B Johnson-Keck Pump--As the name implies, this pump was designed by Johnson-Keck and is for groundwater quality monitoring. It can be used in two inch diameter wells or greater, and is constructed of stainless steel and teflon. Experience with this pump is little reported; however, it appears to be a reasonably efficient means of obtaining water from depths below the limit of suction lift and with minimal disturbance to the chemical integrity of the sample. The pumping rate is such that at least for small diameter installation, it would be an adequate means of removing the standing water from the well. In some instances, degassing within the pump unit or in the outflow line may be of concern.

3.3.9.2 Submersible Gear-Drive Electric Pumps--This type of pump is made with a stainless steel body, a highly efficient electric motor, and a set of two teflon gears. The motor drives the set of teflon gears, which draws water through a fine mesh intake screen at the top of the pump. Water is drawn through the gear and pushed in a continuous stream through the discharge line to the surface for sampling. There are several different power sources for these pumps. The basic unit is factory equipped with a series of four six-volt DC rechargeable batteries. These batteries may provide power for approximately four hours of continuous operation and may be recharged overnight by using a 120-volt trickle-charger unit. For a longer duration and an increased pumping rate, these batteries may be supplemented or replaced by one of the following sources: 1) an auxiliary DC generator; 2) an auxiliary battery pack; 3) two vehicle batteries wired in parallel to provide 24-volts; or 4) an adapter unit to facilitate the use of a 120-volt AC power supply.

The only parts that should require replacement under normal field use are the teflon gears. With prolonged purging and/or sampling of water with high suspended solids, these gears may wear, which diminishes pump output. The gears are inexpensive and simple to replace. The weight of the entire system is less than 50 pounds, so it is highly portable. Reasonably high pumping rates can be achieved to depths of 150 feet, and the depth range can be extended through the use of an auxiliary power source. The disadvantages are:

1) there is no control of flow rates;
2) sampling in wells with high levels of suspended solids may require frequent replacement of gears; and
3) the potential for pressure changes produced at the drive mechanism.

3.3.9.3 Submersible Gas-Operated Piston Pumps--Pumps of this type consist of a plunger (piston) or set of plungers moving inside a stationery submerged cylinder (barrel). Another type, a reverse one, of piston pump is the traveling barrel type, in which the piston is held stationery inside a moving cylinder. Although the operating principle for both is identical, the latter type is fairly uncommon.

The cylinder, and sometimes the piston, is fitted with one-way check valves in such a way as to direct the water moved by the piston toward the surface. The pumping capacity depends on the inside diameter of the cylinder, the stroke rate of the moving piston, and the length of the stroke. Once these three parameters are fixed, the output of the pump will have little variation. The piston can be operated by means of a mechanical device or by a gas driven mechanism. Pumps driven by the mechanical device are often referred to as "rod pumps", and those powered by a gas-driven mechanism are referred to simply as "gas-operated" or gas-driven piston pumps.

Like centrifugal pumps, piston pumps, which were initially developed for water and petroleum production, and in terms of water quality monitoring, the rod pumps possess the same disadvantages as the large diameter centrifugal pumps and do not have much value that would require further elaboration here.

Two gas-operated piston pumps reviewed below are single acting and double acting piston pumps.

3.3.9.3A Single-Acting Gas Driven Piston Pumps

An example from Hillerich (1977) is given in Figure 3-19. This pump consists of a gas chamber in the bottom of the pump housing in line with a water chamber in the top, sharing the same piston rod. A gas pressure alternately applied to the air chamber from the end of the chamber drives both pistons up and down. On the upstroke, water is drawn through a check valve into the water chamber on one side of the piston. At the same time the water is expelled from the chamber on the other side of the piston, through the check valve, and into the water discharge line. On the downstroke, water is moved from one side of the piston to the other through a check valve on the piston itself.

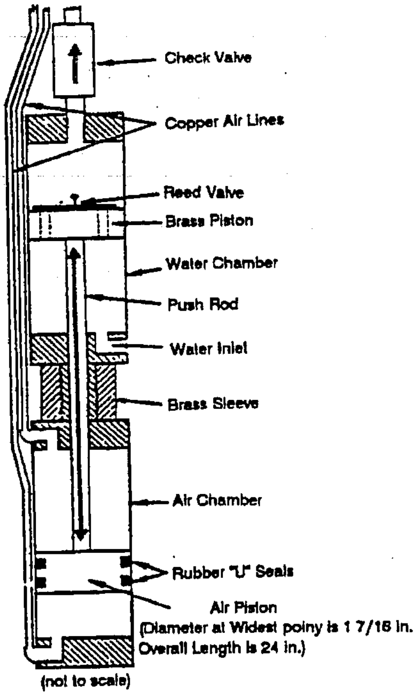


Figure 3-19 Single-Acting Gas Driven Piston Pump

3.3.9.3B Double-Acting Gas Driven Piston Pump--This double acting gas driven piston pump (Figure 3-20) uses two water chambers on either side of a gas chamber and a switching unit through which a common connecting rod passes to a piston in each cylinder. Through an arrangement of O-ring seals, button bleed valves, and needle-valve restrictions in the switching unit, the driving gas both enters and exhausts from the intermediate chamber as it alternately drives the two-piston assembly up and down. Two check valves in each water chamber operate so that on the upstroke, water is expelled from the upper chamber as water is drawn into the lower chamber from well; on the downstroke, water is expelled from the lower chamber and water from the well is drawn into the upper chamber.

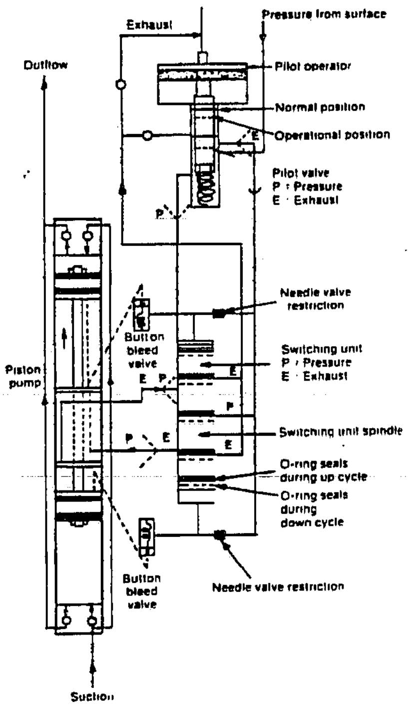
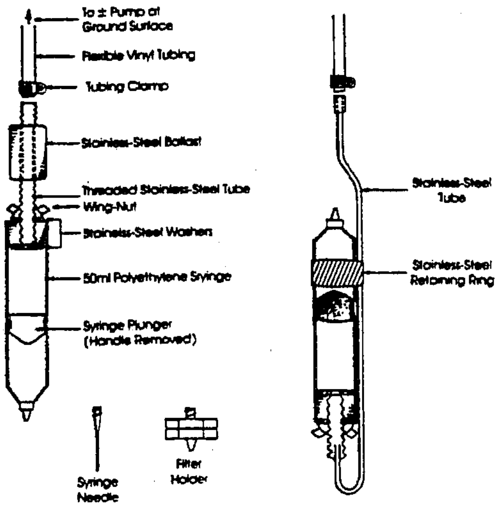


Figure 3-20 Double-Acting Gas Driven Piston Pump

The flow rate of the pump may be varied over a limited range by increasing or decreasing the driving gas pressure to the pump. Rates of from 0.25 to 0.50 gpm are achievable at pumping lifts up to 500 feet with these pumps. The design of this double acting piston pump offers a better driving gas consumption than the previous single acting pump, but it may also be prone to more frequent malfunction because of more mechanical components. It is convenient but bulky, weighing several hundred pounds. Adding the compressed gas equipment, the entire system may be less desirable for moving from place to place.

In general, gas driven piston pumps are well suited for groundwater monitoring because they are portable and can be made of very inert materials. Thus, there is a reduced possibility for sample contamination. No aeration of the sample can occur, and the pump is relatively easy to operate and to disassemble for cleaning and maintenance. The pump can provide a continuous sampling over extended periods of time and uses compressed gas economically. The disadvantages are: 1) the unit itself is relatively expensive; 2) particulate material may damage or inactivate the pump unless the intake is filtered; 3) the pump has the potential of causing pressure drops and degassing in the sample because of its intricate valving mechanism; and 4) the tubing may be difficult to clean making it difficult to avoid cross-contamination.

Figure 3-21 Syringe-Type/Syringe Sampler



3.3.9.4 Syringe-Sampler or Syringe-Type Sampling Devices--Another pneumatic sample collection device is the syringe sampler (Figure 3-21), also called the "Pneumatic Depth-Specific Sampler". The simplest and most inexpensive syringe sampler is composed of a disposable 50 ml plastic syringe modified by cutting off the plunger and the finger grips, and a flexible tubing which is used not only to sustain the syringe but also to provide compressed air or gas for actuating the syringe. To collect a discrete sample, one lowers the syringe to the desired depth in the well and then actuates the syringe, applying positive or negative pressure via the tubing. If water is to be collected from depths of greater than 10-15 feet below the level of standing water in the well, positive pressure must be applied to the syringe while it is being lowered to the sampling depth to keep the plunger from moving. When the desired depth is reached, the pressure in the tubing is released and reduced to atmospheric pressure (or slightly less), and the sampled water enters the syringe. After the syringe is filled, it is withdrawn from the well.

Significant advantages of this method of taking samples are: 1) it can be rinsed down a hole with the water to be sampled; 2) aeration is eliminated and the possibility of degassing is reduced; 3) discrete sampling can be done at any depth; 4) the syringe can be used to sample slowly recharging wells or as a sample container and for wells as small as 1½" inside diameter; 5) the syringes can be made of inert materials, and are inexpensive and highly portable. The disadvantages are: 1) the syringe is inefficient for large volume sampling and can not be used to evacuate a well; and 2) the use of syringes is limited to water with a low suspended solid concentration, and some leakage has been found to be caused from high suspended solid content.

3.3.9.5 Gas-Operated Squeeze or Gas Squeeze Pumps--There are several different designs of gas-squeeze (Bladder (Figure 3-22) and Diaphrams) pumps, but all have several common features and are operated with the same principle. These pumps consist of a flexible membrane enclosed inside a long and rigid housing, a screened intake check valve, a perforated tube inside the bladder (membrane), a discharge check valve, and two tubing lines. One of the two tubings is to allow pressurization of the annular space between the bladder and the housing, and the other one is to allow sample discharge to the surface. When the pump is submerged, water sample enters the bladder through the intake check valve. After the bladder is filled, gas pressure is applied to the annular space between the bladder and the rigid housing, forcing the water upward through the discharge tubing. When the pressure is released, the discharge check valve closes, preventing the water sample from flowing back down into the bladder, and water from the well again refills the bladder through the intake check valve and the cycle is repeated.

The advantages of this pump are: 1) it has a fair range of pumping rates; 2) it has a wide variety of materials that can be used to meet the needs of the parameters of interest; 3) it is relatively portable, though the accessory equipments may be cumbersome; 4) there is no contact between driving gas and the samples, thus eliminating possible contamination or gas stripping; 5) the pump can be as small as one inch, and is easy to disassemble for cleaning and repair; and 6) these pumps are capable of pumping and lifting in excess of 200 feet.

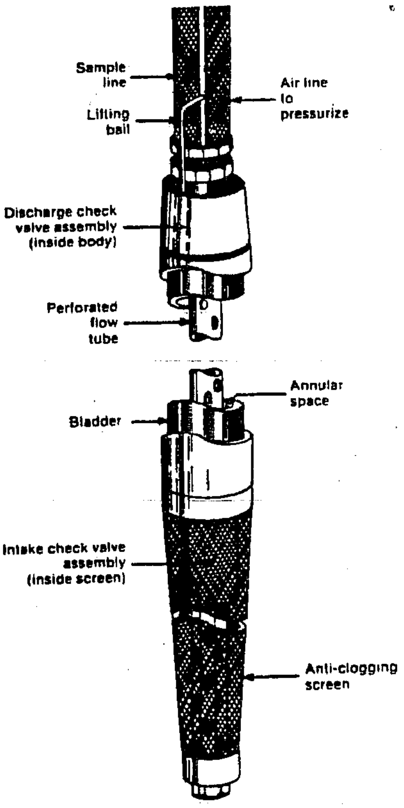


Figure 3-22 Gas-Operated Bladder Pump

Their disadvantages are: 1) deep sampling requires large gas volume and longer cycles; 2) pumping rates can not match the rate of other submersible pumps; and 3) these pumps can be relatively expensive.

3.3.9.6 Gas Drive Pumps--A wide variety of gas-driven sampling devices are available. In principle, the gas-driven pumps (Figure 3-23) use a positive gas pressure to force water from the well to the ground surface. Water enters the pumps through a screened intake and a check valve at the bottom end when the pressure is released. When the pressure is applied, it closes the check valve at the bottom and opens the check valve in the discharge line and forces the water into the sample line extending from the bottom of the chamber to ground surface.

The advantages of this pump are: 1) the pumps are highly portable and inexpensive; 2) pumps can be used in wells of 1½" inside diameter and in boreholes without casing; 3) discrete depth sampling and delivery of a sample at a controlled, nearly continuous rate are possible; and 4) pumps can be constructed entirely of inert materials. The disadvantages are: 1) oxidation may occur, causing precipitation of metals if air is used as the compressed gas; 2) stripping of volatiles and CO_2 can occur; and 3) an air compressor must be transported for deep sampling locations, thus reducing portability.

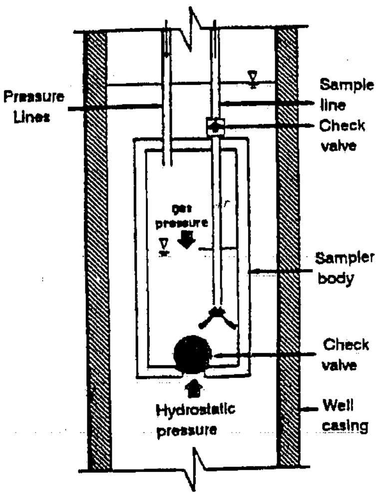
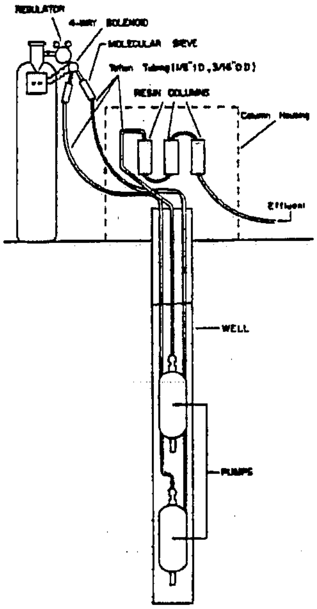


Figure 3-23 Operating Principles of gas Drive Sampling Devices

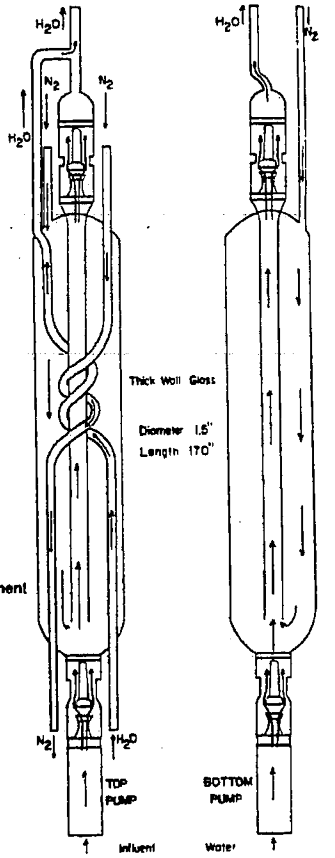
Continuous discharge/High Lift Pump(2 stages)

A continuous flow gas drive was developed for trace organic pollutants in groundwater as shown in Figure 3-24. This device consists of two single-stage glass pumps, placed in the well in line, one below the other. It is powered by high purity nitrogen gas metered alternately to each stage by a four-way solenoid valve and electric timer. The pumps are constructed from heavy wall glass tubing, and each contains two ground glass ball and sock check valves. Inside the upper stage are two glass lines which serve to convey nitrogen to and water from the second (lower) stage. Teflon tubing is used to connect the two stages to deliver nitrogen from the surface supply to the pump and to convey discharged water from the pump to appropriate sample containers.

Figure 3-24



Continuous discharge/high lift pump arrangement



The continuous discharge/high lift pump consists of two stages

During operation, nitrogen is alternatively forced into each of the two single-stage pumps by timed operation of the four-way solenoid valve to obtain sequential filling and emptying of the pump chambers. The air in the pump, which is in the state of being filled, is vented to the atmosphere via the nitrogen inlet line in order to allow water to flow through the lower check valve. Once the filling is completed for that stage (pump), the nitrogen pressure is diverted back into it, forcing the water through the upper check valve into the discharge line. During this pumping cycle, the other pump is operating in the fill mode. The net result is a continuous stream entering the discharge line.

The advantages of this pump are: 1) the pump can be constructed of non-contaminating, non-adsorbing materials; 2) variable flow rates up to 45 gph are obtainable; and 3) the pump can be used in well casings with a diameter of about two inches. The disadvantages are that the pump requires high purity nitrogen gas, in addition to the problems mentioned earlier in this sub-section with the single step gas drive pump.

3.3.9.7 Other Pump Systems--Gas-Lifts and Jet Pumps--Gas (or air)-lift jet pumps use positive pressure and may be good for well purging, but they are not very helpful for sampling, particularly for volatile organics.

Gas (or air)-Lift Pumps consist of a gas or air line extending into the sampled water and a gas or air at high pressure being used to blow the water out of the well. The gas or air acts as a carrier fluid, or reduces the effective specific gravity of the water column, causing the water column to rise to ground surface. The advantages of these systems are that the devices are highly portable and can be permanently installed and used for well development or purging. The method is considered unsuitable for sampling because it can strip volatile compounds, contaminate the sample by the gas or air, affect pH sensitive parameters such as metals, and cause oxidation by air or oxygen-containing gas.

Jet Pumps basically are composed of a circulating pump at the surface and two tubes extending down the well from the pump to an ejector-venturi assembly at the submerged end of the tubes. As the circulating water passes the ejector-venturi assembly, the pressure is reduced as a result of the increased velocity, causing water to be drawn from the well and mixed with the circulating water.

Jet pumps are relatively simple devices and are easily transported. It can be used for pumping at great depths and is useful for purging monitoring wells. Its disadvantages are: 1) a large amount of water needs to be pumped before the circulating water has a composition that is close to the water in the well; 2) the water entering the venturi assembly is subjected to a pressure drop, and can therefore undergo degassing and/or vaporization; and 3) the circulating pump at the surface can contaminate the pumped water because of its materials and lubricants. Because of these multiple deficiencies with regard to sampling, jet pumps are unpopular.

3.4 SUMMARIES AND CHARACTERISTICS OF SOME SAMPLING EQUIPMENT FOR LIQUIDS AND SOLIDS

No one sampling method is applicable to all situations; however, for nearly all situations there may be at least one appropriate sampling device available. The most representative samples are obtained with one of these devices if the appropriate sampling device is chosen for a particular sampling situation.

This section describes examples of sampling equipment and suggests potential uses for the equipment. Because each sampling situation is unique, the cited equipment and applications may have to be modified to ensure that a representative sample is collected and its physical and chemical integrity is maintained. The information in this section is general in nature and therefore limited. It is the responsibility of those who conduct the sampling programs to evaluate the situation and make appropriate modifications.

Table 3-1 provides a review of, and criteria for selecting soil sampling equipment.

Table 3-2 contains examples of sampling equipment and potential applications. Again, these sampling devices may not be applicable to a user's situation due to sample - or site-specific factors.

Table 3-3 summarizes the characteristics of some sampling pumps available for small diameter monitoring wells. Based on these and other considerations of site-specific factors and targeted compounds, appropriate sampling devices may be found. For a brief direction on bigger diameters of monitoring well, see Table 3-4.

Table 3-5, prepared by Pohlman and Hess with EPA support, illustrates the general relation of groudwater

4.0 EQUIPMENT AND CONTAINERS CLEANING PROCEDURES

4.1 GENERAL

4.1.1 Introduction

The cleaning procedures outlined here are to be used by DEC BUREAU OF SPILL PREVENTION AND RESPONSE (DEC BSPR) personnel to guide or evaluate laboratory contractor performance and to clean sampling and other field equipment, as well as sample containers, prior to and after field use. Sufficient clean equipment and sample containers should be transported to the field so that an entire inspection or investigation can be conducted without having to clean sample containers and equipment in the field. However, this will not always be possible when using specialized field equipment. Field cleaning procedures are included to cover these special problem areas. Emergency field sample container cleaning procedures are also included; however, they should not be used unless absolutely necessary. Specific cleaning procedures are presented in the following sections.

These procedures are the operating procedures for the DEC BSPR; any deviation from them should be documented in field records and investigative reports.

4.1.2 Cleaning Materials

The cleaning materials referred to in these procedures are defined in the following paragraphs.

The laboratory detergent shall be a standard brand of phosphate-free laboratory detergent such as Alquinox or Liquinox. The use of any other detergent must be justified and documented in the field logbooks and inspection or investigative reports.

The nitric acid solution (10 percent) shall be made from reagent-grade nitric acid and deionized water.

The standard cleaning solvent shall be pesticide-grade isopropanol. However, solvents may be substituted for a particular investigation if needed. Pesticide-grade acetone or methanol are both acceptable. However, it should be noted that if pesticide-grade acetone is used, the detection of acetone in samples collected with acetone rinsed equipment is suspect. Pesticide-grade methanol is much more hazardous to use than either pesticide-grade isopropanol or acetone, and its use is discouraged. Pesticide-grade hexane and petroleum ether are not miscible with water; therefore, these two solvents are not effective rinsing agents unless equipment is dry. The use of any solvent other than pesticide-grade isopropanol for equipment cleaning purposes must be justified and its use must be documented in field logbooks and inspection or investigative reports.

Tap water may be used from any municipal water treatment system. The use of an untreated potable water supply is not an acceptable substitute for tap water.

Deionized water is defined as tap water that has been treated by passing through a standard deionizing resin column. The deionized water should contain no heavy metals or other inorganic compounds (i.e., at or above analytical detection limits) as defined by a standard Analytical Method inductively coupled Argon Plasma Spectrophotometer (ICP) scan or any justified equivalent method. Organic-free water is defined as tap water that has been treated with activated carbon and deionizing units. A set up of a 5-micron pre-filter, activated carbon unit, two mixed bed deionizing units (in series), a 0.2 micron post filter, and a post-carbon filter can produce organic-free water. The Milli-Q system also produces organic-free water. Organic-free water should contain no pesticides, herbicides, extractable organic compounds, and less than 50 ug/l of purgeable organic compounds as measured by a low level GC/MS scan.

Sections which need special attention from DEC BSPR personnel are: 4.3, 4.4, 4.7.7, 4.7.10, 4.8.2.

During cleaning operations, the substitution of a higher grade water (i.e., deionized or organic-free water for tap water) is permitted and need not be noted as a variation of these procedures. However, the deionized and organic-free water utilized must be subject to the specific quality control procedures as outlined in Section 4.2.2.

The brushes used to clean equipment as outlined in the various sections of this protocol shall not be of the wire-wrapped type.

The solvents, nitric acid solution, laboratory detergent, and rinse waters used to clean equipment shall not be reused, except as specifically permitted in the footnote for Step 3, Section 4.3.

4.1.3 Marking of Cleaned Sampling Equipment and Containers

All equipment and sample containers that are cleaned utilizing these procedures shall be tagged, labeled, or marked with the date that the equipment was cleaned. Also, if there was a deviation from the standard cleaning procedures outlined in this protocol, this fact should be noted on the label.

When sample containers are cleaned and prepared, they should be cleaned in standard sized lots of 100, if possible, to facilitate the quality control procedures outlined in Section 4.2.

4.1.4 Marking and Segregation of Used Field Equipment

Field or sampling equipment that needs to be repaired shall be identified with a red tag. Any problems encountered with the equipment and needed repairs shall be noted on this tag. Field equipment or reusable sample containers needing cleaning or repairs shall not be stored with clean equipment, sample tubing, or sample containers. Field equipment, reusable sample containers, disposable sample containers, and sample tubing that are not used during the course of an investigation may not be replaced in storage, without being recleaned, if these materials are transported to a facility or study site where herbicides, pesticides, organic compounds, or other toxic materials are present or suspected of being present, and/or, if, in the opinion of the field investigator, they may have become contaminated during the course of the field investigation.

4.1.5 Decontamination of Equipment Used to Collect Samples of Toxic or Hazardous Waste

Equipment that is used to collect samples of hazardous materials or toxic wastes or materials from hazardous waste sites, RCRA facilities, or in-process waste streams shall be decontaminated before it is returned from the field. At a minimum, this decontamination procedure shall consist of washing with laboratory detergent and rinsing with tap water. More stringent decontamination procedures may be required, depending on the waste sampled.

4.1.6 Proper Disposal of Cleaning Materials

The solvent used to rinse sampling equipment and containers shall be collected and disposed of by allowing it to evaporate under a fume hood or be containerized and disposed of through an approved hazardous waste disposal contract. Similarly, spent nitric acid shall be collected and disposed of through the same disposal contract. These procedures apply whether the cleaning operations take place in the equipment washroom or in the field.

4.1.7 Safety Procedures to be Utilized During Cleaning Operations

The materials used to implement the cleaning procedures outlined in this protocol can be dangerous if improperly handled. Due caution must be exercised by all operating personnel and all applicable safety procedures shall be followed. At a minimum, the following precautions shall be taken in the washroom and in the field during these cleaning operations:

1. Safety glasses with splash shields or goggles, neoprene gloves, and a neoprene laboratory apron will

be worn during all cleaning operations.

2. All solvent rinsing operations will be conducted under a fume hood or in the open (never in a closed room).
3. No eating, smoking, drinking, chewing, or any hand to mouth contact shall be permitted during cleaning operations.

4.1.8 Storage of Field Equipment and Sample Containers

All field equipment and sample containers shall be stored in a contaminant free environment after being cleaned using the procedures outlined in this protocol.

4.2 SPECIFIC QUALITY CONTROL PROCEDURES FOR CLEANING OPERATIONS

4.2.1 General

This section establishes guidelines for specific quality control procedures to monitor the effectiveness of the sampling equipment and sample container cleaning procedures outlined in this protocol. These procedures shall be carried out by appropriate personnel and the results monitored by the Quality Assurance Officer. All quality control procedures shall be recorded in a logbook maintained in the appropriate washroom(s). All quality control data shall be maintained in a separate quality assurance file. Upon receipt of quality control data, the Quality Assurance Officer shall review these data to identify any abnormalities or contamination of sampling equipment or sample containers. If problems are detected, the Quality Assurance Officer shall immediately initiate an investigation to determine the cause of the problem(s) and institute an immediate, corrective action.

4.2.2 Rinse Water

The quality of the deionized and organic-free water used shall be monitored by collecting samples once per quarter in standard precleaned, sample containers and submitting them to a certified laboratory for a standard ICP scan. Organic-free water will also be submitted for low level pesticide, herbicide, extractable and purgeable compounds analyses. When field deionizing and/or organic-free water units are utilized, more frequent quality control samples will be collected. An initial sample and samples at weekly intervals are the minimum number considered acceptable.

4.2.3. Sampling Equipment Cleaned in Washroom

The effectiveness of the equipment cleaning procedures used in the washroom shall be monitored by rinsing cleaned equipment (equipment used to collect samples for trace organics and metals analyses) with organic-free or Milli-Q water and submitting the rinse water to a certified laboratory for low level analysis of extractable organic compounds including pesticides and a standard ICP scan. At least one piece of field equipment shall be selected for this procedure each time equipment is washed. An attempt should be made to select different pieces of equipment for this procedure, each time equipment is washed, so that a representative sampling of all equipment is obtained over a 12-month period.

4.2.4 Sampling Equipment Cleaned in the Field

The effectiveness of field cleaning procedures shall be monitored by rinsing field cleaned equipment with organic-free water and submitting the rinse water in standard sample containers to a certified laboratory for analysis as outlined in Section 4.2.3. Any time equipment is cleaned in the field at least one such quality control sample shall be collected. No more than five percent of the equipment cleaned during large field studies shall be subjected to these procedures.

Additional samples may be required to document quality assurance of field cleaning procedures. Any time a source of cleaning materials or rinse water is used other than that specified in Section 4.1.2, a sample of that cleaning material or rinse water shall be submitted in standard sample containers as specified in Section 4.2.2.

4.2.5 Glass Disposable Sample Containers for Organic Compounds and Plastic Containers for Metals Analyses and Other Specified Organic Compounds

The sample containers will be submitted to a certified laboratory for analysis utilizing the same standard low level analytical techniques as outlined in Section 4.2.3. The sample containers will be supplied to the certified laboratory at the rate of one percent of each kind of container used.

4.2.6 Plastic Disposable Sample Containers for Oxygen Demand, Nutrients, and General Inorganics

These containers will be filled with deionized or organic-free water, preserved as required, and submitted to be checked up for the designated parameters for each sample container. These sample containers will be selected at random from the stock at the rate of approximately one percent of each kind of container of the total used.

4.2.7 Reusable Composite Sample and Organic-Free Water Containers

These containers will be rinsed with organic-free water and the rinse water will be submitted to the check up procedures as outlined in Section 4.2.3. Approximately one percent of all such containers cleaned will be subjected to this procedure.

4.3 CLEANING PROCEDURES FOR TEFLON OR GLASS FIELD SAMPLING EQUIPMENT USED FOR THE COLLECTION OF SAMPLES FOR TRACE ORGANIC COMPOUNDS AND/OR METALS ANALYSES*

1. Equipment will be washed thoroughly with laboratory detergent and hot water using a brush to remove any particulate matter or surface film.
2. The equipment will be rinsed thoroughly with hot tap water.
3. Rinse equipment with at least a 10 percent nitric acid solution.**
4. Rinse equipment thoroughly with tap water.
5. Rinse equipment thoroughly with deionized water.
6. Rinse equipment twice with solvent and allow to air dry for at least 24 hours.
7. Wrap equipment completely with aluminum foil or equivalent to prevent contamination during storage and/or transport to the field.

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* - When this sampling equipment is used to collect samples that contain oil, grease or other hard to remove materials, it may be necessary to rinse the equipment several times with pesticide-grade acetone or hexane to remove the materials before proceeding with Step 1. In extreme cases, it may be necessary to steam clean the field equipment before proceeding with Step 1. If the field equipment cannot be cleaned utilizing these procedures, it should be discarded.

** - Small and awkward equipment such as vacuum bottle inserts and well bailers may be soaked in the nitric acid solution instead of being rinsed with it. Fresh nitric acid solution should be prepared for each cleaning session.

8. Rinse the Teflon or glass sampling equipment thoroughly with tap water in the field as soon as possible after use.

4.4 CLEANING PROCEDURES FOR STAINLESS STEEL OR METAL SAMPLING EQUIPMENT USED FOR THE COLLECTION OF SAMPLES FOR TRACE ORGANIC COMPOUNDS AND/OR METALS ANALYSIS*

1. Wash equipment thoroughly with laboratory detergent and hot water using a brush to remove any particulate matter or surface film.
2. Rinse equipment thoroughly with hot tap water.
3. Rinse equipment thoroughly with deionized water.
4. Rinse equipment twice with solvent and allow to air dry for at least 24 hours.
5. Wrap equipment completely with aluminum foil to prevent contamination during storage and/or transport to the field.
6. Rinse the stainless steel or metal sampling equipment thoroughly with tap water in the field as soon as possible after use.

4.5 CLEANING PROCEDURES FOR AUTOMATIC WATER SAMPLING EQUIPMENT

4.5.1 General

All ISCO and other automatic samplers will be cleaned as follows:

- The exterior and accessible interior (excluding the waterproof timing mechanism) portions of automatic samplers will be washed with laboratory detergent and rinsed with tap water.
- The face of the timing case mechanism will be cleaned with a clean damp cloth.
- All tubing (sample intake and pump tubing) will be discarded after use.
- New precleaned, silastic pump tubing (see Section 4.6.1) will be installed.
- When utilizing the samplers for collecting samples for metals and/or organic compounds analyses, the metal distributor tubes should not be used; only glass or silastic pump tubing should be used for this purpose.

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* - When this sample equipment is used to collect samples that contain oil, grease or other hard to remove materials, it may be necessary to rinse the equipment several times with pesticide grade acetone or hexane to remove the materials before proceeding with Step 1. In extreme cases, when equipment is painted, badly rusted, or coated with materials that are difficult to remove, it may be necessary to steam clean, wire brush, or sandblast equipment before proceeding with Step 1. Any stainless steel sampling equipment that cannot be cleaned using these procedures should be discarded.

- The ISCO 1680 automatic samplers should not be used for collecting samples for organic compounds analyses in the individual bottle mode because there is no way to properly clean the distributor plate to remove any residual organic compounds. The sample tubing headers may not be used to collect samples for organic compounds analyses for the same reason. The ISCO 2100 automatic samplers may be used to collect samples for organic compounds analyses in the individual bottle mode, if the specific cleaning procedures for the ISCO 2100 glass sequential bottles are followed as outlined in Section 4.5.8.

Specific cleaning procedures for components of the ISCO automatic samplers follow.

4.5.2 ISCO 1680 Automatic Sampler Rotary Funnel and Distributor

1. Use only for non-organic compounds sample collection using individual sequential bottles.
2. Clean with hot water, laboratory detergent and a brush.
3. Rinse thoroughly with deionized water.
4. Replace in sampler.

4.5.3 ISCO 1680 Automatic Sampler Metal Tube

Clean as outlined in 4.5.2.

4.5.4 All Automatic Sampler Heads

1. Disassemble header and using a bottle brush, wash with hot water and phosphate free laboratory detergent.
2. Rinse thoroughly with deionized water.
3. Reassemble header, let dry thoroughly and wrap with aluminum foil.

4.5.5 Reusable Glass Composite Sample Containers*

1. Wash containers thoroughly with hot tap water and laboratory detergent, using a bottle brush to remove particulate matter and surface film.
2. Rinse containers thoroughly with hot tap water.
3. Rinse containers with at least 10 percent nitric acid.
4. Rinse containers thoroughly with tap water.

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* - When these containers are used to collect samples that contain oil, grease or other hard to remove materials, it may be necessary to rinse the container several times with pesticide grade acetone before proceeding with Step 1. If these materials cannot be removed with acetone, the container should be discarded. Glass reusable composite containers used to collect samples at pesticide, herbicide, or other chemical manufacturing facilities that produce toxic or noxious compounds shall be disposed of "properly" (preferably at the facility) at the conclusion of sampling activities and shall not be returned for cleaning. Also, glass composite containers used to collect in-process wastewater samples at industrial facilities shall be discarded after sampling. Any bottles that have a visible film, scale, or discoloration remaining after this cleaning procedure shall also be discarded.

5. Rinse containers thoroughly with deionized water.

6. Rinse twice with solvent and allow to air dry for at least 24 hours.

7. Cap with aluminum foil or Teflon film.

8. After using, rinse with tap water in the field, seal with aluminum foil to keep the interior of the container wet, and return to the laboratory.

4.5.6 Plastic Reusable Composite Sample Containers*

Proceed with the cleaning procedures as outlined in 4.5.5 but omit the solvent rinse.

4.5.7 ISCO 1680 and 2100 Glass Sequential Sample Bottles Automatic Sampler Base for Sequential Mode**

1. Rinse with 10 percent nitric acid.

2. Rinse thoroughly with tap water.

3. Dishwasher, wash cycle, using laboratory detergent cycle, followed by tap and deionized water rinse cycles.

4. Replace bottles in covered, automatic sampler base, and cover with aluminum foil for storage.

5. Rinse bottles in the field as soon as possible after using tap water.

4.5.8 ISCO 2100 Glass Sequential Sample Bottles (Automatic Sampler Base for Sequential Mode) to be Used for Collecting Samples for Organic Compounds Analyses

1. Proceed as outlined in Steps 1-4 in Section 4.5.7.

2. Rinse twice with solvent and allow to air dry for at least 24 hours.

3. Replace in covered, automatic sampler base, cover with aluminum foil for storage, and mark the base as follows: "Cleaned for organic analyses."

4.5.9 Bottle Siphons Used to Transfer Sample From Composite Container

1. Use a new siphon for each sampling location.

2. Use 3/8-inch Teflon tubing for samples collected for organic compounds analyses. The tubing should be rinsed with solvent and dried in the contaminant-free drying oven overnight before use. The ends

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* - Plastic reusable sample containers used to collect samples from facilities that produce toxic or noxious compounds or are used to collect in-process waste stream samples at industrial facilities will be disposed of properly (preferably at the facility) at the conclusion of the sampling activities and will not be returned for cleaning. Any plastic composite sample containers that have a visible film, scale, or other discoloration remaining after this cleaning procedure will be discarded.

** - These ISCO 1680 glass sequential sample bottles are not to be used for collecting samples for organic compounds analyses. The ISCO 2100 bottles also are not to be used for collecting samples for organic compounds analyses unless the cleaning procedures outlined in 4.5.8 are used.

of the siphon should be capped with aluminum foil and/or Teflon film for storage. The siphon should be flushed with sample thoroughly before use.

3. The 3/8-inch PVC tubing utilized for samples, other than those collected for organic compounds analyses, should be thoroughly flushed with sample before use.

4.5.10 Reusable Teflon Composite Mixer Rods

1. Follow procedure outlined in Section 4.3.
2. Wrap rod in aluminum foil for storage.

4.6 CLEANING PROCEDURES FOR SAMPLE TUBING

4.6.1 Silastic Rubber Pump Tubing Used In Automatic Samplers and Other Peristaltic Pumps

New Precleaned tubing must be used for each automatic sampler set-up. The silastic rubber tubing need not be replaced in peristaltic pumps where the sample does not contact the tubing or where the pump is being used for purging purposes (i.e., not being used to collect samples).

The silastic tubing shall be precleaned as follows:

1. Flush tubing with hot tap water and phosphate-free laboratory detergent.
2. Rinse tubing thoroughly with hot tap water.
3. Rinse tubing with deionized water.
4. Install tubing in automatic sampler or peristaltic pump.
5. Cap both ends of tubing with aluminum foil.

4.6.2 Teflon Sample Tubing

Use only new Teflon tubing precleaned as follows for collection of samples for organic compound analyses:

1. Teflon tubing shall be precut in convenient lengths before cleaning.
2. Rinse outside of tubing with solvent.
3. Flush interior of tubing with solvent.
4. Dry overnight in the contaminant-free drying oven.
5. Wrap tubing and cap ends with aluminum foil to prevent contamination during storage.

4.6.3 Polyvinyl Chloride (PVC) Sample Tubing (1/8, 1/4, or 3/8 inch)

1. Use only new tubing.
2. The tubing will be flushed with sample immediately before use to remove any residues from the

manufacturing or extruding process.

3. Polyvinyl chloride tubing will be used selectively where organic compounds are not of concern.

4. Tubing should be stored in original container and not removed from this container until needed.

4.6.4 Stainless Steel Tubing

1. Wash with laboratory detergent and hot water using a long, narrow, bottle brush.

2. Proceed with Steps 2-6 as outlined in Section 4.4 (footnote applies).

4.6.5 Glass Tubing

Use new glass tubing, precleaned as follows:

1. Rinse thoroughly with solvent.

2. Air dry for at least 24 hours.

3. Wrap tubing completely with aluminum foil to prevent contamination during storage.

4. Discard tubing after use.

4.7 MISCELLANEOUS EQUIPMENT CLEANING PROCEDURES

4.7.1 Well Sounders or Tapes Used to Measure Ground Water Levels*

1. Wash with laboratory detergent and tap water.

2. Rinse with tap water.

3. Rinse with deionized water.

4. Equipment should be placed in a polyethylene bag or wrapped with polyethylene film to prevent contamination during storage or transport.

4.7.2 Submersible Pumps and Hoses Used to Purge Ground Water Wells*

Proceed as outlined in Section 4.7.1.

4.7.3 Portable Power Augers Such as the Little Beaver

1. The engine and power head should be cleaned with a power washer, steam jenny, or hand washed with a brush using detergent (does not have to be laboratory detergent but should not be a degreaser) to

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* - The same procedure applies whether this equipment is cleaned in the laboratory or equipment washroom or in the field.

remove oil, grease, and hydraulic fluid from the exterior of the unit. These units should be rinsed thoroughly with tap water.

2. All auger flights and bits shall be cleaned utilizing the procedures outlined in Section 4.4 (including footnotes) or Section 4.8.3 (including footnotes if appropriate).

4.7.4 Large Soil Boring and Drilling Rigs

1. The rig should be cleaned before being mobilized and brought on-site as outlined in Step 1 of Section 4.7.3.

2. All auger flights, auger bits, drilling rods, drill bits, hollow stem augers, Split Spoon Samplers, Shelby Tubes, or other parts of the drilling equipment that will contact the soil or ground water should be cleaned as outlined in Section 4.4 (including footnotes) or Section 4.8.3 (including footnotes if appropriate).

4.7.5 Miscellaneous Sampling and Flow Measuring Equipment

Miscellaneous flow measuring and sampling equipment shall be washed with laboratory detergent, rinsed with hot tap water, followed by a thorough deionized water rinse, and dried before being stored. This procedure is not used for any equipment utilized for the collection of samples for trace organic compounds or metals analyses.

4.7.6 ISCO Flow Meters, Field Analytical Equipment, and Other Field Instrumentation

The exterior of sealed, watertight equipment such as ISCO flow meters should be washed with a mild detergent (for example, liquid dish washing detergent) and rinsed with tap water before storage. The interior of such equipment may be wiped with a damp cloth if necessary.

Other field instrumentation should be wiped with a clean, damp cloth; pH meter probes, conductivity probes, DO meter probes, etc. should be rinsed with deionized water before storage.

The desiccant in flow meters and other equipment should be checked and replaced, if necessary, each time the equipment is cleaned.

4.7.7 Ice Chests and Shipping Containers

All ice chests and reusable containers will be washed with laboratory detergent (interior and exterior) and rinsed with tap water and air dried before storage. In the event that an ice chest becomes severely contaminated, in the opinion of the field investigator, with concentrated waste or other toxic material, it shall be cleaned as thoroughly as possible, rendered unusable, and disposed of properly.

4.7.8 Pressure Field Filtration Apparatus*

1. Proceed with steps 1 through 5 as outlined in Section 4.3, assembling and applying pressure to the apparatus after each rinse step (water and acid) to drive rinse material through the porous glass filter holder in the bottom of the apparatus.

2. Assemble the apparatus and cap both the pressure inlet and sample discharge lines with aluminum foil to prevent contamination during storage.

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* - The same procedure applies whether the pressure filtration apparatus is cleaned in the laboratory or equipments washroom or in the field.

4.7.9 Organic-Free Milli-Q Water Storage Containers

1. These containers will be used only for storing organic-free or Milli-Q water.
2. New containers shall be prepared as outlined in Section 4.5.5, Steps 1-5, then rinsed thoroughly with organic-free or Milli-Q water, filled with Milli-Q water and capped.
3. Used containers shall be capped with aluminum foil immediately after being used in the field.
4. The exterior of the container will be washed with laboratory detergent and rinsed with deionized water if necessary.
5. The interior of the container shall be rinsed twice with solvent.
6. The interior of the container will be thoroughly rinsed with organic-free or Milli-Q water. The container will be filled with organic-free or Milli-Q water and capped with aluminum foil for storage.

4.7.10 Vehicles

All vehicles utilized by sampling personnel should be washed when necessary at the conclusion of field trip. This routine maintenance should minimize any chance of contamination of equipment or samples due to contamination of vehicles. When vehicles are used in conjunction with hazardous waste site inspections, or on studies where pesticides, herbicides, organic compounds or other toxic materials are known or suspected to be present, a thorough interior and exterior cleaning is necessary at the conclusion of such investigations. It shall be the responsibility of the project leader and/or field investigators to judge its necessity and to see this procedure is followed.

All vehicles should be equipped with trash bags and/or trash containers to facilitate vehicle cleaning. All field personnel are responsible for keeping field vehicles clean by removing all trash and other debris before it accumulates. All contaminated trash and equipment must be kept separate from ordinary trash and must be disposed of properly on-site or upon return to appropriate facility for proper disposal.

4.8 FIELD EQUIPMENT CLEANING PROCEDURES

4.8.1 General

Sufficient clean equipment should be transported to the field so that an entire study can be conducted without the need for field cleaning. However, this is not possible for some specialized items of field equipment such as portable power augers (Little Beaver), well drilling rigs, soil coring rigs, and other large pieces of field equipment. In addition, during particularly large scale studies, it is not practical or possible to transport to the field all of the precleaned field equipment required. The following procedures are to be utilized when equipment must be cleaned in the field.

4.8.2 Equipment Used for Routine Sample Collection Activities

For routine operations involving classic parameter analyses, water quality sampling equipment such as Kemmerers, buckets, DO dunkers, dredges, bailers, etc. may be cleaned with sample or deionized water between sampling locations. Heavy duty disposable paper towel or cloth may also be used reciprocally with sample or deionized water to clean equipment when sample has any sticky product present. But the last step of cleaning should be rinsing with sample or deionized water. A brush may be used to remove deposits of material or sediment, if necessary. If deionized water is used, water samplers should be flushed with sample at the next sampling location before the sample is collected. <u>It should be emphasized that these procedures cannot be used to clean equipment for the collection of samples for organic compounds or trace metals analyses</u>.

Flow measuring equipment such as weirs, staff gages, velocity meters, and other stream gaging equipment may be cleaned with tap water after use between measuring locations, if necessary.

4.8.3 <u>Teflon, Stainless Steel or Metal Equipment Used to Collect Sample for Organic Compounds and Trace Metals Analyses*</u>

1. Clean with tap water and laboratory detergent using a brush if necessary to remove particulate matter and surface films.
2. Rinse thoroughly with tap water.
3. Rinse thoroughly with deionized water.
4. Rinse twice with solvent.
5. Rinse thoroughly with organic-free water and allow to air dry as long as possible.
6. If organic-free water is not available, allow equipment to air dry as long as possible. Do <u>not</u> rinse with deionized or distilled water.
7. Wrap with aluminum foil, if appropriate, to prevent contamination if equipment is going to be stored or transported.

4.9 PREPARATION OF DISPOSABLE SAMPLE CONTAINERS

4.9.1 <u>General</u>

<u>No</u> sample container (with the exception of the glass and plastic compositing containers) will ever be reused. All disposable sample containers will be stored in their original packing containers. When packages of uncapped sample containers are opened, they will be placed in new plastic garbage bags and sealed to prevent contamination during storage. Specific precleaning instructions for disposable sample containers are given in the following sections. These instructions apply to precleaned disposable sample containers whether they are purchased from a contractor or are precleaned by any appropriate personnel.

4.9.2 <u>One-Pint Storemore, One-Quart Storemore, One-Half Gallon, and One-Gallon Plastic Containers for Oxygen Demand, Nutrients, Classic Inorganic, Sulfide, and Cyanide Analyses</u>

Only new containers will be used.

4.9.3 <u>One-Half and One-Gallon Amber Glass Bottles (Water Samples), 8-, 16-, and 32 -Ounce Clear Wide-mouth Jars (Soil, Sediment, Sludge, and Concentrated Waste) With Teflon Lined Caps for Organic Compounds (Excluding Purgeables) and Metals Analysis</u>

1. Wash bottles and jars, Teflon liners, and caps in hot tap water and laboratory detergent.

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* - Portable power augers (such as the Little Beaver) or large soil boring or drill rigs should be cleaned as outlined in Step 1 of Section 4.7.3 before boring or drilling operations.

2. Rinse three times with tap water.
3. Rinse with nitric acid solution.*
4. Rinse three times with deionized water.
5. Rinse bottles, jars, and liners (not caps) with solvent.*
6. Oven dry bottles, jars, and liners at 125° C. Allow to cool.
7. Place liners in caps and cap containers.
8. Store containers in contaminant-free area.

4.9.4 40 ml Glass Vials for Water Samples (Purgeable Organic Compounds Analysis) and 250 ml Amber Glass Narrow Necked Bottles for Water Samples (TOX Analysis) with Teflon Lined Septa; and 4-Ounce (120 ml) Clear Wide-mouth Glass Jars with Teflon Liner for Soil Samples (Purgeable Organic Compounds Analysis)

1. Wash vials, bottles and jars, Teflon liners and septa, and caps in hot tap water and laboratory detergent (non-phosphate).
2. Rinse three times with hot tap water, and rinse three times with deionized water.
3. Oven dry at 125° C.
4. Allow all vials, bottles, jars, liners, and septa to cool in an enclosed contaminant-free environment.
5. Seal vials, bottles, and jars with liners or septa as appropriate and cap.
6. Store vials, bottles, and jars in a contaminant free area.

4.9.5 One Liter Polyethylene Bottle for Metals and General Inorganics

1. Wash polyethylene bottles and caps in hot water with laboratory detergent.
2. Rinse both with nitric acid solution.
3. Rinse three times with deionized water.
4. Invert bottles and dry in contaminant free environment.
5. Cap bottles.
6. Store in contaminant free area.

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* - Some bottle cleaning contractors use pesticide grade methylene chloride to solvent rinse sample containers. Also some of these contractors use 1:1 reagent grade nitric acid to rinse sample containers. For the purpose of cleaning sample containers as outlined in Section 4.9.3 and 4.9.5, both of these deviations from the information contained in Section 4.1.2 are permitted.

4.9.6 Containers for Conventionals, and Nitrogen and Phosphorous Series

1. Use new plastic or borosilicate glass bottles (1 liter minimum).
2. Wash containers and caps with hot water.
3. Rinse with 1:1 sulfuric acid.
4. Rinse three times with ASTM Type I reagent water.
5. Air dry.
6. Cap bottles when dry.

4.10 EMERGENCY DISPOSABLE SAMPLE CONTAINER CLEANING

New one-pint or one-quart mason jars may be used to collect samples for analyses of organic compounds and metals in waste and soil samples in an emergency. These containers would also be acceptable on an emergency basis for the collection of water samples for extractable and pesticide organic analyses, as well as metal analyses. These jars cannot be used for the collection of water samples for purgeable organic analyses.

The rubber sealing ring should not be in contact with the jar and aluminum foil should be used, if possible, between the jar and the sealing ring. If possible, the jar and aluminum foil should be rinsed with pesticides grade methanol* and allowed to air dry before use. Several empty bottles and lids should be submitted to the laboratory as blanks for quality control purposes.

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* - Pesticide-grade petroleum ether or hexane may also be used. The specific solvent used should be specified.

5.0 SAMPLING PROCEDURES

5.1 INTRODUCTION

This section discusses practices and procedures for use by DEC Bureau of Spill Prevention and Response (DEC BSPR) personnel or contractor during field operations to ensure the collection of representative samples. All sampling activities conducted by DEC BSPR personnel or contractor are conducted with the expectation that they will be used for enforcement purposes, unless specifically stated to the contrary in advance of the field investigation. Therefore, the use of proper sampling procedures cannot be over emphasized. The collection of representative samples depends upon:

- ensuring that the sample taken is truly representative of the material or medium being sampled;
- using proper sampling, sample handling, preservation, and quality control techniques;
- properly identifying the collected samples and documenting their collection in permanent field records;
- maintaining sample chain-of-custody; and
- protecting the collected samples by properly packing and transporting (shipping) them to a laboratory for analysis.

The objectives of this section are to present:

- general considerations that must be incorporated in all sampling operations conducted by the DEC BSPR personnel or contractor;
- specific sampling site selection and collection procedures for individual media; and
- specific sampling quality assurance procedures as well as equipment calibration and maintenance requirements for sampling equipment.

5.2 GENERAL CONSIDERATIONS

The following factors and procedures shall be considered and implemented in planning and conducting all sampling operations with the specific objectives and scope of individual site investigation. Representative sampling sites are dependent on the type of investigation being undertaken and are discussed under the sample procedures for each medium later in this section. The type of sampling equipment to be used is also discussed in Section 3.0 and the sampling procedure in this section. Section 4.0 describes the equipment cleaning procedures.

5.2.1 Sampling Equipment Construction Material

The material that sampling equipment is constructed of can affect sample analytical results. Materials must not contaminate the sample being collected and must be readily cleaned so that samples are not cross-contaminated. The standard materials for sampling equipment used for trace organic compounds or metals analyses are, in order of decreasing desirability; Teflon, glass, stainless steel and steel.

5.2.2 Selection of Parameters to be Measured

Parameters to be measured are usually dictated by the purpose of an investigation and should be based on required monitoring conditions (NPDES or RCRA permits for example) or on the field investigator's or requester's knowledge of the problem being investigated.

5.2.3 Dissolved and Particulate Sample Fractions

A water sample is generally composed of dissolved and particulate fraction. When it is necessary to analyze samples for each fraction, instead of the total sample, it may be necessary to filter the sample in the field. Field filtration should be conducted only for conventional analytical parameters or metals; samples that will be analyzed for organic compounds shall not be filtered in the field.

5.2.4 Required Sample Volumes

The volume of samples obtained should be sufficient to perform all required analyses with an additional amount collected to provide for quality control needs, split samples, or repeat examinations. Individual aliquots of a composite sample should be at least 100 milliliters in order to minimize sample solids bias when using a peristaltic pump.

Although the volume of sample required by contract laboratories depends on the analyses to be performed, the amount of sample required for a complete water or wastewater analysis can be up to two gallons (7.6 leters) for each laboratory receiving a sample. However, the laboratory receiving the sample should be consulted for any specific volume requirements.

The volumes of samples collected from waste sources at hazardous waste sites or samples from sources which are known to be toxic should be kept to an absolute minimum.

The sample volume required for each analysis is the volume of the standard container less ullage (empty space) required for sample mixing by laboratory personnel and safe shipment of samples to the laboratory. Sampling personnel shall allow a minimum of ten percent ullage in every sample container for this purpose. The only exceptions are samples collected for purgeable organic analysis (VOA) or dissolved gases such as sulfides for which sample containers must be completely filled.

5.2.5 Selection and Proper Preparation of Sample Containers

The type of sample container is dictated by the analyses required. Standard sample containers to be used by sampling personnel are presented in Appendix 5X.1. Special sample container preparation requirements are in Section 4.0.

5.2.6 Sample Preservation

Samples for some analyses must be preserved in order to maintain their integrity. Preservations required for routine analyses of samples are given in Appendix 5X.1. All samples should be preserved immediately upon collection in the field. The only samples that should not be immediately preserved in the field are:

- Samples collected within a hazardous waste site that are known or thought to be highly contaminated with toxic materials. Barrel, drum, closed container, spillage, or other source samples from hazardous waste sites are not to be preserved with any chemical. These samples may be preserved with ice, if necessary.

- Samples that have extremely low or high pH or samples that may generate potentially dangerous gases if they were preserved using the procedures given in Appendix 5X.1.

- Well or ground water samples that contain visible sediment, that are not filtered in the field, shall not be preserved with nitric acid in the field. These samples shall be preserved with ice and taken to the laboratory for additional sample preparation.

- Samples for metals analysis which are to be shipped as soon as possible. They shall not be preserved with nitric acid in excess of the amount specified in Appendix 5X.3.

- Samples for purgeable organic compounds (VOA) analyses which are shipped by air shall not be preserved with hydrochloric acid in excess of the amount specified in Appendix 5X.3.

All samples preserved with chemicals shall be clearly identified by indicating on the sample tag that the sample is preserved. If the samples are not preserved, field records shall indicate why.

5.2.7 Sample Holding Times

The elapsed time between sample collection and initiation of laboratory analyses must be within a prescribed time frame for each individual analysis. Sample holding times for all routine samples are shown in Appendix 5X.1.

5.2.8 Sample Handling and Mixing

Once a sample has been collected, it may have to be split into separate containers for different analyses. The best way to split liquid samples is to continually stir the sample contents with a clean pipette or pre-cleaned Teflon rod and allow the contents to be alternately siphoned into respective sample containers using Teflon or PVC (Tygon type) tubing. Teflon must be used when analyses for organic compounds or trace metals are to be conducted. Any device used for stirring, or tubing used for siphoning, must be cleaned in the same manner as other equipment (Section 4.0).

A true split of soil, sediment, or sludge samples is almost impossible to accomplish under field conditions. The more moisture samples contain, the more difficult it is to split them. Procedures such as the one outlined in Section 5.7.4.5 should be used to obtain a homogenous sample. Even when such procedures are followed, the sample should be considered a duplicate and not a split sample.

After collection, all samples should be handled as few times as possible. Sample handling personnel should use extreme care to ensure that samples are not contaminated. If samples are placed in an ice chest, personnel should ensure that melted ice cannot cause sample containers to become submerged, as this may result in sample cross-contamination. Plastic bags, such as zip-lock bags, should be used to prevent cross-contamination when small sample containers (e.g., VOA's or bacterial samples) are placed in ice chests.

5.2.9 Special Precautions for Trace Contaminant Sampling

Some compounds can be detected in the parts per billion and/or parts per trillion range. Extreme care must be taken to prevent cross-contamination of these samples. The following precautions shall be taken when trace contaminants are of concern:

- A clean pair of new, disposable gloves will be worn each time a different point or location is sampled;

- Sample containers for source samples or samples suspected of containing high concentrations of contaminants shall be placed in separate plastic bags immediately after collecting, preserving, tagging, etc.;

- If possible, ambient samples and source samples should be collected by different field teams. If separate collection is not possible, all ambient samples shall be collected first and placed in separate ice chests or shipping containers. Samples of waste or highly contaminated samples shall never be placed in the same ice chest as environmental samples. It is good practice to enclose waste or highly contaminated samples in a plastic bag before placing them in ice chests. Ice chests or shipping containers for source samples or samples suspected of containing high concentrations of contaminants shall be lined with new, clean, plastic bags.

- If possible, one member of the field team should take all the notes, fill out tags, etc., while the other member does all of the sampling.
- When sampling surface waters, the water sample should always be collected before the sediment sample is collected.
- Sample collection activities should proceed progressively from the least contaminated area to the most contaminated area (if this fact is known).
- Sampling personnel should use equipment constructed of Teflon, stainless steel, or glass that has been properly precleaned (Section 4.0) for collecting samples for trace metals or organic compounds analyses. Teflon or glass is preferred for collecting samples where trace metals are of concern. Equipment constructed of plastic or PVC shall not be used to collect samples for trace organic compounds analyses.

5.2.10 Sample Identification

All samples will be fully documented, as outlined in Appendix 5X.2, in the field records, on the field sample chain-of-custody record, and on the sample tags.

5.2.11 Procedures for Identifying Potentially Hazardous Samples

Any sample either known or thought to be hazardous should be so identified on both the sample tag and the field sample chain-of-custody sheet. Information explaining the hazard, i.e., corrosive, flammable, poison, etc., shall also be listed.

5.2.12 Collection of Auxiliary Data

All auxiliary data such as flow measurements, photographs of sampling sites, meteorogical conditions, and other observations shall be entered into field records when the auxiliary data are collected. Auxiliary data relative to a particular sampling location should be collected as close to the sample collection time as possible. Specific types of auxiliary data to collect for each medium sampled are discussed later in this section.

5.2.13 Time Records

All records of time shall be kept using local time in the 2400 hour time format and shall be recorded to the nearest five minutes.

5.2.14 Transporting and Shipping of Samples

Samples may be hand delivered to the laboratory using government owned (or private) vehicles or they may be shipped by common carrier. All sample handling personnel must be aware that certain samples are hazardous materials and, as such, are regulated by the U.S. Department of Transportation under the Transportation Safety Act of 1974. These regulations are contained in Title 49, CFR, Parts 110-119. All DEC BSPR employees shall be aware of and meet the regulations that have been set up by the Transportation Safety Act of 1974 when shipping samples by common carrier.

5.2.15 Sample Chain-of-Custody

DEC BSPR employees or all sample handling personnel shall maintain chain-of-custody during all field investigations for all samples collected. The recommended sample chain-of-custody procedures used by DEC BSPR employees or contractor are given in Appendix 5X.2.

5.3 DEFINITIONS

5.3.1 Grab Sample

A grab sample is an individual sample collected over a period of time generally not exceeding 15 minutes. A grab sample is normally associated with water or polluted water sampling. However, soil, sediment, liquid hazardous samples, etc., may also be considered grab samples. No particular time limit would apply for the collection of such samples.

1. Grab samples are:
   - Used to characterize the medium at a particular instant in time; and
   - Always associated with instantaneous water or polluted water flow data (where appropriate).
2. Grab sampling is conducted when:
   - The water or polluted water stream is not continuous (e.g., batch-discharges or intermittent flow);
   - The characteristic of the water or polluted stream are known to be constant or nearly so;
   - The sample is to be analyzed for parameters whose characteristics are likely to change significantly with time, i.e., dissolved gases, bacteria, etc.;
   - The sample is to be collected for analysis of a parameter such as oil and grease where the compositing process could significantly affect the actual concentration; and
   - Data on maximum/minimum concentrations are desired for a continuous water or polluted water stream.
3. Analyses for which samples of water should always be collected by the DEC BSPR personnel or contractor using the grab sample method or for which measurements shall be made in-situ include:

pH
temperature
dissolved oxygen
sulfide
chlorine residual
other dissolved gases
phenol
oil and grease
bacteria
volatile organic compounds
specific conductance
dissolved constituents in field filtered samples (total-P, ortho-P, metals, etc.)

5.3.2 Composite Sample

5.3.2.1 Timed Composite - A sample containing some discrete samples in equal volume collected at equal time intervals over the compositing period. (A timed composite may be collected continuously). Timed composites may be collected where water or polluted water flows vary widely and are not dampened by polluted water treatment units.

5.3.2.2 Flow Proportional Composites - A sample containing some discrete samples collected proportionally to the flow rate over the compositing period. Flow proportional samples may be collected where water or polluted water flows vary widely and are not dampened by polluted water treatment units.

5.3.2.3 Timed and Flow Proportional Composite Samples - The following guidance is given concerning the collection of composite samples:

1. Composite samples are:
   - collected when average concentrations are of interest; and are
   - always associated with average flow data (where appropriate).
2. Composite sampling is used when:
   - the water or polluted water stream is continuous;
   - it is necessary to calculate mass/unit time loadings; or when
   - analytical capabilities are limited.
3. A timed composite shall be collected as follows:
   - continuously; or
   - with constant sample volume at a constant time interval between samples.
4. A flow proportional composite shall be collected as follows:
   - continuously, proportional to stream flow;
   - with constant sample volume and with the time between samples proportional to stream flow; or
   - at a constant time interval between samples and with the sample volume proportional to flow at time of sampling.

5.3.2.4 Areal Composite - A sample composited from individual grab samples collected on an areal or cross-sectional basis. Areal composites shall be made up of equal volumes of grab samples. Each grab sample shall be collected in an identical manner. Examples include sediment composites made up of quarter-point grab samples from a stream, soil samples from grid points on a grid system, water samples collected at various depths at the same point or from quarter points in a stream, etc.

5.3.3 Split Sample

A split sample is a sample which has been portioned into two or more containers from a single sample container. Portioning assumes adequate mixing to assure the "split samples" are, for all practical purposes, identical.

5.3.4 Duplicate Samples

Duplicate samples are samples collected simultaneously from the same source under identical conditions into separate containers.

5.3.5 Reference or Control Sample

A sample collected upstream or upgradient from a source or site to isolate the effects of the source or site on the particular ambient medium being sampled.

5.3.6 Background Sample

A sample collected from an area, water body, or site similar to the one being studied, but located in an area known or thought to be free from pollutants of concern.

5.3.7 Sample Aliquot

A portion of a sample that is representative of the entire sample.

5.4 SPECIFIC SAMPLE COLLECTION QUALITY CONTROL PROCEDURES

5.4.1 General

This subsection provides guidelines for establishing quality control procedures for DEC BSPR sampling activities. Specific guidelines for sample site selection, selection of sampling equipment, types of samples to be collected, standard sample collection procedures, specific maintenance and calibration procedures for sampling equipment, and other considerations are presented for each medium later in this Section. Specific recommendations for all sampling activities are presented in Section 5.2. Adherence to the standard operating procedures outlined in this section form the basis for the DEC BSPR sampling quality assurance program.

5.4.2 Experience Requirements

There is no substitute for field experience. Therefore, all employees shall have field experience before they are permitted to select sampling sites. This field experience shall be gained by on-the-job training using the "buddy" system. Each new employee shall accompany an experienced employee on as many different types of field studies as possible. During this training period, the new employee will be permitted to perform all facets of field investigations, including sampling, under the direction and supervision of qualified technical staff.

5.4.3 Traceability Requirements

All sample collection activities shall be traceable through field records to the person collecting the sample and to the specific piece of sampling equipment (where appropriate) used to collect that sample. All maintenance and calibration records for sampling equipment (where appropriate) shall be kept so that they are similarly traceable.

5.4.4 Measurement of Relative Sampling Precision

The following duplicate sampling procedures shall be used during the collection of samples as a relative measure of the precision of the sample collection process. Duplicate grab and composite samples shall be collected during all major investigations and studies conducted by the DEC BSPR. No more than ten percent of all samples shall be collected in duplicate. These duplicates shall be collected at the same time, using the same procedures, the same equipment, and in the same types of containers as the required samples. They shall also be preserved in the same manner and submitted for the same analyses as the required samples. The collection of duplicate composite samples shall require the installation of duplicate automatic sampler setups if automatic samplers are used for sample collection. Duplicate sample data shall be reported to the quality assurance officer or his designee.

These data will be periodically examined to determine if any problems are evident with specific types of media samples or with the procedures used by specific sample handling personnel. The Quality Assurance Officer will advise the appropriate Section Chiefs of any problems encountered so that corrective action can be taken.

5.4.5 Measurement of Sample Handling Effectiveness

The effectiveness of sampling handling personnel's sample handling techniques will be monitored by utilizing preserved and unpreserved field blank samples. These blank samples will be prepared by DEC BSPR personnel or proper suppliers. These blank samples will be handled as follows:

- Water Sample Organic Trip Blank - Two sealed preserved (or unpreserved if appropriate) VOA vials and one sealed container each for other organic compounds will be transported to the field. These samples will be handled and treated by sampling personnel in the same manner as the other samples collected for organic compounds analysis on that particular study. These samples will be clearly identified on sample tags and Chain-of-Custody Records as trip blanks. These water sample trip blanks will also be used to monitor the effectiveness of sample handling techniques where samples other than water, i.e., sludge, soil, sediment, etc. are collected. At least one set of trip blanks will be used on every study where samples for organic compounds analyses will be conducted.

- Metals and General Inorganic Preservation Blanks - Metals and general inorganic sample containers filled with blank water will be transported to the field and treated in the same manner as other like samples. These blank samples will be preserved and submitted for the same analyses as the other samples collected. These samples will be clearly identified as preservatives blanks on sample tags and in the Chain-of-Custody Record(s). At least one preservative blank for each type of sample should be collected on non-routine field investigations. A minimum of one preservative blank should be prepared at the beginning and at the end of all major field investigations (20 samples or more). At least one preservative blank for each type of sample should be prepared once per quarter for routine inspections.

- Automatic Sampler Blanks - The procedure for collecting automatic sampler blanks is given separately at its own category of automatic sampling. In general, cleaning procedures outlined in Section 4.0 should be adequate to insure sample integrity. However, it is the standard practice of the DEC BSPR to submit automatic sampler blanks for analysis when automatic samplers are used to collect samples for organic compounds analyses. Automatic sampler blanks for other standard analyses shall be submitted at least once per quarter.

The DEC BSPR will advise the Quality Assurance Officer when trip blanks or preservative blanks are unacceptably contaminated. The Quality Assurance Officer will immediately initiate an investigation to determine the cause of the problem. The results of this investigation will be promptly reported to the appropriate Section Chiefs so that corrective action can be initiated.

5.4.6 Measurement of Sample Container, Sample Equipment, and Cleaning Procedure Integrity

Specific quality control procedures are outlined in Section 4.0.

5.4.7 Special Quality Control Procedures for Water Samples for Extractable, Pesticide, or Herbicide Organic Compounds Analyses

Sampling personnel shall submit duplicate water samples for extractable organic, pesticide, and/or herbicide organic compounds analyses from one sampling location per project. This sample should be collected from a location expected to be relatively free from contamination, since this sample will be used for laboratory quality control purposes. The duplicate sample should be clearly identified as "Duplicate Sample for Matrix Spike" on the sample tag, in the Chain-of-Custody Record, in the field logbook. This procedure shall be followed for all DEC BSPR projects where water samples are collected for the indicated organic compounds analyses, whether the samples are submitted to the contracted lab or other certified laboratory.

5.5 GROUNDWATER SAMPLING

5.5.1 General

Groundwater sampling may be required for a variety of reasons, such as examining potable or industrial water supplies, checking for and/or tracking contaminant plume movement in the vicinity of a land disposal or spill site, RCRA compliance monitoring , or examining a site where historical information is minimal or non-existent, but where it is thought groundwater contamination could have occurred.

Groundwater is usually sampled from a monitoring well, either temporarily or permanently installed. However, it can also be sampled anywhere groundwater is present, as in a pit or a dug or drilled hole.

Occasionally, a well will not be in the ideal location to obtain the sample needed. For example, a well may not be ideally located for tracking a contaminant plume. In that case, a well will have to be installed, and it may be either temporary or permanent. An experienced and knowledgeable person, preferably a hydrogeologist, will be needed to locate a place for the well and to supervise its installation so that the samples ultimately collected will be representative of the groundwater.

5.5.2 Site Selection

The relationship of the following factors to potential pollution sources shall be considered and evaluated when selecting groundwater sampling sites; the direction of groundwater flow; depth of groundwater; thickness of the aquifer (if applicable); type of stratigraphy; presence of perched water tables; types of soils; depth of bedrock; type of vegetation; surface drainage patterns; type of topography; and general land use. Surface features such as rock outcrops, seeps, springs, streams, rivers, and wet areas should also be considered (14). The area of interest should be located on an aerial photograph, a USGS 7.5 minute quadrangle map, a USDA soils map, and/or any other appropriate map that shows topography and general relationships between surface features. Aerial photographs can usually be obtained at the local Agricultural Stabilization Conservation Service Office or the local county tax office. USGS 7.5 minute quadrangle maps can be acquired from the State Department of Transportation or from the USGS, and soils maps from the USDA-SCS. A visual inspection of the area may be sufficient to evaluate and determine the surface conditions and their relationship to the subsurface conditions (14). In some cases, surface conditions and subsurface conditions cannot be correlated by site inspection or reconnaissance. When this occurs, a more detailed study, possibly involving test drilling, will have to be conducted.

It is extremely important to sample the unconfined or surficial aquifer downgradient of potential pollution sources or spills to determine if this aquifer has been affected. Generally the direction of groundwater flow can be estimated by two vectors - one in the direction of surface water flow (i.e., downstream) and another toward the surface water stream or river, if present. The relative magnitude of these vectors will vary according to site conditions and in some instances, both direction and magnitude may be changed by construction activities. If both shallow and deep aquifers are involved in the zone of interest, a screening study will reveal whether or not the deep aquifer needs to be sampled and/or if a more detailed study is required. To adequately assess subsurface conditions, a minimum of three wells are required, one in the upgradient portion of the area of interest, one in the middle portion, and one in the downgradient portion. In some cases, a more complex system of wells may be needed to define the subsurface conditions. Site conditions and the scope of the project will determine the total number of wells required. Existing wells should be used whenever possible. Where well installation is necessary, the wells should be installed according to the following procedures.

5.5.3 Monitoring Well Installation

Wells shall be dug, driven, drilled, or bored depending on the scope of work. Hand equipment such as augers, post hole diggers, picks, and shovels can be used to dig shallow wells in soft soils. Wells can be installed by driving a piece of casing connected to a well point into the ground with an axe, sledge hammer, or mechanical or power device. Power equipment such as drilling rigs can be used to drill or auger wells in all types of soils and to any depth.

Where feasible the following procedures shall be used for well installation:

5.5.3.1 Temporary Monitoring Wells - For very shallow wells (15 feet) in soft material, hand augers or small portable power augers shall be used for boring. A temporary well casing with a well screen attached shall be installed as soon as the hole is augured.

For deeper temporary wells, larger well drilling equipment should be used with a hollow stem auger wherever possible. The use of a hollow stem auger prevents cave-in of the hole during drilling, allows for the collection of soil samples at various depths during the drilling operation, and may serve as a temporary casing for the well. In some cases the bottom of the auger will become plugged and not allow water to flow into the casing. When this happens, the auger should be pulled and the hole allowed to fill with water. A well casing can be installed if caving occurs.

When the water table is 25 to 30 feet deep, permanent well installation procedures should be considered.

5.5.3.2 Permanent Monitoring Well - Permanent monitoring wells shall be installed using hollow stem augers or continuous flight augers in soil and by standard rock coring procedures when drilling in rock. Where site conditions do not warrant the use of augers, alternate drilling methods such as straight rotary by using mud as a drilling fluid, or air rotary can be used. When muds are used in the drilling, a sample of the mud shall be collected for appropriate analyses. Casings with well screens shall be installed in unconsolidated and semi-consolidated soils to prevent soil and other foreign material from entering the well during pumping. Screens may or may not be required for wells in rock. The space surrounding the screen should be back filled with sand and filter pack and the remainder of the space surrounding the casing above the screen should be backfilled with natural clay, bentonite and/or cement bentonite grout, depending on the conditions at the site. Stainless steel well casings are preferred if samples are to be collected for organic compounds analyses. PVC casings are not acceptable where organic contaminants are a concern or under extremely corrosive conditions (18).

5.5.3.3 Monitoring Well Security - Wells should be capped and locked at the conclusion of installation or sampling for future use, or if the well will not be used in the future, it should be properly abandoned by backfilling with suitable permanent fill materials such as concrete, bentonite, compatible soil, or a combination of these materials (15).

5.5.4 Monitoring Well Development

All permanently installed wells shall be adequately developed prior to initial sampling efforts (14). Adequate development should eliminate all fine material from the area of the well screen and allow for the collection of a sample which is free of suspended materials. Wells installed by "wet drilling" where drilling muds are used shall be developed so that residual drilling muds will not settle around the well screens or in the surrounding soil and contaminate future sampling.

Various methods may be used to develop wells. These methods consist of suction lift pumping (pitcher, centrifugal, roller, piston, peristaltic pumps), pressure ejection pumping, submersible pumping, surge blocks, bailing, and air lift pumping (15, 16, 17).

5.5.5 Purging Equipment and Techniques

5.5.5.1 General - Wells shall be purged before taking samples in order to clear the well of stagnant water which has been standing in the well casing and may not be representative of aquifer conditions. One method of purging is to pump the well until three to five times the volume of standing water in the well has been removed. A second method is to pump the well until the specific conductance, temperature and pH of the groundwater stabilizes. Normally, a combination of the two methods is employed (i.e., specific conductance, temperature, and pH are measured at intervals and a record of the volume purged is monitored). If a well is pumped dry, this constitutes an adequate purge and the well can be sampled following recovery (15, 17).

5.5.5.2 Equipment Available - Monitoring well purging is accomplished by using in-place plumbing/pumps or when in-place pumps are not available, by using a proper equipment, such as peristaltic, turbine, bladder, centrifugal, or other appropriate pump, depending on well depth. A Teflon, closed top bailer may be used for purging; however, bailing stirs up sediment in the well and tends to increase turbidity. Thus pumping is preferred.

Other monitoring equipment used during purging includes water level indicators, pH meters, thermometers, and conductivity bridges.

5.5.5.3 Purging Techniques (Wells Without Plumbing or in Place Pumps)

5.5.5.3.1 General - For permanently installed wells, the depth of water shall be determined (if possible) before purging. This can be accomplished by attaching a weight on the end of tape and lowering it into the well until it touches the water, or by use of a mechanical or electrical water level indicator. Operating personnel shall exercise extreme caution during this procedure to prevent contamination of the well. This is a critical concern when samples for trace organic compounds or metals analyses are collected.

5.5.5.3.2 Using Pumps to Purge - When suction lift or centrifugal pumps are used, only the intake line is placed into the water column. To minimize contamination, the line placed into the water is either standard cleaned Teflon (see Section 4.0), in the case of the suction lift pumps, or standard cleaned stainless steel pipe attached to a hose, when centrifugal pumps are used.

When submersible pumps (bladder, turbine, displacement, etc.) are used, the pump itself is lowered into the water column.

5.5.5.3.3 Using Bailers to Purge - Standard cleaned (Section 4.0) closed-top bailers with nylon rope are lowered into the top of the water column, allowed to fill and be removed, and the water is discarded.

Cleaning and decontamination materials are specifically mentioned as having to be collected and disposed of properly in Section 4.1.6. Purge water should be held in drums, labeled for each well, then disposed of properly in accordance with water quality laboratory results.

5.5.5.3.4 Field Care of Purging Equipment - Regardless of which method is used for purging, new aluminum foil or plastic sheeting shall be placed on the ground surface around the well casing. This is done to prevent contamination of the pumps, hoses, ropes, etc. in the event they need to be placed on the ground during the purging or accidentally come into contact with the ground surface.

It is preferable that hoses used in purging that come into contact with the groundwater be kept on a spool, both during transporting and during field use, to further minimize contamination from the transportation vehicle or ground surface.

5.5.5.3.5 Purging Entire Water Column - The pump/hose assembly or bailer used in purging should be lowered into the top of the standing water column and not deep into the column. This is done so that the purging will "pull" water from the formation into the screened area of the well and up through the casing so that the entire static volume can be removed. If the pump was placed deep into the water column, the water above the pump may not be removed, and the subsequent samples collected may not be representative of the groundwater.

To minimize cross contamination between wells, no more than three to five feet of hose should be lowered into the water column. If the recovery of the well is at least as fast as the pump rate, the pump may be left hanging at the initial level until an adequate volume has been purged. If the pump rate exceeds the recovery rate of the well, the pump will have to be lowered, as needed, to accommodate the draw-down.

After the pump is removed from the well, all wetted portions of the hose and the pump shall be cleaned as outlined in Section 4.0.

Careful consideration shall be given to using pumps to purge wells which are excessively contaminated with oily compounds, because it may be difficult to adequately decontaminate severely contaminated pumps under field conditions. When wells such as this are encountered, alternative purging methods, such as bailers, should be considered.

5.5.4 Purging Techniques - Wells With in-Place Plumbing

5.5.4.1 General - In-place plumbing is found at water treatment plants, industrial water supply wells, private residences, etc. The objective of purging is the same as with monitoring wells without in-place pumps -- to ultimately collect a sample representative of the groundwater.

The volume to be purged depends on several factors: whether the pumps are running continuously or intermittently, how close to the source the sample can be collected, and the presence of any storage/pressure tanks between the sampling point and the pump. If storage/pressure tanks are present, an adequate volume must be purged to totally exchange the volume of water in the tank.

5.5.4.2 Continuously Running Pumps - If the pump runs continuously, and the sample can be collected prior to a storage/pressure tank, no purge, other than opening a valve and allowing it to flush for a few minutes, is necessary.

If the pump runs continuously, and a storage/pressure tank is located ahead of the sample location, the purge must include the entire storage volume to be sure that a sample representative of the goundwater will be collected.

5.5.4.3 Intermittently Running Pumps - If the pump runs intermittently, it is necessary to determine the volume to be purged, including storage/pressure tanks that are located ahead of the sampling location.

The pump should then be run continuously until the required volume has been purged.

5.5.6 Sampling Equipment and Techniques

5.5.6.1 Equipment Available - Sampling equipment which can be used includes closed-top bailers and the peristaltic pump/vacuum jug assembly.

Other monitoring equipment used during sampling includes water level indicators, pH meters, thermometers, and conductivity brides.

5.5.6.2 Sampling Techniques - Wells With in Place Plumbing - Following purging, samples should be collected from a valve or cold water tap as near to the well as possible. Samples should be collected directly into the appropriate containers (see recommended Sample Containers, Appendix 5X.1). Also, refer to the Potable Water Supply discussion in Section 5.6.

5.5.6.3 Sampling Techniques - Wells Without Plumbing - Following purging, samples should be collected using a peristaltic pump - vacuum jug procedure, if possible, or with a closed top bailer. The pump used for purging generally should not be used for sampling. When the peristaltic pump is used, samples for purgeable organic compounds should be collected using a bailer or by allowing the Teflon tube to fill and then allowing the water to drain into the sample vials. All equipment shall be cleaned using the procedures described in Section 4.0. Also, refer to the Potable Water Supply discussion, Section 5.6, for additional information.

When bailing, new foil or plastic sheeting should be placed on the ground around each well to prevent contamination of sampling equipment in the event any equipment is dropped or otherwise comes in contact with the ground. Braided nylon cord may be used to haul the bailer if the nylon cord is used only one time and then discarded. Teflon coated wire, single strand stainless steel wire, or monofilament are acceptable for hauling bailers and may be decontaminated for reuse.

5.5.7 Special Sample Collection Procedures

5.5.7.1 Trace Organic Compounds and Metals - Special sample handling procedures shall be instituted when trace organic compounds and metals samples are being collected. All sampling equipment, including pumps, bailers, drilling equipment, water level measurement equipment, etc., which come into contact with the water in the well must be cleaned in accordance with the cleaning procedures described in Section 4.0. Synthetic drilling mud (i.e., Revert) should not be used when constructing wells which will be used for trace organic compounds and metals sampling. Pumps shall not be used for sampling, unless the interior and exterior portions of the pump and discharge hoses can be thoroughly cleaned. Blanks should be collected to determine the adequacy of cleaning prior to collection of any sample using a pump. Peristaltic pumps using Teflon tubing and a Teflon insert can be used to collect samples without the sample coming into contact with the pump. This is accomplished by placing the Teflon insert into the opening at a standard cleaned gallon glass container (Section 4.0). The Teflon tubing connects the container to the pump and sample source. The pump creates a vacuum in the container, thereby drawing the sample into the container without coming into contact with the pump tubing. Samples for purgeable organic compounds analyses shall be collected with well bailers or by allowing the Teflon tube to fill and then allowing the water to drain into sample collection vials. The procedures given in the General Considerations, Special Precautions for Trace Contaminant Sampling (Section 5.2) shall be followed.

5.5.7.2 Filtering - As a standard DEC BSPR policy, groundwater samples should not be filtered in the field. However, if required by RCRA regulations, then both filtered and non-filtered samples will be submitted for analyses. Proper well installation and development as well as proper well purging technique should minimize the turbidity of samples. Whenever extremely high concentrations of sediment are present in a well sample, the aliquot of the sample for metals analyses should not be preserved without first being filtered. Whenever samples for dissolved metals analyses are collected, an additional sample, unfiltered and acid preserved will also be collected for total metals analyses. Samples for analyses of organic compounds shall never be filtered. When samples are being filtered in the field, the filter apparatus must be cleaned (Section 4.0) and samples must be filtered properly.

5.5.7.3 Bacterial Sampling - Whenever wells (normally potable wells) are sampled for bacteriological parameters, care must be taken to ensure the sterility of all sampling equipment and all other equipment entering the well. Further information regarding bacteriological sampling is available in Sampling for Organic Chemicals and Microorganisms in the Subsurface (19) as well as References 4 and 5.

5.5.8 Specific Sampling Equipment Quality Assurance Techniques

All equipment used to collect groundwater samples shall be cleaned as outlined in Section 4.0 and repaired, if necessary, before being stored at the conclusion of field studies.

All equipment shall be tested before being issued for field studies.

Cleaning procedures conducted in the field (Section 4.0) or field repairs shall be thoroughly documented in field records.

5.5.9 Auxiliary Data Collection

Water table measurements from the top of the well casings (referenced to National Geodetic Vertical Datum) in permanent wells, and ground surface elevation in temporary wells should be made to determine the general direction of groundwater flow and gradient. Traced dyes and thermal detection methods can be used to determine direction and velocities of flow (14). Also, a study of the general topography and drainage patterns will generally indicate direction of groundwater flow.

Water table measurements shall not be taken until the water table has stabilized, preferably 24 hours after well installation for permanent wells (20). The ground surface elevation at the wells should be determined by standard engineering survey practices.

In addition to water level measurements, the pumping rate used to purge a well, the volume of water in wells, and drillers logs are examples of auxiliary data that should be collected during groundwater sampling activities. This information should be documented in field records. Methodology for obtaining these data are given in the following sections.

Temperature, specific conductance, and pH shall be measured each time a well is sampled. This information is generally obtained during the purging process to evaluate the adequacy of the purging procedure. In this situation, the final measurements for these parameters prior to sampling shall be considered the measurement of record for the well. If these parameters were not evaluated during purging, they shall be obtained prior to sampling.

5.5.9.1 Well Pumping Rate - Bucket/Stop Watch Method - The pumping rate of a pump can be determined by collecting the flow of water from the pump in a bucket of known volume and timing how long it takes to fill the bucket. The results should be flow rate in gallons per minute. This method shall be used only with pumps with a constant pump rate, such as gasoline powered or electric submersible pumps. It should not be used with battery powered pumps. As the batteries lose their charge, the pump rate decreases so that pumping time calculations using initial, high pump rates are erroneously short.

5.5.9.2 Volume of Water in Wells - In order to purge wells, the volume of water in the well should be known. To determine the volume, the following method should be used; measure the distance from the bottom of the well to the static water level, then measure the inside diameter of the well or casing. Obtain the volume of the well by the formula:

$$V = 0.041\, d^2 h$$

Where:

h = depth of water in feet
d = diameter of well in inches
V = volume of water in gallons

If preferred, a quick reference nomograph or table may be used.

5.5.9.3 Driller's Log - It is imperative that drilling logs be concise, complete, and described in a manner that is easily understood to all who read them. The following items shall be included in the logging data:

- hole number and location;
- description of soils and subsurface conditions (if applicable);
- type of drilling equipment, driller, and drilling company (if applicable);
- method of drilling;
- type and size of casing;
- type and size of well screen;
- depth to well screen;
- type of pump and pumping rate;
- drilling and sampling times;

- depth to water table, and date and time measured;
- types of samples taken and depths at which the sample was taken;
- volume of water purged;
- type of well (permanent or temporary);
- type of sampling equipment and/or cleaning procedure; and
- depth of sampling and description (if applicable).

Additional groundwater related data can be obtained from most local, state, and federal agencies dealing with water resources. Some sites require well drillers to be licensed, and all work performed on wells must be reported to the state on prescribed forms. These forms are available to the public, so a study of wells installed in the area of interest will provide background information as to the subsurface conditions. State geological surveys, as well as the USGS, have various types of water related papers and reports on all phases of groundwater studies in each state. City and county governments usually have departments that deal with water related projects that may provide data for the local area. Federal agencies such as the U.S. Army Corps of Engineers, the Bureau of Reclamation, U.S. Forest Service, Science and Education Administration, and the U.S. Public Health Service have water programs and may provide data. Other sources include the Bureau of Mines, colleges, universities, and technical societies such as the American Association of Petroleum Geologists, American Institute of Mining and Metallurgical Engineers, National Water Well Association, Association of Engineering Geologists, and Geological Society of America (14,21).

5.6 SAMPLING OF POTABLE WATER SUPPLIES

5.6.1 General

When sampling potable water supplies, utmost care must be taken to insure that samples are representative of the water supply being sampled. This is important not only from a technical and public health perspective, but also from a public relations standpoint. Poor sampling techniques may result in incorrect results (either not detecting a compound which is present or by contaminating the sample and falsely indicating a compound which is not present). If incorrect results are disclosed to the public, it may be very difficult to change public opinion when correct results are reported.

5.6.2 Sampling Site Selection/Sampling Techniques

Even though the same care and techniques used in groundwater, etc., sampling (including thorough documentation of location, date, time, etc.) are used by sampling personnel in potable water supply sampling, there are certain additional special procedures which shall be used.

When water samples are collected from wells, either by mechanical or hand pumping, the wells must be purged before the sample is collected (see Section 5.5 for groundwater sampling methods). This procedure insures that water in the well field is sampled, not the standing water in the pump or holding tank. As a rule of thumb, at least one volume of water in the well casing and storage tank should be evacuated (see Section 5.5.5.4 for more details). This also insures that any contaminants that might have entered the area of the tap from external sources are flushed away (19).

Potable water samples shall be representative of the water quality within a given amount of the distribution network. Taps selected for sample collection should be supplied with water from a service pipe connected directly to a water main in the segment of interest and should not be separated from the segment of interest by a storage tank. The sampling tap must be protected from exterior contamination associated with being too close to the sink bottom or to the ground. Contaminated water or soil from the faucet exterior may enter the bottle during the collecting procedure since it is difficult to place a bottle under a low tap without grazing the neck interior against the outside faucet surface. Leaking taps that allow water to flow out from around the stem of the valve handle and down the outside of the faucet, or taps in which water tends to run up on the outside of the lip, are to be avoided as sampling locations. Aerator, strainer, and hose attachments on the tap must be removed before sampling. These devices can harbor a bacterial population if they are not cleaned routinely or replaced when worn or cracked. Whenever a steady stream of water cannot be obtained from taps, after such devices are removed, a more suitable tap shall be sought. Taps where the water flow is not steady should be avoided because temporary fluctuation in line pressure may cause sheets of microbial growth that are lodged in some pipe section or faucet connection to break loose and contaminate the sample. The cold water tap should be opened for two or three minutes or for sufficient time to permit clearing of the service line. A smooth-flowing water stream at moderate pressure without splashing should be obtained. Then, without changing the water flow which could dislodge some particles in the faucet, the samples can be collected (19).

Regardless of the type of sample bottle being used, the bottle cap should not be placed on the ground or in a pocket. Instead, hold the bottle in one hand and the cap in the other, keeping the bottle cap right side up (threads down) and using care not to touch the inside of the cap. Exercise care not to lose the Teflon liner in certain bottle caps. Avoid contaminating the sample bottle with fingers or permitting the faucet to touch the inside of the bottle. When sampling for bacterial content, the bottle should not be rinsed before use. This may not only contaminate the bottle, but also remove the thiosulfate dechlorinating agent (if used). When filling any container, care should be taken so splashed drops of water from the ground or sink do not enter into either the bottle or cap. In order to avoid dislodging particles in the pipe or valve, do not adjust the stream flow while sampling.

When sampling at a water treatment plant, samples should be collected both from the raw water supply and after chlorination.

Duplicate samples will always be collected for VOA and bacterial analyses. Single samples may be collected for extractable organic compounds, metals, phenol, cyanide, and conventional parameter analyses. The procedures given in Section 5.2.9 (Special Precautions for Trace Contamination Sampling) and in the Section 5.6.2.1 below (Purgeable Organic Compounds Sample Collection) shall always be followed when potable water supplies are sampled.

DEC BSPR or contractor shall always obtain the name(s) of the resident or water supply owner/operator and the resident's exact mailing address, as well as the resident's home and work telephone numbers. The information is required so that the residents or water supply owner/operators can be informed of the results of the sampling program.

5.6.2.1 Purgeable Organic Compounds Analyses (VOA) - Samples to be analyzed for purgeable organic compounds should be stored in 40 ml septum vials with screw caps that have a Teflon lined silicone disk in the cap to prevent contamination and loss of the sample through the cap. The disks should be placed in the caps (Teflon in contact with the sample) in the laboratory prior to the beginning of the sampling program.

When sampling for purgeable organic compounds, duplicate samples should always be collected from each location. The investigator should determine if the water to be sampled contains chlorine. If the water contains no chlorine, two 40-ml vials containing four drops of concentrated HCl should be filled with the sample and labeled PA (preserved acid). If the sample contains no chlorine and only if it will be analyzed within 24 hours, the HCl preservation is not necessary. If the water contains chlorine, the following sampling and preservation procedure should be followed:

- Fill a 4-ounce (120 ml) soil VOA sampling container containing 0.008 percent sodium thiosulfate with the water sample. Cap and mix thoroughly but gently by swirling to eliminate residual chlorine. Transfer the sample to two 40-ml VOA vials containing four drops of concentrated HCl*. Label 40-ml vials - PTA (preserved/sodium thiosulfate/acid).

* The sodium thiosulfate preservatives must be added in this order and in two separate steps because HCl reacts with sodium thiosulfate.

The purgeable organics vials (40-ml) should be completely filled to prevent volatilization, and extreme caution should be exercised when filling a vial to avoid any turbulence which could also produce volatilization. The sample should be carefully poured down the side of the vial to minimize turbulence. As a rule, it is best to gently pour the last few drops into the vial so that surface tension holds the water in a "convex meniscus". The cap is then applied and some overflow is lost, but air space in the bottle is eliminated. After capping, turn the bottle over and tap it to check for bubbles; if any are present, repeat the procedure.

Sampling and preservation containers should be prelabeled (i.e., PA, PT, or PTA) prior to any field activities. This will reduce the chances of confusion during sampling activities by the investigation team.

5.6.3 Sampling Equipment/Specific Sampling Equipment Quality Assurance Techniques

Sampling equipment and specific equipment quality assurance techniques are contained in Section 5.5 (Groundwater Sampling).

5.7 SOIL SAMPLING

5.7.1 General

The objective of this section is to give general guidance for the collection of soil samples during field investigations. Guidance for preparing soil sampling protocols, including statistical sampling methodology are included in the EPA publication "Preparation of Soil Sampling Protocol, Techniques and Strategies" (22).

5.7.2 Sampling Location/Site Selection

Any site selected for soil sampling shall be strategically located in order to collect a representative fraction of the soils with the minimum number of samples and amount of effort. A surface inspection of the subject area shall be made to locate pertinent features (e.g., rock outcrops, drainage patterns, surface runoff, ponds, lakes, wet areas, seeps, springs, permanent structures, fill areas, erosional areas, depositional areas, etc.) and to evaluate the relationship between these features and potential sources of pollution. The location of sediment depositional areas are good indicators of surface runoff direction. If the direction of surface runoff or drainage is difficult to detect, observation of new depositions or sediment movement following a rain may prove helpful in establishing this direction. The spreading or fanning of the sediment body will indicate direction of flow.

In most instances, the first investigation of a site will be a reconnaissance type survey. Soil sampling in these instances will generally be confined to surface or near-surface soils and/or sediments with hand equipment. For screening purposes, sampling of this type should be conducted in depositional areas on the periphery of the study area, primarily at the downstream or downgradient portion(s) of the area of interest; however, an upgradient location should also be selected for obtaining background and/or control samples. Investigators should be aware that sampling in depositional areas tends to bias the sampling toward elevated concentrations, which is useful as a screening tool, but should not be construed as representative of the area conditions.

More in-depth investigations are usually conducted after a preliminary study or reconnaissance survey has been completed. Review of previous investigations will aid in selection of suitable sampling locations, and these studies should be examined when the study plan for the more detailed study is prepared. The number of samples and the number of test pits and/or borings and the specific depth that samples are collected will vary according to the site conditions and the scope of the investigation. A determination of soil sample number and location based on statistical concept is discussed in Section 6B.1.

5.7.3 Equipment Available

The following equipment is available for field use in soil sampling: stainless steel spoons; stainless steel hand augers; stainless steel shovels; Shelby tubes; portable power augers (Little Beaver); stainless steel scoops; glass pans; and drill rigs and associated equipment (i.e., split spoon samplers), which may, on occasion, be rented or borrowed for special projects.

5.7.4 Sampling Techniques

5.7.4.1 General - Sampling is often conducted in areas where a vegetative turf has been established. In these cases a clean stainless steel shovel should be used to carefully remove the turf so that it may be replaced at the conclusion of sampling. When the soil sample is obtained, it should be deposited into a glass pan for mixing (or compositing, if applicable) prior to filling in the sample containers. Mixing of the soil sample for non-volatile or non-semi volatile chemical analysis should be performed in accordance with the procedures outlined in Section 5.7.4.5. If an undisturbed sample is needed, the Shelby tube sampler may be used as described in Section 5.7.4.2.

If practical, and at the project leader's discretion, all trenches or holes that were excavated for sampling should be filled in and the turf replaced.

5.7.4.2 Surface Soil Sampling - Prior to sampling, leaves, grass, and surface debris should be removed from the area to be sampled using a clean stainless steel spoon or shovel. Surface soil samples shall then be collected using a precleaned, stainless steel scoop or spoon.

5.7.4.3 Shallow Subsurface Soil Sampling - Shallow subsurface soil samples may be collected by digging a hole or trench with a stainless steel shovel, then removing all of the loose soil and collecting a sample at the desired depth using a stainless steel spoon, a stainless steel hand auger, or a Shelby tube.

The stainless steel hand auger consists of three basic parts: (1) the bucket, (2) extension, and (3) handle. At the bottom end of the bucket are two cutting edges. The extensions are three feet long. When sampling deeper subsurface soil (Section 5.7.4.4), a number of extensions may be joined end to end to increase the depth from which soil may be sampled.

The Shelby tube is a stainless steel tube approximately 12 inches long and 2 inches in diameter. One end of the tube has the edges beveled into a cutting edge. The other end can be mounted on an adapter which allows attachment to the end of the hand auger. The Shelby tube is pushed into the soil to be sampled and then removed. The tube can then be removed from the adapter and the soil pushed out using a decontaminated piece of equipment such as the handle of a stainless steel spoon. If an undisturbed sample is required, the Shelby tube with its sample intact may be shipped directly to the laboratory for analyses.

5.7.4.4 Deeper Subsurface Soil Sampling - For deeper sampling using hand equipment, a stainless steel auger (see Section 5.7.4.3) is used to bore a sampling hole until the desired depth is reached. Another clean auger bucket or a Shelby tube is then used to collect the sample which is placed in a glass pan as described in Section 5.7.4.1. Surface debris should be removed from the location of the sampling hole using a clean, stainless steel shovel or spoon before auguring operations are initiated.

Often the depth which can be reached using a hand auger is limited due to the soil having low cohesion which leads to the hole collapsing or to the soil being very tightly packed, which can make turning and removing the auger difficult. In cases such as these, a portable power auger Little Beaver may be used to reach the desired depth. The sample can then be collected as described in the previous paragraph. The portable power auger consists of a powered drive unit (hand-held) used by sampling personnel to drive crew-like auger flights. The auger flights should be cleaned using the same procedures as for the other soil sampling equipment (Section 4.0). For safety reasons, the Little Beaver portable power auger should never be used with less than two sampling personnel present.

The split spoon sampler may be used for sampling at greater depths. Because of its weight, the split spoon sampler is generally used with power equipment, i.e., drilling rig. A hollow stem auger is used to advance the hole to the desired depth. The split spoon is added to the correct length of drill rod and forced into the undisturbed soil by means of a 140-pound weight or hammer. The split spoon is retrieved from the hole and opened to reveal the sample. The top two or three inches of the sample normally will be disturbed and should be discarded. The undisturbed portion should be placed in a glass pan by means of a clean, stainless steel spoon or spatula. The procedure is repeated until the desired amount of sample is collected. The sample should then be thoroughly mixed.

5.7.4.5 Mixing - Regardless of the method of collection, soil samples collected for non-volatile chemical analyses should be thoroughly mixed before being placed in the appropriate sample containers. The soil should be removed from the sampling device (dredge, core tube, scoop, etc.) and placed in a glass or Teflon coated stainless steel pan. The soil in the pan should be scraped from the sides, corners, and bottom of the pan, rolled to the middle of the pan, and initially mixed. The sample should then be quartered and moved to the four corners of the container. Each quarter of the sample should be mixed individually. Each quarter is then rolled to the center of the container and the entire sample is mixed again.

This procedure should be continued to ensure that all parts of the sample are mixed and that the sample is as homogenous as possible before being placed in the sample containers.

5.7.5 Special Precautions for Trace Contaminant Soil Sampling

The procedures outlined in Section 5.2.11 shall be followed. All soil sampling equipment used for sampling of trace contaminants should be constructed of stainless steel whenever possible. In no case will chromium, cadmium, or galvanized plated or coated equipment be used for soil sampling operations. Similarly, no painted equipment shall be used. All paint and primer must be removed from soil sampling equipment by sandblasting or other means before such equipment can be used for collecting soil samples.

5.7.6 Soil Samples Collected for Purgeable Organic Compounds Analyses (VOA)

When soil samples collected for purgeable organic compounds analyses need to be mixed in field, they should be done properly and placed in containers as soon as possible after sampling. The sample should be placed in the sample container so that no head space is left in the container after the container is closed.

5.7.7 Specific Sampling Equipment Quality Assurance Techniques

Drilling rigs and other major equipment used to collect soil samples shall be identified so that they can be traced through field records. A log book shall be established for this equipment so that all cleaning, maintenance and repair procedures can be traced to the person performing these procedures and to the specific repairs made. Sampling spoons, hand augers, Shelby tubes, and other minor disposable type equipment are exempted from this equipment identification requirement.

All equipment used to collect soil samples shall be cleaned as outlined in Section 4.0 and repaired, if necessary, before being stored at the conclusion of field studies.

Any cleaning conducted in the field (Section 4.0) or field repairs should be thoroughly documented in field records.

5.7.8 Auxiliary Data Collection

In addition to information pertaining to an area of specific site/location that may be available in DEC BSPR files from previous investigations (i.e., site screenings, water quality, well monitoring studies, etc.) information and data may be obtained from various city, county, federal, and other state agencies.

A system of logging all pertinent data collected during drilling and sampling operations should be maintained. The test hole locations should be recorded and referenced to the site map and/or datum base so that each location can be permanently established. Samples should be accurately tagged and labeled with all pertinent site information at the time of sampling.

APPENDIX 5X.1
RECOMMENDED SAMPLE CONTAINERS, SAMPLE PRESERVATION, MAXIMUM SAMPLE HOLDING TIMES, AND PERMISSIBLE SAMPLE TYPES

Parameter	Container	Preservative	Maximum Holding Time	Permissible Sample Type	Reference
Concentrated Waste Samples					
Organic Compounds	8-oz. widemouth glass with Teflon liner	None	7 days	G or C	A
Metals and Other Inorganic Compounds	8-oz. widemouth glass with Teflon liner	None	7 days	G or C	A
EP Toxicity	8-oz. widemouth glass with Teflon liner	None	7 days	G or C	B
Flash Point and/or Heat Content	8-oz. widemouth glass with Teflon liner	None	ASAP - NS	G	B
Fish Samples					
Organic Compounds	Wrap in aluminum foil	Freeze	ASAP	G or C	A
Metals and Other Inorganic Compounds	Place in plastic ziplock bag	Freeze	ASAP	G or C	A
Liquid - Low to Medium Concentration Samples					
Alkalinity	500-ml or 1-liter poly-[1] ethylene with polyethylene or polyethylene lined closure	Cool, 4°C	12-14 days	G or C	C
Acidity	500-ml or 1-liter poly-[1] ethylene with polyethylene or polyethylene lined closure	Cool, 4°C	12-14 days	G or C	C
Bacteriological Tests (coliform)	250-ml glass with glass closure or plastic capable of being autoclaved	Cool, 4°C	6 hrs.	G	C

Parameter	Container	Preservative	Maximum Holding Time	Permissible Sample Type	Reference
Liquid - Low to Medium Concentration Samples (Continued)					
Static Bioassay	1-gal. amber glass (not solvent rinsed)	Cool, 4°C	48 hrs.	G or C	D
Biochemical Oxygen Demand (BOD)	1/2-gal. polyethylene[1] with polyethylene closure	Cool, 4°C	48 hrs.	G or C	C
Chloride	500-ml or 1-liter poly-[1] ethylene with polyethylene or polyethylene lined closure	None	28 days	G or C	C
Chlorine Residual	In-situ, beaker or bucket	None	Analyze Immediately	G	C
Color	500-ml or 1-liter poly-[1] ethylene with polyethylene or polyethylene lined closure	Cool, 4°C	48 hrs.	G or C	C
Conductivity	500-ml or 1-liter poly-[1] ethylene with polyethylene or polyethylene lined closure	Cool, 4°C	28 days (determine on site if possible)	G or C	C
Chromium, Hexavalent	1-liter polyethylene with polyethylene closure	Cool, 4°C	24 hrs.	G	C
Cyanide	1-liter or 1/2-gallon polyethylene with polyethylene or polyethylene lined closure	Ascorbic Acid[2],[3] Sodium Hydroxide, pH>12, Cool,4°C.	14 days	G	C
Dissolved Oxygen (Probe)	In-situ, beaker or bucket	None	Determine On Site	G	C
Dissolved Oxygen (Winkler)	300-ml glass, BOD bottle	Fix on site, store in dark	8 hrs. (determine on site if possible)	G	C

Liquid - Low to Medium Concentration Samples (Continued)

Parameter	Container	Preservative	Maximum Holding Time	Permissible Sample Type	Reference
EP Toxicity	1-gal. glass (amber) with Teflon liner	Cool, 4°C	7 days till extraction	G or C	B
Fluoride	1-liter polyethylene or [1] 1/2-gal. polyethylene with polyethylene or polyethylene lined closure	None	28 days	G or C	C
Hardness	500-ml or 1-liter polyethylene with polyethylene or polyethylene lined closure	50% Nitric[2] Acid, pH <2	6 months	G or C	C
LAS	500-ml or 1-liter poly-[1] ethylene with polyethylene or polyethylene lined closure	Cool, 4°C	48 hrs.	G or C	C
Metals (Total)	1-liter polyethylene with polyethylene lined closure	50% Nitric[2] Acid, pH <2	6 months (except Hg, Cr^{+6})	G or C	C
Metals, Dissolved	1-liter polyethylene with polyethylene lined closure	Filter-on-site[2] 50% Nitric Acid, pH <2	6 months (except Hg, Cr^{+6})	G	C
Nutrients[4] (NH_3, COD, TOC, nitrate-nitrite, etc.)	1-liter polyethylene or 1/2-gal. polyethylene with polyethylene or polyethylene lined closure	50% Sulfuric[2] Acid, pH <2 Cool, 4°C	28 days	G or C	C
Oil and grease	1-liter widemouth glass with Teflon liner	50% Sulfuric[2] Acid, pH <2 Cool, 4°C	28 days	G	C

Parameter	Container	Preservative	Maximum Holding Time	Permissible Sample Type	Reference
Liquid - Low to Medium Concentration Samples (Continued)					
Organic Compounds -- Extractable and Pesticide Scan					C
No Residual Chlorine Present	1-gal. amber glass or 2 1/2-gal. amber glass with Teflon liner	Cool, 4°C	5-7 days[5]	G or C	C
Residual Chlorine Present	1-gal. amber glass or 2 1/2-gal. amber glass with Teflon liner	Add 3 ml 10% sodium thiosulfate per gallon Cool, 4°C	5-7 days[5]	G or C	C
Organic Compounds - Purgeable (VOA)					
No Residual Chlorine Present	2 40-ml vials with Teflon lined septum caps	4 drops conc. hydrochloric acid, Cool, 4°C	14 days	G	C
No Residual Chlorine Present	2 40-ml vials with Teflon lined septum caps	Cool, 4°C	7 days	G	C
Residual Chlorine Present	2 40-ml vials with Teflon lined septum caps	Footnote 6	14 days	G	C
Organic Compounds - Specified and Pesticides (Non-Priority Pollutants such as Herbicides)	1-gal. galss (amber) or 2 1/2-gal. glass (amber) with Teflon lined closure	Footnote 7	7 days[7]	G or C	C
Organic Halides - Total (TOX)	250-ml amber glass with Teflon lined septum closure	Cool, 4°C	7 days	G	E
pH	In-situ, beaker or bucket	None	Analyze Immediately	G	C
Phenols	1-liter amber glass with Teflon lined closure	50% Sulfuric Acid, pH <2 Cool, 4°C	28 days	G	C

Liquid - Low to Medium Concentration Samples (Continued)

Parameter	Container	Preservative	Maximum Holding Time	Permissible Sample Type	Reference
Phosphate-Ortho	500-ml or 1-liter polyethylene with polyethylene or polyethylene lined closure	Filter-on-site Cool, 4°C	48 hrs.	G	C
Phosphorus, Total Dissolved	500-ml or 1-liter polyethylene with polyethylene or polyethylene lined closure	Filter-on-site 50% Sulfuric Acid, pH < 2, Cool,4°C	28 days	G	C
Solids, Settleable	1/2-gal. polyethylene with polyethylene closure	Cool, 4°C	48 hrs.	G or C	C
Solids (Total and Suspended, etc.)	500-ml or 1-liter poly-[1] ethylene with polyethylene or polyethylene lined closure	Cool, 4°C	7 days	G or C	C
Sulfates	500-ml or 1-liter poly-[1] ethylene with polyethylene or polyethylene lined closure	Cool, 4°C	28 days	G or C	C
Sulfides	500-ml or 1-liter poly-[2] ethylene with polyethylene or polyethylene lined closure	2 ml Zinc Acetate[2] Conc. Sodium Hydroxide to pH >9, Cool, 4°C	7 days	G	C
Temperature	In-situ, beaker or bucket	None	Determine On Site	C	C
Turbidity	500-ml or 1-liter poly-[1] ethylene with polyethylene or polyethylene lined closure	Cool, 4°C	48 hrs.	G or C	C

Parameter	Container	Preservative	Maximum Holding Time	Permissible Sample Type	Reference
Soil, Sediment or Sludge Samples - Low to Medium Concentration					
E.P. Toxicity	8-oz. widemouth glass with Teflon lined closure	Cool, 4°C	7 days till extraction	G or C	B
Metals	8-oz. widemouth glass with Teflon lined closure	Cool, 4°C	6 months	G or C	A
Nutrients Including: Nitrogen, Phosphorus, Chemical Oxygen Demand	500-ml polyethylene with polyethylene closure or 8 oz. widemouth glass with Teflon lined closure	Cool, 4°C	ASAP	G or C	A
Organics - Extractable	8-oz. widemouth glass with Teflon liner	Cool, 4°C	ASAP	G or C	A
Organics - Purgeable (VOA)	4-oz. (120 ml) widemouth glass with Teflon liner	Cool, 4°C	7 days	G or C	A
Other Inorganic Compounds - Including Cyanide	500-ml polyethylene with polyethylene closure or 8-0z. widemouth glass with Teflon lined closure	Cool, 4°C	7 days	G or C	A
Radiological Tests					
Alpha, beta, gamma	Polyethylene container with polyethylene closure	HNO_3 to pH < 2	6 months	G or C	

Abbreviation:
G = Grab
C = Composite
ASAP = As Soon As Possible
NS = Not Specified

Footnotes:

1. Use indicated container for single parameter requests, 1/2-gallon polyethylene container for multiple parameter requests except those including BOD, or 1-gallon polyethylene container for multiple parameter request which include BOD.

2. Must be preserved in the field at time of collection. For dissolved metals, the sample must be filtered through a 0.45 membrane filter immediately after collection and prior to preservation in the field.

3. Use ascorbic acid only if the sample contains residual chlorine. Test a drop of sample with potassium iodide-starch test paper; a blue color indicates need for treatment. Add ascorbic acid, a few crystals at a time, until a drop of sample produces no color on the indicator paper. Then add an additional 0.6 g of ascorbic acid for each liter of sample volume.

4. May include nitrogen series (ammonia, total Kjeldahl nitrogen, nitrate-nitrite), total phosphorus, chemical oxygen demand and total organic carbon.

5. Samples must be extracted within seven days and extract must be analyzed within 40 days.

6. Collect the sample in a 4 oz. soil VOA container which has been pre-preserved with four drops of 10 percent sodium thiosulfate solution. Gently mix the sample and transfer to a 40 ml VOA vial that has been pre-preserved with four drops concentrated HCl, cool to 4°C.

7. See Organic Compounds - Extractable (the 4th page of this appendix). The Analytical Laboratory should be consulted for any special organic compound analyses in order to check on special preservation requirements and or extra sample volume.

References:

A. US-EPA, Region IV, Environmental Services Division, "Analytical Support Branch, Operations and Quality Control Manual," June 1, 1985 or latest version.

B. EPA Method 1310, Extraction Procedures, "SW 846," US-EPA, Office of Solid Wastes, Washington, DC, 1982.

C. 40 CFR Part 136, Federal Register, Vol. 49, No. 209, October 26, 1984.

D. US-EPA, Region IV, Environmental Services Division, "Ecological Support Branch, Standard Operating Procedures Manual," latest version.

E. EPA Interim Method 450.1, "Total Organic Halide," US-EPA, ORD, EMSL, Physical and Chemical Methods Branch, Cincinnati, Ohio, November 1980.

APPENDIX 5X.2 – CHAIN-OF-CUSTODY, DOCUMENT CONTROL, AND STANDARD OPERATING PROCEDURES

The objectives of this section are to present the laboratory proper operating procedures for sample identification, sample control, chain-of-custody, maintenance of records, and document control.

The laboratory should not deviate from the procedures described herein without the written approval of the Bureau of Spill Prevention and Response, or without a DEC approved equivalent.

1. Sample Chain-of-Custody

A sample is physical evidence collected from a facility or from the environment. An essential part of hazardous chemical or material investigations is that samples and data may be used as evidence in NYSDEC enforcement proceedings. To satisfy enforcement uses of the data, the following chain-of-custody procedures have been established.

1.1 Sample Identification

To ensure traceability of samples while in possession of the laboratory, a method for sample identification shall be developed and documented in laboratory Standard Operating Procedures (SOPs) (see Section 3). Each sample or sample preparation container shall be labeled with a unique number identifier (or the NYSDEC Sample Number). This identifier shall be cross-referenced to the NYSDEC Sample Number. There shall be a written description of the method of assigning this identifier and attaching it to the sample container included in the laboratory SOPs.

Samples, other than those collected for in-situ field measurements or analyses, are identified by using a sample tag which is attached to the sample container. In some cases, particularly with biological samples, the sample tag may have to be included with or wrapped around the sample. The sample tags are sequentially numbered and are accountable documents after they are completed and attached to a sample or other physical evidence. The following information shall be included on the sample tag:

- DEC spill, project number and name;
- field identification or sample point number;
- date and time of sample collection;
- designation of the sample as a grab or composite;
- type of sample (groundwater, wastewater, leachate, soil, sediment, etc.) and a very brief description of the sampling location;
- the signature(s) of the sampler(s);
- whether the sample is preserved or unpreserved;
- the general types of analyses to be conducted (VOA, PAH, EPA 624, etc.)
- any relevant comments (such as readily detectable or identifiable odor, color, or known toxic properties).

1.2.1 A Sample is under custody if:

- It is in your actual possession,
- It is in your view after being in your physical possession,
- It was in your possession and then you locked or sealed it up to prevent tampering, or
- It is in a secure area.

1.2.2 - Upon receipt of the samples in custody, the laboratory shall inspect the shipping

FIGURE 5X.2-1 (Example)
Sample Chain-of-Custody Record*

Must be completed for samples that might be used for enforcement proceedings or litigation.

Sample ID (Lab Use Only)	Field Reference No.	Date/Time Collected	Sample Collection Point	Type/Number: Water, Air, Soil, Etc.	Remark

Specify Method of Preservation

______ NaOH

______ Cool, 4°C

______ Acidification (specify)

______ Other (specify)

Transporting Samples

During transport of the sample from sampling site to laboratory, the chain-of-custody must be unbroken. Generally, this will require that the sample be delivered by the sample collector or a designated representative, who will sign for the receipt, integrity, and transfer of the sample during shipment. <u>If integrity of sample is questioned, describe problem on reverse side of this form</u>.

CUSTODY OF SAMPLES

Name Affiliation Date

Time

1. Sample Container:
   Prepared by: ______ ______ ______ ______
2. Received by: ______ ______ ______ ______
3. Received by: ______ ______ ______ ______
4. Sample Collected by: ______ ______ ______ ______
5. Sample Received by: ______ ______ ______ ______
6. Sample Received by: ______ ______ ______ ______
7. Sample Received by: ______ ______ ______ ______
8. Sample Received by: ______ ______ ______ ______
9. Sample Received by: ______ ______ ______ ______
10. Sample Rec'd for Lab by: ______ ______ ______ ______
11. Sample Accessed by: ______ ______ ______ ______

___* This form was developed based on the chain-of-custody report used by Center for Laboratories and Research, New York State Department of Health.

FIGURE 5X.2-2 (Example)
RECEIPT FOR SAMPLES FORM

PROJECT NO.:	PROJECT NAME:	Name of Facility/Site:

SAMPLERS (Signature)

Facility/Site Location:

Split Samples Offered
( ) Accepted ( ) Declined

STATION NO.	DATE	TIME	COMP	GRAB	SPLIT SAMPLES	TAG NUMBERS	SITE/STATION DESCRIPTION	NO. OF CONTAINERS	REMARKS

Transferred by: (Signature)

Received by: (Signature) Telephone

Date: Time:

Title: Date: Time:

Distribution: Original to Coordinator Field Files: Copy to Facility/Site Representative container and sample bottles and shall document receiving information as specified in Section 3.2. The sample custodian or a designated representative shall sign and date appropriate receiving documents at the time of receipt (i.e. chain-of-custody forms (Figure 5X.2-1), Contract Lab Receipt of Samples Information Sheets (Figure 5X.2-2), airbills, etc.). The laboratory shall contact the Bureau of Spill Prevention and Response if documents are absent, if information on receiving documents does not agree, if custody seals are not intact, or if the sample is not in good condition. The laboratory shall document resolution of any discrepancies, and this documentation shall become a part of the permanent case file.

1.2.3 - Once samples have been accepted by the laboratory, checked, and logged in, they must be maintained in accordance with custody and security requirements specified in 3.3.

2. Document Control Procedures

The goal of the laboratory document control program is to ensure that all documents for a specified case will be accounted for when the project is completed. Accountable documents used by Contractor laboratories shall include, but not be limited to, logbooks, chain-of-custody records, sample work sheets, bench sheets, and other documents relating to the sample or sample analyses. The following document control procedures have been established to ensure that all laboratory records are assembled and stored for delivery to NYSDEC upon request from NYSDEC.

2.1 Pre-printed Data Sheet and Logbooks

Pre-printed data sheets shall contain the name of the laboratory and be dated and signed by the analyst or individual performing the work. All documents produced by the laboratory which are directly related to the preparation and analysis of NYSDEC samples shall become the property of the NYSDEC and shall be placed in the case file. For that reason, all observations and results recorded by the laboratory, but not on pre-printed data sheets, shall be entered into permanent laboratory logbooks. The person responsible for the work shall sign and date each entry and/or page in the logbook. When all data from a case is compiled, copies of all NYSDEC case-related logbook entries shall be included in the documentation package. Analysts' logbook entries must be in chronological order and shall include only one Case per page. Instrument run logs shall be maintained so as to enable a reconstruction of the run sequences of individual instruments.

Because the laboratory must provide copies of the instrument run logs to NYSDEC, the laboratory may exercise the option of using only laboratory or NYSDEC sample identification numbers in the logs for sample ID rather than government agency or commercial client names.

Using laboratory or NYSDEC Sample Number ID's only in the run sequences will assist the laboratory in preserving the confidentiality of commercial clients.

2.2 Error Correction Procedure

All documentation in logbooks and other documents shall be in ink. If an error is made, corrections shall be made by crossing a line through the error and entering the correct information. Changes shall be dated and initialed. No information shall be obliterated or rendered unreadable.

2.3 Consistency of Documentation

Before releasing analytical results, the laboratory shall assemble and cross-check the information on sample tags, custody records, lab bench sheets, personal and instrument logs, and other relevant data to ensure that data pertaining to each particular sample or case is consistent throughout the case file.

2.4 Document Numbering and Inventory Procedure

In order to provide document accountability of the completed analysis records, each item in a case shall be inventoried and assigned a serialized number and identifier associating it to the case and region.

Case # - Region - Serialized Number (For Example: 75-2-0240)

The number of pages of each item must be accounted for if each page is not individually numbered. All documents relevant to each case, including logbook pages, bench sheets, mass spectra; chromatographs, custody records, library search results, etc., shall be inventoried. The laboratory shall be responsible for ensuring that all documents generated are placed in the file for inventory and are delivered to NYSDEC in the Case File Purge package. Figure 1 is an example of a document inventory.

FIGURE 1 (Example)
DOCUMENT INVENTORY

Document Control #*	Document Type	# Pages
232-2-0001	Case File Document Inventory Sheet	1
232-2-0002	Chain-of-Custody Records	2
232-2-0003	Shipping Manifests	2
232-2-0004	Sample Tags	50
232-2-0005	Contract Lab Sample Information Sheets	10
232-2-0006	Inorganics Analysis Data Summary Sheets	10
232-2-0007	Analysts' Notebook Pages	14
232-2-0008	ICP and AA Instrument Logbook Pages	12
232-2-0009	GC/MS Spectra for Sample R-388-061-01	
232-2-0010	GC/MS Spectra for Sample R-388-0610-2	
etc.	etc.	etc.

* This number is to be recorded on each set of documents.

2.5 Shipping Data Packages and Case Files

The laboratory shall have written procedures to document shipment of deliverables packages to the recipients. These shipments require custody seals on the containers placed such that it cannot be opened without damaging or breaking the seal. The laboratory shall also document what was sent, to whom, the date, and the method (carrier) used.

3. Standard Operating Procedures

The laboratory must have written standard operating procedures (SOPs) for: (1) receipt of samples, (2) maintenance of custody, (3) sample storage, (4) tracking the analysis of samples, and (5) assembly of completed data.

An SOP is defined as a written narrative step-by-step description of laboratory operating procedures including examples of laboratory documentation. The SOPs must accurately describe the actual procedures used in the laboratory, and copies of the written SOPs shall be available to the appropriate laboratory personnel. These procedures are necessary to ensure that analytical data produced under this protocol are acceptable for use in NYSDEC enforcement case preparation and litigation. The laboratory's SOPs shall provide mechanisms and documentation to meet each of the following specifications and shall be used by NYSDEC as the basis for laboratory evidence audits.

3.1 The laboratory shall have a designated sample custodian responsible for receipt of samples and have written SOPs describing his/her duties and responsibilities.

3.2 The laboratory shall have written SOPs for receiving and logging in of the samples. The procedures shall include but not be limited to, documenting the following information:

- Presence or absence of appropriate chain-of-custody forms
- Presence or absence of airbills
- Presence or absence of appropriate Contract Lab Receipt of Samples Information Sheet
- Presence or absence of custody seals on shipping and/or sample containers and their condition
- Presence or absence of sample tags
- Sample tag ID numbers if not recorded on the chain-of-custody record(s) or packing list(s)
- Condition of the shipping container
- Condition of the sample bottles
- Verification of agreement or non-agreement of information on receiving documents
- Resolution of problems or discrepancies with the Bureau of Spill Prevention and Response.

3.3 The laboratory shall have written SOPs for maintenance of the security of samples after log-in and shall demonstrate security of the sample storage and laboratory areas.The SOPs shall specifically include descriptions of all storage areas for NYSDEC samples in the laboratory, and steps taken to prevent sample contamination. The SOPs shall include a list of authorized personnel who have access or keys to secure storage areas.

3.4 The laboratory shall have written SOPs for tracking the work performed on any particular sample. The tracking SOP shall include the following:

3.4.1 A description of the documentation used to record sample receipt, sample storage, sample transfers, sample preparations, and sample analyses.

3.4.2 A description of the documentation used to record instrument calibration and other QA/QC activities.

3.4.3 Examples of the document formats and laboratory documentation used in the sample receipt, sample storage, sample transfer, and sample analyses.

3.5 The laboratory shall have written SOPs for organization and assembly of all documents relating to each NYSDEC Case, including technical and managerial review. Documents shall be filed on a Case-specific basis. The procedures must ensure that all documents including logbook pages, sample tracking records, chromatographic charts, computer printouts, raw data summaries, correspondence, and any other written documents having reference to the Case are compiled in one location for submission to NYSDEC. The system must include a document numbering and inventory procedures.

3.6 The laboratory shall have written SOPs for laboratory safety.

3.7 The laboratory shall have written SOPs for cleaning of glassware used in preparing and analyzing samples under this protocol.

3.8 The laboratory shall have SOPs for traceability of standards used in sample analysis QA/QC.

4. Handling of Confidential Information

Laboratory conducting work under this protocol may receive NYSDEC designated confidential information from the Agency. Confidential information must be handled separately from other documentation developed under this contract. To accomplish this, the following procedures for the handling of confidential information have been established.

4.1 All confidential documents shall be under the supervision of a designated Document Control Officer (DCO).

4.2 Confidential Information

Any samples or information received with a request of confidentiality shall be handled as "confidential". A separate locked file shall be maintained to store this information and shall be segregated from other non-confidential information. Data generated from confidential samples shall be treated as confidential. Upon receipt of confidential information, the DCO logs these documents into a Confidential Inventory Log. The information is then made available to authorized personnel but only after it has been signed out to that person by the DCO. The documents shall be returned to the locked file at the conclusion of each working day. Confidential information may not be reproduced except upon approval by the Bureau of Spill Prevention and Response. The DCO will enter all copies into the document control system. In addition, this information may not be disposed of except upon approval by the Bureau of Spill Prevention and Response. The DCO shall remove and retain the cover page of any confidential information disposed of for one year, and shall keep a record of the disposition in the Confidential Inventory Log.

APPENDIX 5X.3

CHEMICALS LISTED IN THE HAZARDOUS MATERIALS TABLE (49 CFR 172.101) USED FOR PRESERVING SAMPLES

PRESERVATIVE	SAMPLE TYPE/ PARAMETER	pH RECOMMENDATION	QUANTITY OF PRESERVATIVE ADDED PER LITER	WT. % OF PRESERVATIVE
HC1	Volatile Organic Analysis	$<2 - \geq 1$	4 drops conc. HCL/40 ml	0.22% (2)
$HgCl_2$	Nitrogen Species	N.A.	40 mg.	0.004% (1)
HNO_3	Metals, Hardness	$<2 - \geq 1$	5 ml of conc. (70%)	0.35% (1)
H_2SO_4	Nitrogen Species COD, Oil & Grease, P (hydrolyzable) Organic Carbon, Phenols	$<2 - \geq 1$	2 ml of 36N	0.35% (1)
NaOH	Cyanides, Sulfides	$>12 - \leq 13$	2 ml of 10N	0.080% (1)
Freezing* O°C (Dry Ice)	Biological - Fish & Shellfish Tissue	N.A.	N.A.	N.A.

* - Dry ice is classified as a ORM-A hazard by DOT. There is no labeling requirement for samples preserved with dry ice, but each package must be plainly and durably marked on at least one side or edge with the designation "ORM-A". The package should also be marked "Dry Ice" or "Carbon Dioxide, Solid" and "Frozen Diagnostic Specimens". Samples must be packaged in accordance with the requirements of 49 CFR 173.615 and advance arrangements must be made between the shipper and each carrier.

N.A. - Not applicable.

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Standard Guide for
Planning and Preparing for a Groundwater Sampling Event[1]

This standard is issued under the fixed designation D 5903; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide covers planning and preparing for a ground-water sampling event. It includes technical and administrative considerations and procedures. Example checklists are also provided as Appendices.

1.2 This guide may not cover every consideration procedure, or both, that is necessary before all ground-water sampling projects. In karst or fractured rock terranes, it may be appropriate to collect ground water samples from springs (see Guide D 5717). This guide focuses on sampling of ground water from monitoring wells; however, most of the guidance herein can apply to the sampling of springs as well.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This guide offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 653 Terminology Relating to Soil, Rock, and Contained Fluids[2]

D 5717 Guide to the Design of Ground-Water Monitoring Systems in Karst and Fractured-Rock Aquifers

3. Significance and Use

3.1 The success of a sampling event is influenced by adequate planning and preparation. Use of this guide will help the ground-water sampler to methodically execute the planning and preparation.

3.2 This guide should be used by a professional or technician that has training or experience in ground-water sampling.

4. Considerations and Procedures

4.1 Evaluate the scope of the sampling and analysis program.

4.1.1 Review plans, protocols, and objectives of the sampling program and event. The sampler should review the sampling and analysis plan, site health and safety plan, sampling protocol, and quality assurance/quality control plan, when available. These documents will provide information on required sampling procedures and also should provide the information in the following paragraphs.

4.1.2 Determine which wells will be sampled. The sampler should have a map or diagram showing the locations of the wells to be sampled. Determine if there is a preferred well sampling sequence specified in the sampling and analysis plan.

4.1.3 Identify the laboratory analyses to be performed on samples from each well. The analytical requirements are often, but not always, the same for each well. Determine if there is a preferred order in filling containers based on analytes.

4.1.4 Identify data to be collected in the field. The sampler must know in advance what types of data must be collected in the field (that is, chemical measurements, water level measurements, etc.) Many samplers use a form to record field data and other observations. The use of a form can help the sampler to collect and record information in a consistent manner and can reduce the chance of failure to collect needed data.

4.1.5 Determine from what depth range within the well the samples will be collected.

4.1.6 Evaluate the need for specialized handling of purged water and decontamination wastewater. The waters may be released to the ground surface, discharged to a sanitary or industrial sewer, or containerized and handled as a potentially hazardous waste. Hazardous wastes will require specialized labeling, storage, transportation, and disposal.

4.1.7 Identify all documentation and field quality control procedures stipulated in the sampling and analysis plan or quality control plan.

4.2 Review available information.

4.2.1 Review well construction details. The sampler should

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[1] This guide is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.21 on Ground Water and Vadose Zone Investigations.

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[2] *Annual Book of ASTM Standards*, Vol 04.08.

know the material of construction, the inside diameter, the completion depth, the screened interval, and the cap type and lock type (if locked). This information is needed to select purging and sampling equipment, and may be needed to select other tools (for example, a strap wrench to remove the cap, boltcutters or a hack saw to remove damaged locks, or keys for locks).

4.2.2 Evaluate historical well performance and chemical characteristics of the water from each well, if available. The behavior of the well during past sampling events is useful information in the planning process. This may include the flow rate in the screened interval, the maximum pumping rate, the time required to purge the well, whether the well is easily bailed or pumped dry, etc. Knowledge of the past ground-water chemistry and non-aqueous phase liquids in the well also can be useful. The turbidity of the water may influence sampling methods and the need for or approach to filtration of samples. Use of personal protective equipment also may be dictated by known contamination of the water from a well.

4.2.3 Evaluate the physical setting of the well locations. This is necessary to determine the accessibility of the wells. Access could be impeded or difficult due to mud, snow, trees, fences, steep hills, secured areas, etc. This information will help the sampler determine what type of vehicle is needed, whether special tools are needed, or whether administrative clearances are required, or both.

4.2.4 For wells with dedicated sampling equipment find out the type of equipment, pump depth, whether there are any packers in the well, where packers are set, and the power source for equipment.

4.3 Estimate the time required to complete the sample collection and associated field work. The amount of time required will affect equipment needs and possibly lodging or other administrative arrangements. It is usually necessary to inform the laboratory when samples should arrive at the laboratory.

4.4 Coordinate with the analytical laboratory.

4.4.1 Notify the laboratory in advance of the number of analyses of each type to include quality control sample analyses. This notification allows the laboratory to plan for adequate equipment and personnel resources to complete the analyses.

4.4.2 Determine the volume of sample needed for each analysis.

4.4.3 Coordinate the preparation or shipment, or both, of sample containers, preservatives, and shipping containers to the site and to the laboratory. The analytical laboratory often supplies the sample containers and preservatives, and sometimes the shipping containers for the return of samples. The project manager or sampler will need to provide the details needed to accomplish this. The laboratory will need to know the number of containers and preservatives for each analyte, when the containers are needed, whether containers will be picked up or shipped, and the address of the location to which containers/preservatives must be shipped. The laboratory should specify any related administrative requirements. The return of samples to the laboratory also must be coordinated. The sampler will need to be aware of any special instructions regarding shipment or receipt of the samples (that is, times when samples cannot be received, unacceptable shipping containers, Department of Transportation restrictions, and documentation requirements). The sampler also must have the address of the laboratory if samples will be shipped.

4.4.4 When the sampler is also the project manager, the methods of analyses and lower reporting limits also must be coordinated with the laboratory. These are chosen based on the data quality objectives.

4.4.5 Identify the sample volumes, preparation, and holding time requirements. The sampler should be aware of the total volume of water that must be collected from each well. This may influence the selection of sampling equipment. The sampler also should know what will be involved in the preparation of samples (that is, chemical and physical preservation). This knowledge is needed to make logistical arrangements. For example, the sampler may need to use an area near the site that has an electrical outlet and a sink if filtration is required. Lastly, the sampler must know if any of the samples have a short holding time (maximum allowable time between sample collection and preparation or analysis). Collecting samples with short holding times could influence the timing or method of sample shipment.

4.4.6 Inform the laboratory of any special requirements that are different than normal laboratory procedures.

4.4.7 Notify the laboratory of the types and numbers of field quality control samples that will be submitted. Some quality control samples will be prepared or collected in the field; others will be prepared in the laboratory. The sampler must know how to collect and prepare the field quality control samples.

4.4.8 Identify laboratory documentation needs. The laboratory may have certain project identifiers, sample identifiers, or forms that they use for sample tracking or data reporting, or both. It is important that the sampler and the laboratory agree on all means of documentation that will be used by the laboratory.

4.4.9 Determine when the laboratory must be notified regarding sample arrival times and how accurate the time estimates must be (that is, within a day, a half a day, a week). The sampler should discuss this notification process with the laboratory.

4.4.10 Provide information to the laboratory on when data are needed. This is the responsibility of the project manager; however, the sampler and the project manager may be the same person.

4.5 Coordinate with the client or site-related personnel. Coordination with the client is necessary when sampling at a site not owned by you or your company. It also may be necessary to coordinate with people at your own site if they should be notified or have some involvement in your project.

4.5.1 Notify the client or site workers, or both, of when the sampling event will take place.

4.5.2 Request logistical support as needed. This may be as simple as requesting use of the phone. In some cases, logistical support needs may be more extensive. Other logistical support items could include an area for sample preparation and storage, a potable water source, a vehicle, fuel, maintenance support, tools, etc. The sampler should ensure that all support needed from outside sources is prearranged.

4.5.3 Obtain necessary site and well access. It may be necessary to get a pass to enter a site or to have a permit to sample the wells. It also may be necessary to obtain keys to gates or wells, or both. All possible access restrictions should be identified in advance to prevent a delay in the sampling event.

4.5.4 Address site-specific safety concerns. This information should be available in a site health and safety plan. If no such plan exists, at a minimum the sampler should obtain emergency phone numbers and a map showing the location of the nearest health care facility, and identify any safety hazards or weather conditions unique to the site.

4.6 Identify equipment needs. This identification will include selecting purging and sampling devices; field measurement equipment; sample handling, filtration, preservation, and shipping supplies; documentation; personal protective equipment, and other incidental equipment. Appendix X1 is an example checklist of supplies and equipment. Using a comprehensive checklist will reduce the chance of overlooking a needed item.

4.7 Make provisions to keep sample containers separated from potential sources of contamination such as decontamination reagents and fuel.

4.8 Prepare sampling equipment and supplies for use. It is important that sampling equipment be in good operating condition before going into the field. The sampler should pack necessary and contingency supplies. Appendix X2 is an example checklist.

4.9 Prepare field measurement equipment for use. The sampler should check all field measurement devices to ensure that they are operational. This should include calibration of test instruments.

4.10 Make lodging and transportation arrangements if necessary.

5. Keywords

5.1 ground-water sampling; laboratory coordination; monitoring well; sampling and analysis plan

APPENDIXES

(Nonmandatory Information)

X1. SAMPLING EQUIPMENT CHECKLIST

X1.1 *Personal Protection:*

X1.1.1 Gloves,
X1.1.2 Coveralls,
X1.1.3 Respirators (with appropriate filters),
X1.1.4 Protective eyewear and footwear, and
X1.1.5 *Comfort Items*
Sunscreen, water, insect repellant, rain/snow gear, space heater.

X1.2 *Measurement:*

X1.2.1 Water level measuring device,
X1.2.2 Hydrocarbon/water interface probe,
X1.2.3 Thermometer,
X1.2.4 Ph meter and probes,
X1.2.5 Conductivity meter and probe,
X1.2.6 Dissolved oxygen meter and probe,
X1.2.7 Organic vapor analyzer,
X1.2.8 Turbidity meter,
X1.2.9 Oxidation reduction potential meter and probe,
X1.2.10 Flow-through cell/beakers,
X1.2.11 Calibration standards for all meters,
X1.2.12 Maintenance supplies and spare batteries for meters/probes,
X1.2.13 Deionized water and squeeze bottle,
X1.2.14 Timekeeping device, and
X1.2.15 Explosimeter.

X1.3 *Incidentals:*

X1.3.1 Plastic ground cover,
X1.3.2 Paper towels,
X1.3.3 Scissors,
X1.3.4 Miscellaneous tools,
X1.3.5 Duct tape,
X1.3.6 Trash bags,
X1.3.7 Keys for site or well access,
X1.3.8 Calculator,
X1.3.9 Funnel, and
X1.3.10 Extension cord.

X1.4 *Portable Sampling:*

X1.4.1 Bailer,
X1.4.2 Disposable haul line,
X1.4.3 Pump, cables, hoses, reel,
X1.4.4 Pump control box,
X1.4.5 Pump power supply,
X1.4.6 Fuel for pump or generator,
X1.4.7 Discharge tubing,
X1.4.8 Maintenance supplies and spare parts,
X1.4.9 Graduated cylinders or buckets for measuring discharge rate,
X1.4.10 Container for purged water, and
X1.4.11 *Decontamination Supplies*
Solutions, brushes, drums, buckets, spray bottles.

X1.5 *Sample Preparation and Shipment:*

X1.5.1 Filtration system,
X1.5.2 Chemical preservatives,
X1.5.3 Material Safety Data Sheets,
X1.5.4 Pipettes,

X1.5.5 Sample containers,
X1.5.6 Plastic bags (to keep containers dry),
X1.5.7 Shipping containers,
X1.5.8 Trash bags to line shipping containers,
X1.5.9 Packing material,
X1.5.10 Ice, and
X1.5.11 Packing tape.

X1.6 *Documentation:*

X1.6.1 Sampling and analysis plan,
X1.6.2 Well completion data,
X1.6.3 Sample container labels,
X1.6.4 Address labels,
X1.6.5 Chain of custody forms,
X1.6.6 Field data sheet or logbook,
X1.6.7 Calibration sheets,
X1.6.8 Custody seals, and
X1.6.9 Permanent marker.

X2. CHECKLIST FOR PREPARING SAMPLING EQUIPMENT AND SUPPLIES

X2.1 *Check Performance of Power Supplies and Controls:*:

X2.1.1 Visually inspect power sources for damage or wear (hoses; cables, etc.)

X2.1.2 Check fluid levels, and fill to proper levels as needed.

X2.1.3 Check/tighten drive belts, shafts or gears, or both.

X2.1.4 Inspect for presence and condition of safety shrouds and guards.

X2.1.5 If electric start, check battery condition; if manual start, check pull cord condition.

X2.1.6 Perform maintenance per manufacturer's guidelines (for example, oil change).

X2.1.7 Operate to check performance and output if possible.

X2.2 *Check Condition and Operation of Purging and Sampling Devices:*

X2.2.1 Visually inspect tubing, hoses, electrical cable, support cable, etc. for damage or wear.

X2.2.2 Check condition of fittings, electrical connectors, and support cable attachments.

X2.2.3 Operate pumps to check performance and output if possible.

X2.3 *Prepare Spare Parts, Fuels and Lubricants for Equipment and Power Sources:*

X2.3.1 *Power Sources*:

X2.3.1.1 Lubricating oil, gasoline, etc.

X2.3.1.2 Spare spark plug and plug wrench.

X2.3.1.3 Funnel for refueling.

X2.3.2 *Pumps and Samplers*:

X2.3.2.1 Spare fittings or ferrules, or both.

X2.3.2.2 Check valves or valve components, or both.

X2.3.2.3 O-rings/seals.

X2.3.2.4 Retaining pins/clips.

X2.3.2.5 Polytetrafluoroethylene thread tape.

X2.3.2.6 Tools for service or disassembly, especially special tools for specific devices.

X2.3.2.7 Batteries/charger/extension cord.

G

Temporary Sewer Discharge Permit Application, Pollutant Guidance, and Example Permit

FOR BUFFALO SEWER AUTHORITY USE ONLY

Date Application Received: ____________

Permit Number: ____________

Industrial Waste Investigator: ____________

BUFFALO SEWER AUTHORITY

TEMPORARY DISCHARGE PERMIT APPLICATION

A 1. Applicant Business Name: ____________

A 2a. Business Address:

____________ (Street) (City) (State) (Zip)

A 2b. Mailing Address *(if different than above)*:

____________ (Street) (City) (State) (Zip)

A 3. Chief Business Official:

____________ (Name) (Title)

A 4. Person to be contacted about this application:

____________ (Name) (Title)

Phone: ____________ Fax: ____________

A 5. Person to be contacted in case of emergency:

____________ (Name) (Title)

Day Phone: ____________ Night Phone: ____________

A 6. Insurance Agent(s) of responsible party: ____________

Certificate of Insurance for responsible party must be attached.

(Continued on Reverse Side)

B 1. Type of Wastestream: ____________________

____

B 2. Source of Wastestream:

Name: ____________________

Address: ____________________ (Street) ____________________ (City) ____________________ (State) ____________________ (Zip)

B 3. Volume of Wastestream ____________ average flow (gals./day); ____________ peak flow (gals./sec)

B 4. Variability of Wastestream Volume: Yes ____ No ____

If yes, explain ____________________

____

B 5. Attach analytical data (*(if available)*

B 6. Duration of discharge: ____________________

C 1. Map must be attached detailing source of wastestream, proposed pretreatment equipment and discharge location.

I have personally examined, and am familiar with, the information submitted in this document and attachments. Based upon my inquiry of those individuals immediately responsible for obtaining the information reported herein, I believe that the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information.

____/____/____ (Date)

____________________ Signature of Official

GUIDANCE FOR BSA POLLUTANT LIMITS

POLLUTANT	TCLP mg/l	SAFETY mg/l	BADS mg/l	SLUG mg/l	PRESENT MASS (lbs)	TOG MASS (lbs)	LIMIT mg/l
CONVENTIONALS							
T. Ext. Hydrocarbons							100
BOD					255204		255204
TSS					300240		300240
TPO4					27030		27030
METALS							
Arsenic	5.000			1.800	52.900		1.800
Barium	100.000						100.000
Cadmium	1.000			40.000	82.900		1.000
Chromium	5.000			40.000	3827.000		5.000
Copper				16.000	561.000		16.000
Lead	5.000			65.000	2747.000		5.000
Mercury	0.200		0.0008	7.000	4.645		0.0008
Nickel				14.000	201.000		14.000
Selenium	1.000			2.400	18.000		1.000
Silver	5.000			2.200	6.800		2.200
Zinc				25.000	3407.000		25.000
Amenable Cyanide				6.200			
T. Cyanide				66.000	175.500		66.000
ORGANICS							
Benzene	0.500	0.142				21.484	0.142
Bis(2-ethylhexyl)phthalate					49.800		mass
BHC-t			0.010000	1.900	0.000		0.010
Bromodichloromethane				nl	nl	9.668	mass
Carbon Tetrachloride	0.500	0.030				10.742	0.030
Chlordane	0.030		0.010000				0.010
Chlorobenzene	100.000	0.310				21.484	0.310
Chloroethane		0.420				10.742	0.420
Chloroform	6.000	0.408		8.500	50.400		0.408
Cresol,(o,m,p)	200.000					10.742	8.000
2,4-D	10.000					0.215	PQL
4,4'-DDD			0.010000	0.680	0.000		PQL
1,4-Dichlorobenzene	7.500	0.472				1.074	0.472
1,1-Dichloroethane	0.500	2.288				21.484	0.500
trans-1,2-Dichloroethene		0.285				6.445	0.285
1,1-Dichloroethylene	0.700	0.003				10.742	0.003
2,4-Dinitrotoluene	0.130	9.014				10.742	0.130
Dioxin			0.000017				PQL
Endosulfan				1.600	0.000		PQL
Endrin	0.020		0.010000				0.010
Ethylbenzene		1.584				32.226	1.584
Fluoranthene				0.100	6.500		0.100
Heptachlor	0.008	0.003	0.008000				0.003
Hexachlorobenzene	0.130		0.008000				0.130
Hexachloro-1,3-butadiene	0.500	0.000				4.297	0.500
Hexachloroethane	3.000	0.093				6.445	0.093
Lindane	0.400		0.010000				0.010
Methoxychlor	10.000		0.018000				0.018
Methylene Chloride		2.062		nl	49.400		2.062
Methylethylketone	200.000	249.000				107.419	200.000
Nitrobenzene	2.000	9.434				10.742	2.000
PCBs			0.000300	0.002	0.000		PQL
Pentachlorophenol	100.000	4.371				32.226	4.371
Phenol,t				20.000	31.500		8.000
Pyrene				0.100	119.250		0.100
Pyridine	5.000					5.371	5.000
Tetrachloroethane		0.445				32.226	0.445
Tetrachoroethylene	0.700	0.267		nl	72.800		0.267
Toluene		0.679		nl	168.000		0.679
Toxaphene	0.500		0.010000				0.010
1,2,4-Trichlorobenzene		0.394		0.800	0.000		0.394
Trichloroethene		0.712				8.594	0.712
1,1,1-Trichloroethane		1.550				21.484	1.550
2,4,5-Trichlorophenol	400.000					10.742	8.000
2,4,6-Trichlorophenol	2.000					10.742	2.000
2,4,5-TP (Silvex)	1.000					0.043	mass
Vinyl Chloride	0.200	0.003				10.742	0.003
Xylene,T.		2.080				5.371	2.080

TCLP -	toxicity characteristic leachate procedure limits (RCRA)
SLUG -	slug limit - BSA Sewer Regs. based on grab(As limit - Malcome Pirnie report 92)
STUDY MASS	allowable mass to allocate to permits (URS 1987 study for organics)(MP Study for all others)
TOG MASS-	calculated mass using NYS TOG guidance (80%of(161*8.34*.001*PQL)
SAFETY -	screening levels based upon fume toxicity (ACGIH 93-94 values)
BADS -	NYSDEC - BAT/BPJ ~~bioaccumulative & durable substance's limits for new waste streams~~
LIMIT -	recommended limit for discharge
PQL-	Practical Quantification Limit

Prepared by JIM CARUSO 7/31/2003

BSALIMguidance.xls

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATE, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE	Date: 08/15/05	☒ New Submittal ☐ Resubmittal

SECTION I: REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS (THIS SECTION WILL BE INITIATED BY THE CONTRACTOR)

TO: **Ecology & Environment**	FROM: **Earth Tech, Inc.**	SUBMITTAL NO.: 37 PREVIOUS SUBMITTAL NO. AND DATE (if any):
Specification Sec. No. SS-02140	Project Title and Number: **FOURTH STREET MGP SITE**	

Item No.	**Description of item Submitted**	**Manufacturer or Contractor Catalog, Drawing, or Brochure**	**No. of copies**	**Contractor Reference Document**		**Comments**
				Spec. Para. No.	**Drawing Sheet No.**	
37	Permit for discharging treated water		1	02140 – 1.02 B.1		

Remarks: Permit from BSA	**EARTH TECH, INC.** This stamp certifies the review of this submittal, verification of products, field measurements, field construction criteria, and coordination of information within submittal with requirements of work and contract documents. Signature: Keith Title: Project Director Date: 8/15/05	

BUFFALO
SEWER AUTHORITY

ADMINISTRATIVE OFFICES
1038 CITY HALL
65 NIAGARA SQUARE
BUFFALO, NY 14202-3378
PHONE: (716) 851-4664
FAX: (716) 856-5810

WASTEWATER TREATMENT PLANT
FOOT OF WEST FERRY
90 WEST FERRY STREET
BUFFALO, NY 14213-1799
PHONE: (716) 883-1820

HERBERT L. BELLAMY JR.
CHAIRMAN

JAMES P. NAPLES
VICE CHAIRMAN

JOHN D. KENNEDY
ASSISTANT VICE CHAIRMAN

CHRISTOPHER ROOSEVELT
SECRETARY

ELEANOR C. WILSON-DIVINCENZO
ASSISTANT SECRETARY

ANTHONY A. HAZZAN
GENERAL MANAGER

SALVATORE J. LOTEMPIO
TREATMENT PLANT SUPERINTENDENT

1935

August 10, 2005

RECEIVED
AUG 12 2005
EARTHTECH-ALBANY

Mr. Keith A. Decker
Earth Tech
40 British American Boulevard
Latham, New York 12110

Re: Buffalo Sewer Authority
BPDES Permit #05-08-BU110

Dear Mr. Decker:

You will find enclosed the finalized Buffalo Sewer Authority BPDES permit for Earth Tech to discharge wastewater from a remediation site at Carolina and Fourth Street into the Buffalo Sewer Authority sewer system.

Please note that the reporting requirements contained in Part I, Page 3 of this permit is the responsibility of Earth Tech. Also be advised that a copy of this permit is required to be kept on the premises of the facility as stated in Part II, C.1, on Page 6 of this permit.

If you have any questions, feel free to call James Overholt at extension 255.

Very truly yours,

BUFFALO SEWER AUTHORITY

Anthony A. Hazzan
General Manager

By: Leslie Sedita
Leslie Sedita
Industrial Waste Administrator
Industrial Waste Section

cc: J. Keller
wp\jo\fearthtech.ltr

AUTHORIZATION TO DISCHARGE UNDER THE BUFFALO POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT NO. 05-08-BU110
EPA CATEGORY 40 CFR 403

In accordance with the provisions of the Federal Water Pollution Control Act, as amended, and the Sewer Regulations of the Buffalo Sewer Authority, authorization is hereby granted to:

EARTH TECH, INC.

to discharge groundwater from a remediation facility located at:

Carolina & Fourth Street, Buffalo, New York, 14201

to the Buffalo Municipal Sewer System.

Issuance of this permit is based upon a permit application filed on **June 20, 2005** and analytical data. This permit is granted in accordance with discharge limitations, monitoring requirements and other conditions set forth in Parts I and II hereof.

Effective this 1st day of August, 2005

To Expire the 31st day of July, 2008

General Manager

Signed this 9th **day of** August**, 2005**

PART I: SPECIFIC CONDITIONS

A. DISCHARGE LIMITATIONS & MONITORING REQUIREMENTS

During the period beginning the effective date of this Permit and lasting until the expiration date, discharge from the permitted facility outfall(s) (see attached map) shall be limited and monitored by the permittee **monthly** as specified below.

Sample Point	**Parameter**	**Discharge Limitations Daily Maximum**	**Sampling Requirements Period**	**Type**
001	EPA Test Method 624(1)	Monitor only	1 day	Grab
	EPA Test Method 625(1)	Monitor only	1 day	Grab
	EPA Test Method 608(1)	Monitor only	1 day	Grab
	Total Extractable Hydrocarbons	100 mg/l	1 day	Grab
	Total Cadmium	1.0 mg/l	1 day	Grab
	Total Chromium	5.0 mg/l	1 day	Grab
	Total Copper	16.0 mg/l	1 day	Grab
	Total Lead	5.0 mg/l	1 day	Grab
	Total Mercury	0.0008 mg/l	1 day	Grab
	Total Nickel	14.0 mg/l	1 day	Grab
	Total Zinc	25.0 mg/l	1 day	Grab
	pH	5.0-12.0 S.U.	1 day	Grab
	Total Flow	Monitor only	Daily	Flow Meter

1. The permittee must report any compound whose concentration is greater than 0.01 mg/l. The permittee is not authorized to discharge any of the parameters evaluated by this test procedure which may cause or contribute to a violation of water quality standards or harm the sewerage system. Any parameter detected may, at the discretion of the Buffalo Sewer Authority, be specifically limited and incorporated into the permit.

PART I: SPECIFIC CONDITIONS

B. DISCHARGE MONITORING REPORTING REQUIREMENTS

During the period beginning the effective date of this permit and lasting until the expiration date, discharge monitoring results shall be summarized and reported by the permittee **monthly** on the days specified below:

Sample Point	**Parameter**	**Reporting Requirements** **Initial Report**	**Subsequent Reports**
001	All Parameters	One month after startup of treatment system	Monthly

BUFFALO POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT

PART II: GENERAL CONDITIONS

A. MONITORING AND REPORTING

1. Local Limits

Except as otherwise specified in this permit, the permit holder shall comply with all specific prohibitions, limits on pollutants or pollutant parameters set forth in the Buffalo Sewer Authority Sewer Use Regulations, as amended from time to time, and such prohibitions, limits and parameters shall be deemed pretreatment standards for purposes for the Clean Water Act.

2. Definitions

Definitions of terms contained in this permit are as defined in the Buffalo Sewer Authority Sewer Use Regulations.

3. Discharge Sampling Analysis

All Wastewater discharge samples and analyses and flow measurements shall be representative of the volume and character of the monitored discharge. Methods employed for flow measurements and sample collections and analyses shall conform to the Buffalo Sewer Authority "Sampling Measurement and Analytical Guidelines Sheet".

4. Recording of Results

For each measurement or sample taken pursuant to the requirements of the permit, the permittee shall record the information as required in the "Sampling Measurement and Analytical Guidelines Sheet".

5. Additional Monitoring by Permittee

If the permittee monitors any pollutants at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified in 40 CFR Part 136 the results of such monitoring shall be included in the calculation and reporting of values required under Part I, B. Such increased frequency shall also be indicated.

6. Reporting

All reports prepared in accordance with this Permit shall be submitted to:

Industrial Waste Section
Buffalo Sewer Authority Treatment Plant
90 West Ferry Street
Buffalo, New York 14213

All self-monitoring reports shall be prepared in accordance with the BSA "Sampling Measurement and Analytical Guidelines Sheet". These reporting requirements shall not relieve the permittee of any other reports, which may be required by the N.Y.S.D.E.C. or the U.S.E.P.A.

B. PERMITTEE REQUIREMENTS

1. Change in Discharge

All discharges authorized herein shall be consistent with the terms and conditions of this permit and with the information contained in the BPDES permit application on which basis this permit is granted. In the event of any facility expansions, production increases, process modifications or the installation, modification or repair of any pretreatment equipment which may result in new, different or increased discharges of pollutants, a new BPDES Permit application must be submitted prior to any change. Following receipt of an amended application, the BSA may modify this permit to specify and limit any pollutants not previously limited. In the event that the proposed change will be covered under an applicable Categorical Standard, a Baseline Monitoring Report must be submitted at least ninety (90) days prior to any discharge.

2. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed, calibration and maintenance of instrumentation, and recordings from continuous monitoring instrumentation shall be retained at this facility for a minimum of three (3) years, or longer if requested by the General Manager.

3. Notification of Slug, Accidental Discharge or Spill

In the event that a slug, accidental discharge or any spill occurs at the facility for which this permit is issued, it is the responsibility of the permittee to immediately notify the B.S.A. Treatment Plant at 883-1820 of the quantity and character of such discharge. If requested by the B.S.A., within five (5) days following all such discharges, the permittee shall submit a report describing the character and duration of the discharge, the cause of the discharge, and measures taken or that will be taken to prevent a recurrence of such discharge.

4. Noncompliance Notification

If, for any reason, the permittee does not comply with or will be unable to comply with any discharge limitation specified in this permit, the permittee or their assigns must verbally notify the Industrial Waste Section at 883-1820 within twenty-four (24) hours of becoming aware of the violation. The permittee shall provide the Industrial Waste Section with the following information, in writing, within five (5) days of becoming aware of such condition:

a. a description of the discharge and cause of noncompliance and;

b. The period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

5. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact to the Buffalo Sewerage System resulting from noncompliance with any discharge limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

6. Waste Residuals

Solids, sludges, filter backwash or other pollutants removed in the course of treatment or control of wastewaters and/or the treatment of intake waters, shall be disposed of in a manner such as to prevent any pollutant from such materials from entering the Buffalo Sewer System.

7. Power Failures

In order to maintain compliance with the discharge limitations and prohibitions of this permit, the permittee shall provide an alternative power source sufficient to operate the wastewater control facilities; or, if such alternative power source is not provided the permittee shall halt, reduce or otherwise control production and/or controlled discharges upon the loss of power to the wastewater control facilities.

8. Treatment Upsets

a. Any industrial user which experiences an upset in operations that places it in a temporary state of noncompliance, which is not the result of operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation, shall inform the Industrial Waste Section immediately upon becoming aware of the upset. Where such information is given verbally, a written report shall be filed by the user within five (5) days. The report shall contain:

   (i) A description of the upset, its cause(s) and impact on the discharger's compliance status;

   (ii) The duration of noncompliance, including exact dates and times of noncompliance, and if the non-compliance is continuing, the time by which compliance is reasonably expected to be restored;

   (iii) All steps taken or planned to reduce, eliminate, and prevent recurrence of such an upset.

b. An industrial user which complies with the notification provisions of this Section in a timely manner shall have an affirmative defense to any enforcement action brought by the Industrial Waste Section for any noncompliance of the limits in this permit, which arises out of violations attributable to and alleged to have occurred during the period of the documented and verified upset.

9. Treatment Bypasses

a. A bypass of the treatment system is prohibited unless the following conditions are met:

   (i) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage; or

   (ii) There was no feasible alternative to the bypass, including the use of auxiliary treatment or retention of the wastewater; and

   (iii) The industrial user properly notified the Industrial Waste Section as described in paragraph b. below.

b. Industrial users must provide immediate notice to the Industrial Waste Section upon discovery of an unanticipated bypass. If necessary, the Industrial Waste Section may require the industrial user to submit a written report explaining the cause(s), nature, and duration of the bypass, and the steps being taken to prevent it's recurrence.

c. An industrial user may allow a bypass to occur which does not cause pretreatment standards or requirements to be violated, but only if it is for essential maintenance to ensure efficient operation of the treatment system. Industrial users anticipating a bypass must submit notice to the Industrial Waste Section at least ten (10) days in advance. The Industrial Waste Section may only approve the anticipated bypass if the circumstances satisfy those set forth in paragraph a. above.

C. PERMITTEE RESPONSIBILITIES

1. Permit Availability

The originally signed permit must be available upon request at all times for review at the address stated on the first page of this permit.

2. Inspections

The permittee shall allow the General Manager of the Buffalo Sewer Authority and/or his authorized representatives, upon the presentation of credentials and during normal working hours or at any other reasonable times, to have access to and copy any records required in this permit; and to sample any discharge of pollutants.

3. Transfer of Ownership or Control

In the event of any change in control or ownership of facilities for which this permit has been issued the permit shall become null and void. The succeeding owner shall submit a completed Buffalo Sewer Authority permit application prior to discharge to the sewer system.

D. PERMITTEE LIABILITIES

1. Permit Modification

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to the following:

a. Violation of any terms or conditions of this permit,

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts,

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

2. Imminent Danger

In the event there exists an imminent danger to health or property, the permitter reserves the right to take immediate action to halt the permitted discharge to the sewerage works.

3. Civil and Criminal Liability

Nothing in this permit shall relieve the permittee from any requirements, liabilities, or penalties under provisions of the "Sewer Regulations of the Buffalo Sewer Authority" or any Federal, State and/or local laws or regulations.

4. Penalties for Violations of Permit Conditions

The "Sewer Regulations of the Buffalo Sewer Authority" provides that any person who violates a B.P.D.E.S. permit condition is liable to the Authority for a civil penalty of up to $10,000.00 per day for each violation. Any person who willfully or negligently violates permit conditions will be referred to the New York State Attorney General.

E. NATIONAL PRETREATMENT STANDARDS

If a pretreatment standard or prohibition (including any Schedule of Compliance specified in such pretreatment standard or prohibition) is established under Section 307 (b) of the Act for a pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with such pretreatment standard or prohibition.

F. PLANT CLOSURE

In the event of plant closure, the permittee is required to notify the Industrial Waste Section in writing as soon as an anticipated closure date is determined, but in no case later than five days of the actual closure.

G. CONFIDENTIALITY

Except for data determined to be confidential under Section 308 of the Act, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Buffalo Sewer Authority. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Act.

H. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

H

Generic Safety Plan

Generic Site Safety Plan

This appendix provides a generic plan based on a plan developed by the U.S. Coast Guard for responding to hazardous chemical releases.[1] This generic plan can be adapted for designing a Site Safety Plan for hazardous waste site cleanup operations. It is not all inclusive and should only be used as a guide, not a standard.

A. SITE DESCRIPTION

Date______________ Location______________

Hazards______________

Area affected______________

Surrounding population______________

Topography______________

Weather conditions______________

Additional information______________

B. ENTRY OBJECTIVES - The objective of the initial entry to the contaminated area is to (describes actions, tasks to be accomplished; i.e., identify contaminated soil; monitor conditions, etc.)

C. ONSITE ORGANIZATION AND COORDINATION - The following personnel are designated to carry out the stated job functions on site. (Note: One person may carry out more than one job function.)

PROJECT TEAM LEADER______________

SCIENTIFIC ADVISOR______________

SITE SAFETY OFFICER______________

PUBLIC INFORMATION OFFICER______________

SECURITY OFFICER______________

RECORDKEEPER______________

FINANCIAL OFFICER______________

FIELD TEAM LEADER______________

FIELD TEAM MEMBERS______________

---

[1] U.S. Coast Guard. Policy Guidance for Response to Hazardous Chemical Releases. USCG Pollution Response COMDTINST-M16465.30.

FEDERAL AGENCY REPS (i.e., EPA, NIOSH)

STATE AGENCY REPS ____________

LOCAL AGENCY REPS ____________

CONTRACTOR(S) ____________

All personnel arriving or departing the site should log in and out with the Recordkeeper. All activities on site must be cleared through the Project Team Leader.

D. ONSITE CONTROL

(Name of individual or agency ________ has been designated to coordinate access control and security on site. A safe perimeter has been established at (distance or description of controlled area)

No unauthorized person should be within this area.

The onsite Command Post and staging area have been established at ____________

The prevailing wind conditions are ____________. This location is upwind from the Exclusion Zone.

Control boundaries have been established, and the Exclusion Zone (the contaminated area), hotline, Contamination Reduction Zone, and Support Zone (clean area) have been identified and designated as follows: (describe boundaries and/or attach map of controlled area)

These boundaries are identified by: (marking of zones, i.e., red boundary tape - hotline; traffic cones - Support Zone; etc.)

E. HAZARD EVALUATION

The following substance(s) are known or suspected to be on site. The primary hazards of each are identified.

Substances Involved	Concentrations (If Known)	Primary Hazards
(chemical name)		(e.g., toxic on inhalation)

The following additional hazards are expected on site: (i.e., slippery ground, uneven terrain, etc.)

Hazardous substance information form(s) for the involved substance(s) have been completed and are attached.

F. PERSONAL PROTECTIVE EQUIPMENT

Based on evaluation of potential hazards, the following levels of personal protection have been designated for the applicable work areas or tasks:

Location	Job Function	Level of Protection
Exclusion Zone		A B C D Other
		A B C D Other
		A B C D Other
		A B C D Other
Contamination Reduction Zone		A B C D Other
		A B C D Other
		A B C D Other
		A B C D Other

Specific protective equipment for each level of protection is as follows:

Level A
Fully-encapsulating suit
SCBA
(disposable coveralls)

Level B
Splash gear (type)
SCBA

Level C
Splash gear (type)
Full-face canister resp.

Level D

Other

The following protective clothing materials are required for the involved substances:

Substance	Material
(chemical name)	(material name, e.g., Viton)

If air-purifying respirators are authorized, (filtering medium) is the appropriate canister for use with the involved substances and concentrations. A competent individual has determined that all criteria for using this type of respiratory protection have been met.

NO CHANGES TO THE SPECIFIED LEVELS OF PROTECTION SHALL BE MADE WITHOUT THE APPROVAL OF THE SITE SAFETY OFFICER AND THE PROJECT TEAM LEADER.

G. ONSITE WORK PLANS

Work party(s) consisting of _____ persons will perform the following tasks:

Project Team Leader	(name)	(function)
Work Party #1		
Work Party #2		
Rescue Team (required for entries to IDLH environments)		
Decontamination Team		

The work party(s) were briefed on the contents of this plan at ______________.

H. COMMUNICATION PROCEDURES

Channel _____ has been designated as the radio frequency for personnel in the Exclusion Zone. All other onsite communications will use channel _____.

Personnel in the Exclusion Zone should remain in constant radio communication or within sight of the Project Team Leader. Any failure of radio communication requires an evaluation of whether personnel should leave the Exclusion Zone.

(Horn blast, siren, etc.) is the emergency signal to indicate that all personnel should leave the Exclusion Zone. In addition, a loud hailer is available if required.

The following standard hand signals will be used in case of failure of radio communications:

Hand gripping throat ---------------- Out of air, can't breathe
Grip partner's wrist or both hands around waist ------------- Leave area immediately
Hands on top of head ---------------- Need assistance
Thumbs up -------------------------- OK, I am all right, I understand
Thumbs down ------------------------ No, negative

Telephone communication to the Command Post should be established as soon as practicable. The phone number is ______________________.

I. DECONTAMINATION PROCEDURES

Personnel and equipment leaving the Exclusion Zone shall be thoroughly decontaminated. The standard level _____ decontamination protocol shall be used with the following decontamination stations: (1) _______________

(2) _______________ (3) _______________ (4) _______________ (5) _______________
(6) _______________ (7) _______________ (8) _______________ (9) _______________
(10) _______________ Other ____

Emergency decontamination will include the following stations: _______________
____
____
____

The following decontamination equipment is required: _______________
____
____
____

(Normally detergent and water) will be used as the decontamination solution.

J. SITE SAFETY AND HEALTH PLAN

1. (name) is the designated Site Safety Officer and is directly responsible to the Project Team Leader for safety recommendations on site.

2. Emergency Medical Care

(names of qualified personnel) ________ are the qualified EMTs on site. (medical facility names) ________, at (address) ________, phone ________ is located ____ minutes from this location. (name of person) ________ was contacted at (time) ____ and briefed on the situation, the potential hazards, and the substances involved. A map of alternative routes to this facility is available at (normally Command Post) ____.

Local ambulance service is available from ________ at phone ________. Their response time is ____ minutes. Whenever possible, arrangements should be made for onsite standby.

First-aid equipment is available on site at the following locations:

First-aid kit ________
Emergency eye wash ________
Emergency shower ________
(other) ________ ________

Emergency medical information for substances present:

Substance	Exposure Symptoms	First-Aid Instructions

List of emergency phone numbers:

Agency/Facility	Phone #	Contact
Police		
Fire		
Hospital		
Airport		
Public Health Advisor		

3. Environmental Monitoring

The following environmental monitoring instruments shall be used on site (cross out if not applicable) at the specified intervals.

Combustible Gas Indicator - continuous/hourly/daily/other ________
O_2 Monitor - continuous/hourly/daily/other ________
Colorimetric Tubes - continuous/hourly/daily/other ________
(type) ________ ________
________ ________
________ ________
HNU/OVA - continuous/hourly/daily/other ________
Other ________ - continuous/hourly/daily/other ________
________ - continuous/hourly/daily/other ________

4. Emergency Procedures (should be modified as required for incident)

The following standard emergency procedures will be used by onsite personnel. The Site Safety Officer shall be notified of any onsite emergencies and be responsible for ensuring that the appropriate procedures are followed.

Personnel Injury in the Exclusion Zone: Upon notification of an injury in the Exclusion Zone, the designated emergency signal ______________________ shall be sounded. All site personnel shall assemble at the decontamination line. The rescue team will enter the Exclusion Zone (if required) to remove the injured person to the hotline. The Site Safety Officer and Project Team Leader should evaluate the nature of the injury, and the affected person should be decontaminated to the extent possible prior to movement to the Support Zone. The onsite EMT shall initiate the appropriate first aid, and contact should be made for an ambulance and with the designated medical facility (if required). No persons shall reenter the Exclusion Zone until the cause of the injury or symptoms is determined.

Personnel Injury in the Support Zone: Upon notification of an injury in the Support Zone, the Project Team Leader and Site Safety Officer will assess the nature of the injury. If the cause of the injury or loss of the injured person does not affect the performance of site personnel, operations may continue, with the onsite EMT initiating the appropriate first aid and necessary follow-up as stated above. If the injury increases the risk to others, the designated emergency signal ______________________ shall be sounded and all site personnel shall move to the decontamination line for further instructions. Activities on site will stop until the added risk is removed or minimized.

Fire/Explosion: Upon notification of a fire or explosion on site, the designated emergency signal ______________________ shall be sounded and all site personnel assembled at the decontamination line. The fire department shall be alerted and all personnel moved to a safe distance from the involved area.

Personal Protective Equipment Failure: If any site worker experiences a failure or alteration of protective equipment that affects the protection factor, that person and his/her buddy shall immediately leave the Exclusion Zone. Reentry shall not be permitted until the equipment has been repaired or replaced.

Other Equipment Failure: If any other equipment on site fails to operate properly, the Project Team Leader and Site Safety Officer shall be notified and then determine the effect of this failure on continuing operations on site. If the failure affects the safety of personnel or prevents completion of the Work Plan tasks, all personnel shall leave the Exclusion Zone until the situation is evaluated and appropriate actions taken.

The following emergency escape routes are designated for use in those situations where egress from the Exclusion Zone cannot occur through the decontamination line: (describe alternate routes to leave area in emergencies)

In all situations, when an onsite emergency results in evacuation of the Exclusion Zone, personnel shall not reenter until:

1. The conditions resulting in the emergency have been corrected.
2. The hazards have been reassessed.
3. The Site Safety Plan has been reviewed.
4. Site personnel have been briefed on any changes in the Site Safety Plan.

5. Personal Monitoring

The following personal monitoring will be in effect on site:

Personal exposure sampling: (describe any personal sampling programs being carried out on site personnel. This would include use of sampling pumps, air monitors, etc.)

Medical monitoring: The expected air temperature will be (°F) . If it is determined that heat stress monitoring is required (mandatory if over 70°F) the following procedures shall be followed: (describe procedures in effect, i.e., monitoring body temperature, body weight, pulse rate)

All site personnel have read the above plan and are familiar with its provisions.

	(name)	(signature)
Site Safety Oficer		
Project Team Leader		
Other Site Personnel		