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FINAL

INTERIM REMEDIAL MEASURE WORK PLAN
OPERABLE UNITS OU-2B and OU-2C

FORMER BUFFALO SERVICE CENTER SITE
VOLUNTARY CLEANUP PROGRAM AGREEMENT INDEX NUMBER B9-0577-00-05
BUFFALO, NEW YORK

PREPARED

BY

ESC ENGINEERING OF NEW YORK, P.C.

MARCH 25, 2005

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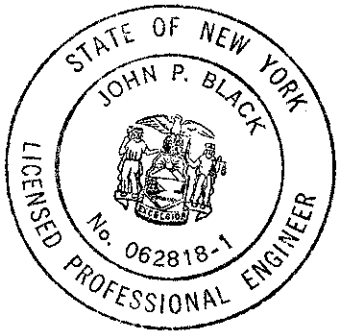
Acronym List

bgs	below ground surface
BPS	Buffalo Public Schools
BSA	Buffalo Sewer Authority
BSC	Buffalo Service Center
BURA	Buffalo Urban Renewal Agency
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulations
cm/sec	centimeters per second
COI	constituent of interest
E&E	Ecology & Environment, Inc.
GAC	granular activated carbon
gpm	gallons per minute
HASP	Health and Safety Plan
HDPE	high density polyethylene
IRM	Interim Remedial Measure
ISCO	*in-situ* chemical oxidation
µg/l	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
mg/kg	milligrams per kilogram
MGP	manufactured gas plant
NAPL	non-aqueous phase liquid
NFG	National Fuel Gas Distribution Corp.
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSC	Ontario Specialty Consulting, Inc.
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
ORC	Oxygen Release Compound
PhillipsLytle	Phillips Lytle LLP
PAHs	polycyclic aromatic hydrocarbons
PPE	personal protective equipment
psi	pounds per square inch
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
SSALs	Site Specific Action Levels
TAGM	Technical and Administrative Guidance Memorandum
TDC	Transportation and Disposal Coordinator
VOC	volatile organic compound

Professional Engineer Certification

I certify that I am an engineer licensed in the State of New York who has received a baccalaureate and post-graduate degree in engineering and have sufficient training and experience in remediation, groundwater hydrology, and related fields, as demonstrated by state registration and completion of accredited university courses that enable me to make sound professional judgements regarding engineering design. I further certify that this report, *Interim Remedial Measure Work Plan, Operable Units OU-2B and OU-2C, Former Buffalo Service Center Site, Voluntary Cleanup Program Agreement Index Number B9-0577-00-05, Buffalo, New York,* dated March 25, 2005, 2005, was prepared under my direction.



John P. Black, P.E.
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03/25/05
Date

1.0 Introduction

ESC Engineering of New York, P.C., has prepared this Interim Remedial Measures Work Plan (IRM Work Plan) in accordance with Exhibit "I" to the Order on Consent (Index #B9-0577-00-05(A)) between the New York State Department of Environmental Conservation (NYSDEC) and National Fuel Gas Distribution Corporation (NFG, effective date February 6, 2005). This IRM Work Plan specifically addresses Operable Unit–2B (OU-2B) and Operable Unit-2C (OU-2C) of the National Fuel Gas Buffalo Service Center site (BSC, Figure 1).

As defined in the Order, this IRM Work Plan includes:

1. a summary of the data supporting the extent of the proposed IRM (Section 2.0)
2. a chronological description of the anticipated IRM activities (Section 2.0, Section 3.0, and Schedule Sheet)
3. a schedule for performance of the IRM activities (Schedule Sheet)
4. detailed documents and/or specifications prepared, signed, and sealed by a Professional Engineer providing sufficient detail to implement the Department-approved IRM, including, as appropriate, a description of soil and sediment erosion control, storm water management and monitoring, and dust, odor, and organic vapor control and monitoring procedures to be implemented during remedial activities, and a detailed description of confirmation sampling and site restoration plans (Throughout IRM Work Plan and Sheets)
5. a health and safety plan, including a community monitoring plan (Section 3.9)
6. a contingency plan, including a description of procedures for dismantling and removing remedial structures and equipment from the Site, if applicable (Sections 4.3 and 4.9)
7. a citizen participation plan, if required, that incorporates appropriate activities outlines in the Department's publication, *Citizen Participation in New York's Hazardous Waste Site Remediation Program: A Guidebook,* dated June 1998, any subsequent revisions thereto, and 6 NYCRR Part 375 (Section 6.0)
8. an operations, maintenance, and monitoring plan, if the performance of the Department-approved IRM results in a treatment system that is expected to operate for greater than 18 months; if the system will not operate for greater than

18 months, or if only monitoring is required, only a monitoring plan will be needed (Section 4.10)

9. a description of institutional controls to be implemented as well as written approval from the owner of the affected property if the remedy selected requires implementation of an institutional control at an offsite location or if the person responsible for the remedy is not the site owner (Section 5.0)

The scope of work includes the excavation and offsite disposal of soil and fill material located within Operable Units OU-2B and OU-2C, as defined herein, beneath the Buffalo Public School District Waterfront School. Dewatering activities will be conducted concurrent to soil excavation activities. Collected groundwater and storm water will be discharged to the Buffalo Sewer Authority (BSA) after satisfying pretreatment criteria via permit. Excavation will continue until pre-determined soil cleanup objectives are satisfied or until predefined physical boundaries are reached. Details necessary to conduct the work are presented herein.

ESC Engineering will serve as the lead engineer (Engineer) for this project. Ontario Specialty Contracting, Inc. (OSC), of Buffalo, New York, under contract to ESC Engineering, will serve as the construction contractor (Contractor) responsible for conducting the majority of the field work. Specialty subcontractors will be subcontracted by ESC Engineering (laboratories) and OSC (bracing, surveying, transportation and disposal) during the course of the project, as necessary. As required under the terms of the Order, the Statements of Capabilities for Environmental Strategies and ESC Engineering, Ontario Specialty Contracting, and STL (the laboratory) have been previously submitted to the NYSDEC. Other laboratories are being considered, but they will be no less qualified than STL.

2.0 Site Description

The site descriptions provided herein include both the Buffalo Service Center Site (BSC), the location of the former Manufactured Gas Plant (MGP), and the Operable Unit OU-2B and OU-2C site, the OU-2B/OU-2C Site. The BSC Site is located at the northwest corner of West Genesee and Seventh Streets in Buffalo, New York, and is owned by NFG. The Site is industrial/commercial in nature, and has been industrial for over 100 years. A portion of the former Buffalo Service Center was acquired by the City of Buffalo[1] for construction of the Waterfront School in the 1970s.

The Site is secured with a chain link fence. There are no occupied structures on the BSC site. Immediately to the north of the site is the Buffalo Public Schools' Waterfront School that is partially underlain by a backfilled former slip from the Erie Canal, the Wilkeson Slip. The Wilkeson Slip was backfilled by others with unknown materials by 1915 and is no longer visible at the surface. A geophysical survey conducted in 2001 delineated the former slip. Investigations in the area of the Waterfront School have detected compounds that are similar to those found at the BSC Site within two areas defined as Operable Units OU-2B and OU-2C, the OU-2B/OU-2C Site.

2.1 Site Conditions

The conditions at the BSC Site have been investigated since 1989. Both the BSC Site and the OU-2B/OU-2C Site are underlain by fill, soil, and bedrock. Groundwater is contained within the overburden materials as well as within fractures in the bedrock. In portions of the site, concentrations of constituents of interest (COIs) potentially related to the former MGP exceed BSC Site Specific Action Levels (SSALs). Subsurface fill material covers the majority of the Site in thickness ranging from 4 to 14 feet. The fill consists primarily of silty sand, gravel, brick fragments, concrete and metal debris, and also contains varying amounts of inert coal gasification residuals such as cinders, slag, ash, and coal fragments. The Wilkeson Slip was filled by others with materials from unknown sources over 90 years ago, and represents the deepest accumulations of fill near the BSC Site.

[1] The City of Buffalo owns the property on which Buffalo Public Schools are constructed. While the Buffalo Public Schools are the occupants of the structure, the City of Buffalo is the owner.

Underlying the fill is a low-permeability alluvium unit comprised predominantly of fine sand to clayey silt throughout the majority of the site. However, in some areas, a silty clay unit is found just above the bedrock. Discontinuous lenses of peat are contained within the fill and between the fill and the alluvium. The peat lenses are a few inches to 2 feet thick and are found mainly in the southern and northwest portions of the Site. The thickness of the alluvium unit ranges from 2 to 12 feet. Bedrock is encountered below the alluvium at depths from 18 to 25 feet below ground surface (bgs). The first bedrock unit is dark gray fractured limestone.

Groundwater has found between 2 to 8 feet bgs in the overburden materials. Groundwater elevation data from all BSC monitoring wells have suggested radial flow, away from the center of the BSC Site with three major components of flow, one to the south, one to the east, and one to the north. The nature of the flow is more likely the result of anthropogenic influences; deep sewer lines to the south and east immediately adjacent to the property line and the buried Wilkeson slip to the north.

Due to the variable conditions across the BSC Site as well as in offsite locations, the analysis had been divided into four components:

- Operable Unit OU-1 – This operable unit is located on the site, predominantly west of the former gas holders, along the western border of the property. Non-aqueous phase liquid (NAPL) impacted or hydrocarbon stained soil was identified at depths between 4 and 18 feet bgs in several locations throughout this area. Isolated detections to 20 feet bgs were found in one area of this OU. Total benzene, toluene, ethylbenzene, and xylenes (BTEX) and total polycyclic aromatic hydrocarbons (PAHs) were also identified at concentrations above SSALs in soil samples collected from below 5 to 7 feet.
- Operable Unit OU-2A – This operable unit is located along the western fence line and includes portions of a municipal parking lot, and City of Buffalo property leased to the Board of Education/Buffalo Public Schools just outside the northwest corner of the BSC property. NAPL impacted or hydrocarbon stained soil was identified at depths below 8 feet, but no deeper than 18 feet, in several areas. Total BTEX and total PAHs were also identified at concentrations above SSALs in soil samples collected from depths below 8 feet within the former Wilkeson Slip.

- Operable Unit OU-2B – This operable unit is located within the OU-2B/OU-2C Site and includes the courtyard at the Buffalo Board of Education/Buffalo Public Schools Waterfront School property (north of the BSC property). NAPL impacted or hydrocarbon stained soil was identified, primarily below 8 feet, but no deeper than 18 feet. Total BTEX and total PAHs were also identified at concentrations above SSALs in soil samples collected between 7 and 18 feet bgs.
- Operable Unit OU-2C – This operable unit is located within the OU-2B/OU-2C Site, beneath the southernmost section of the Waterfront School building on the Buffalo Board of Education/Buffalo Public Schools property (adjacent to OU-2B). Hydrocarbon stained soils, with sheen, were identified beneath the building between 15 and 20 feet bgs. Soil samples collected from beneath the building did not contain BTEX or PAHs above the SSALs except for one sample with a slight exceedance of xylene.

This IRM work plan addresses the OU-2B/OU-2C Site.

2.2 Summary of Remedial Investigations

The nature and extent of environmental conditions at the BSC site were characterized through the completion of several site investigations from 1989 to 2004 (E&E 1998, E&E 1990, FDGTI 1996, FDGTI 1998, IT 2002, Shaw 2002a, Shaw 2002b, RETEC 2002a, RETEC 2002b, RETEC 2003a, RETEC 2003b). Based on the results of the investigations, former MGP structures, residual NAPL, and areas containing affected soil and groundwater have been identified and fully delineated. The site investigations conducted at this site are summarized below.

- 1989 – Ecology & Environment, Inc. (E&E) conducted a preliminary site assessment.
- 1990 – E&E completed a health assessment and interim remedial measure of cyanide-containing soils near the western corner of the property.
- 1990 - E&E completed an investigation by installing and sampling six groundwater monitoring wells.
- 1996 – Fluor Daniel GTI completed qualitative and quantitative risk assessments of groundwater at the site and beneath the Waterfront School property. Direct contact

with groundwater was not found to be a significant route of exposure to COIs. Based on the analyses, no imminent danger to the student body and/or employees of the Waterfront School was identified.

- 1998 – Fluor Daniel GTI installed and sampled two additional monitoring wells and 19 geoprobe borings.
- 2000 – The Board of Education contracted Advanced Environmental Services, Inc., to conduct an indoor air survey near the sumps in the school basement using a HNu photoionization detector. No volatile organic compounds (VOCs) were identified above the detection limit of 1 part per million.
- 2000 – IT Corporation conducted a site-wide investigation of groundwater impacts.
- 2001 – Geomatrix Consultants performed a geophysical survey of the site to delineate former MGP structures as well as the former Wilkeson Slip. The slip was identified along the northern property boundary and was approximately 50 to 70 feet wide.
- 2002 – IT Corporation excavated 17 test pits, installed 27 geoprobe borings to collect soil and groundwater samples, and installed 16 monitoring wells.
- 2002 – IT installed soil borings in the former Wilkeson Slip, conducted a site-wide groundwater sampling event, completed a human health risk assessment, and collected indoor air and sump water samples from the basement of the Waterfront School.
- 2003 – RETEC completed a pre-design investigation which included the installation of 40 soil borings, 3 monitoring wells, 2 recovery wells, and 10 temporary piezometers on- and off-site. A pumping test was conducted on one of the recovery wells. In addition, a treatability study was conducted for in-situ solidification and in-situ chemical oxidation (ISCO).
- 2004 – RETEC installed 13 soil borings within the former Wilkeson Slip and east of the BSC, collected 11 subsurface soil samples for analysis as well as for treatability studies, and collected four storm sewer water samples along the eastern and southern boundaries of the site.
- 2004 – ESC Engineering collected three soil samples and three groundwater samples for validation of cost estimate assumptions.

2.2.1 Nature and Extent of Contamination

The nature and extent of contamination at the Site has been quantified as a consequence of investigations conducted from 1989 to 2004. Based on the existing exposure pathways the soils at both the Site and the OU-2B/OU-2C Site pose no risks to human health. All detected concentrations exceeding the SSALs are in samples collected at depths greater than 4 feet bgs. Groundwater at both the BSC Site and the OU-2B/OU-2C Site have detectable concentrations of site related COIs, but appears to have reached a steady state, or declining constituent concentrations, condition and is not used for potable or non-potable purposes.

2.2.1.1 Soil

Constituents identified in soil samples collected during the site investigations consist primarily of BTEX and PAHs. Cyanide and some Resource Conservation and Recovery Act (RCRA) metals are also present, but at concentrations below SSALs. Soil impacts have been identified throughout much of the OU-2B/OU-2C site. The multiple fill materials and COIs from within the Wilkeson Slip cannot be solely attributed to the BSC site; nonetheless NFG has volunteered to remove fill with concentrations exceeding the SSALs from within the OU-2B/OU-2C Site portions of the slip. Soil samples targeting the highest total concentrations on the BSC Site were collected by ESC Engineering in December 2004. None of the ESC Engineering samples contained detectable concentrations in the TCLP testing, confirming the soils are not characteristically hazardous.

Soil samples exhibiting hydrocarbon sheen were collected at depths of 7 to 20 feet in the OU-2B (courtyard) area and 5 to 15 feet in the OU-2C (school building) area. Tar-like material and/or hydrocarbon NAPL is also present in the subsurface in discrete areas of the OU-2B/OU-2C Site. These areas include portions of the Wilkeson Slip in OU-2B (between depths of 12 to 16 feet). The underlying alluvium layer (comprised of tight fine sand, silt, and clayey silt) is not impacted by visible NAPL, sheen, or blebs.

In OU-2B, total BTEX detected above the SSAL was predominantly between 8 to 16 feet bgs with the highest concentration of 457 mg/kg. Those same soil samples contained total PAHs above the SSAL at concentrations between 702 and 1,870 mg/kg.

No soil samples collected from beneath the school in OU-2C contained total BTEX or total PAHs above the SSALs. However, a boring located within 5 feet of the building contained 109 mg/kg total BTEX and 1,550 mg/kg of total PAHs at a depth of 16 to 20 feet bgs (part of OU-2B).

2.2.1.2 Groundwater

Constituents identified in groundwater also consist primarily of BTEX and PAHs. Cyanide and some RCRA metals are also present, but at concentrations below the SSALs. Groundwater impacts have been identified throughout much of the former Wilkeson Slip (wells MW-30, MW-03, MW-05, MW-09, MW-12, PZ-2). Total BTEX concentrations in these areas ranged from 370 micrograms per liter (µg/l) to 29,500 µg/l. Total PAH concentrations in many of these same wells ranged from 780 µg/l to 14,500 µg/l; however, total PAHs were not as prevalent in the samples from the former Wilkeson Slip providing evidence that the COIs in this area may have originated in the fill placed in the slip rather than from the BSC Site.

Using groundwater data collected from all on-site and off-site monitoring wells, the most recent groundwater contour map indicates that groundwater appears to flow radially from the center of the OU-1 area. Groundwater elevations measured in off-site piezometers and wells (PZ-8, PZ-9, PZ-10, MW-31) located on the Buffalo Urban Renewal Agency (BURA) property to the east of the site indicate a component of flow toward the site.

NAPL was not observed in bedrock fractures during installation of the three bedrock monitoring wells (BDR-1, BDR-2, and BDR-3). The concentrations of organic compounds measured in the bedrock well samples do not indicate the presence of NAPL. These observations are consistent with the fact that the NAPL and PAHs detected at the site are largely immobile and that the clay underlying the fill at the site is clean.

3.0 Preparation and Mobilization

The preparation and mobilization for the IRM of the Operable Units OU-2B and OU-2C Site includes:

- Pre-Construction Sampling and Analysis – To provide data for waste profiles, to help delineate the extent of excavation, and assist in the preparation of contingency plans.
- Permits and Approvals – Permits for discharge of recovered groundwater, excavation, and traffic controls.
- Mobilization and Site Setup – Procuring materials and equipment, moving equipment to the site, and establishing the site infrastructure.
- Temporary Facilities – Requirements for parking, utilities, and traffic flow.
- Contractors Temporary Facilities – Contractors office and storage requirements.
- Engineer's Field Office – Requirements for the ESC Engineering onsite office and sample preparation area.
- NYSDEC Field Office – Requirements for the NYSDEC onsite office.
- Erosion and Sedimentation Control – Requirements for management of site storm water during the IRM
- Health and Safety Plan/Community Air Monitoring Plan – Plan requirements to protect on-site workers and the public.
- Equipment Decontamination – Requirements for decontamination of all equipment moving from the exclusion zones to clean zones during the IRM.
- Spill And Discharge Control – Control and management of liquids on the Operable Unit OU-2B and OU-2C Site
- Monitoring Well Abandonment – Requirements to properly abandon monitoring wells that pass through and below the IRM
- Survey Requirements – Requirements for surveying to define pre-IRM conditions.

3.1 Pre-Construction Sampling and Analysis

To determine conditions located to the north of the proposed excavation for OU-2C, soil samples will be collected before the start of work in this area. Eight soil samples (2 samples

each from 4 borings) are proposed below the concrete floor of the crawl space. The borings will be advanced approximately 2 to 5 feet to the north of the proposed excavation based on the available data concerning the slip location and the location of structural elements restricting access in the crawl space. Three borings will be equally spaced along the east/west direction of the proposed excavation for OU-2C and one boring will be advanced at the east end of the slip. Note: If the boring east of the slip encounters deep fill, additional borings will be added. A core of the concrete will be removed to allow soil sampling from beneath. The concrete thickness will be measured to plan for slab replacement. The soil samples will be collected using a hand-auger or similar technique at a depth of approximately 10 feet below the crawl space floor (approximately 16 feet below outside ground surface), or until refusal, whichever comes first. Two samples from each boring will be collected for analysis, 1 to 2-feet below slab and the interval with the highest photoionization detector measurement.

The samples will be analyzed for the site COIs and compared to the SSALs presented in Section 4.6. The information will be used to determine if additional *in-situ* methods are warranted along the northern wall of the excavation and to preclude the collection of confirmation samples from this area after excavation. If the analytical testing results in concentrations below the SSALs, no further action will be required. If the analytical testing results in residual COI concentrations above the SSALs, a preferred *in-situ* method will be applied to the northern wall of the excavation prior to backfill operations. The evaluation of several *in-situ* methods to address residual COIs above SSALs potentially remaining after excavation along the north wall of the slip excavation is presented in Section 4.9. As discussed with NYSDEC on March 22, 2005, the results of the Pre-Construction Sampling and Analysis will be used to determine if any contingency plan is required north of the excavation. Based on existing data collected from other locations north of the former slip, the results of this sampling and testing are not expected to identify any exceedance of the SSALs. Due to structural constraints, additional excavation will not be required further to the north. If NAPL or other SSAL exceedances are identified, an alternative approach will be identified in coordination with NYSDEC to take advantage of the school not being occupied during the 2005/2006 school year.

This pre-construction sampling was recommended by NYSDEC.

3.2 Permits and Approvals

The Contractor will be responsible for obtaining the permits and approvals necessary to allow for the proper execution of this IRM work plan. ESC Engineering will be responsible for obtaining approval of this IRM work plan from NYSDEC. ESC Engineering will provide technical support to the Contractor, as necessary.

Currently, the following permits and approvals are expected and will be sought:

- BSA water discharge permit
- local construction permits (excavation and traffic)
- landfill acceptance for disposition of excavated soil and fill material
- others as identified by Contractor

3.3 Mobilization and Site Setup

The Contractor will be responsible for mobilization and site set up. The Contractor will procure and transport the necessary resources to accommodate the project requirements (e.g., labor, materials, and equipment). The requirements will include, but not be limited to, the information provided in this section. Other requirements not specifically provided herein, but necessary for the successful conduct and completion of the work, will be provided by the Contractor.

Site preparation activities include mobilizing equipment, materials, supplies, and personnel to the project site. These resources will be utilized to perform the following operations:

- establish site security and entry and exit protocols
- place and install temporary office trailers and associated utilities
- establish a communications system including telephone, facsimile, two-way radios, and emergency warning systems
- establish personnel and equipment decontamination stations and delineate areas with barriers and signage
- mobilize earthmoving equipment
- establish dust and vapor control operations and air monitoring locations
- construct temporary water collection and discharge systems

- construct temporary groundwater dewatering, water collection, treatment, and discharge systems
- locate and mark underground utilities that may potentially be affected during site work

Equipment anticipated for the IRM includes hydraulic excavators, loaders, skidsteer equipment, compaction equipment, grading equipment, highway trucks, and water trucks or other conveyance systems for dust and vapor control. Additional equipment will be required for personnel safety, air monitoring, equipment decontamination, and field sampling.

3.4 Temporary Facilities

The Contractor shall prepare a site plan indicating the proposed location and dimensions of any area to be fenced and used by the Contractor, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. The Contractor shall also indicate if the use of a supplemental or other staging area is desired.

3.4.1 Employee Parking

Contractor employees shall park privately owned vehicles in a designated area on the BSC Site. This area will be off street to avoid occupying on-street parking currently used by residents and employees working in the area. This area will be within reasonable walking distance of the construction areas on the Operable Unit OU-2B/OU-2C Site.

3.4.2 Availability and Use of Utility Services

The Contractor is responsible for providing all temporary utility services required during construction. Utilities include electrical service, air conditioning, ventilation, lighting, heat, telephone, water connections, and sanitation facilities. The Contractor shall procure these services from the local utility provider in Buffalo, New York.

3.4.3 Bulletin Board, Project Sign, and Project Safety Sign

Immediately upon beginning work, the Contractor shall provide a bulletin board for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information required by federal laws.

The Contractor shall also display a project safety sign clearly communicating that *Safety Is Our First Priority* and listing the safe work practices and record for the site.

3.4.4 Protection and Maintenance of Traffic

During construction the Contractor shall provide access and temporary relocated roads as necessary to maintain traffic. The Contractor shall maintain and protect traffic on all affected roads during the construction period. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by the State and local authorities having jurisdiction. The traveling public shall be protected from damage to person and property. The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. The Contractor shall investigate the adequacy of existing roads and the allowable load limit on these roads. The Contractor shall be responsible for the repair of any damage to roads caused by construction operations.

3.4.5 Haul Roads

The Contractor shall construct temporary access and haul roads as required for construction activities. Haul roads shall be constructed with suitable grades and widths; sharp curves, steep slopes, blind corners, and dangerous cross traffic shall be avoided. The Contractor shall provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. Dust and vapor control shall be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and haul roads shall be subject to approval by the Engineer. Lighting shall be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations. Upon completion of the work, haul roads shall be removed.

3.5 Contractors' Temporary Facilities

The contractors' temporary facilities shall be established to facilitate safe work habits and efficient execution of the IRM. The minimum requirements for the contractors' facilities follow.

3.5.1 Administrative Field Offices

The Contractor shall provide and maintain administrative field office facilities within the construction area at the designated site. Field office trailers shall be securely anchored to the ground at all four corners to guard against movement during high winds. Access to the trailer shall meet all state and federal requirements.

Office space shall provide space for project meetings with tables and chairs to accommodate eight persons, drawings table, and drawing storage area. Ample space shall be provided for Health and Safety, Construction Quality Control, and Site Supervisory personnel. The meeting table shall be equipped with a telephone capable of adding people on a speaker conference.

3.5.2 Storage Area

The Contractor shall construct a temporary 6-foot high chain link fence around trailers and materials. Additional secure areas may by constructed as required by the locations of construction activities. Materials shall not be stockpiled outside the fence in preparation for the next day's work. Mobile equipment, such as excavators, wheeled lifting equipment, trucks, and like equipment, shall be parked within the fenced area at the end of each work day.

3.5.3 Appearance of Trailers

Trailers utilized by the Contractor for administrative or material storage purposes shall present a clean and neat exterior appearance and shall be in a state of good repair.

3.5.4 Maintenance of Storage Area

Fencing shall be kept in a state of good repair and proper alignment. Should the Contractor elect to traverse, with construction equipment or other vehicles, grassed or unpaved areas which are not established roadways, such areas shall be covered with gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways.

3.5.5 Security Provisions

Adequate outside security lighting shall be provided at the Contractor's temporary facilities. Guards shall be provided for the site during non-working hours and on weekends.

The Contractor shall be responsible for the security of its own equipment and to the extent practicable all sampling equipment stationed onsite by ESC Engineering.

In addition, the Contractor shall notify the appropriate law enforcement agency requesting periodic security checks of the temporary project field office.

3.5.6 Fueling Stations

Temporary above-ground fuel tanks shall be installed in accordance with all local, state, and federal requirements. Dispensing equipment shall be locked out when not in use. Tanks shall be placed on a 40-mil (minimum) liner with the sides diked to contain the maximum

volume of the tank. Spill control equipment including shovels, brooms, absorbent materials, and waste containers shall be provided at the refueling stations.

3.5.7 Cleanup

Construction debris, waste materials, packaging material and the like shall be removed from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways shall be cleaned immediately. Stored material not in trailers, shall be neatly stacked when stored.

3.5.8 Restoration of Storage Area

Upon completion of the project and after removal of trailers, materials, and equipment from within the fenced area, areas used by the Contractor for the storage of equipment or material, or other use, shall be restored to the original or better condition.

3.6 Engineer's Field Office

Full-time supervision by the engineer will be provided. To ensure adequate facilities, the following minimum requirements shall be satisfied.

3.6.1 Engineer's Office

The Contractor shall provide the Engineer with a lockable office, approximately 200 square feet in floor area, located where directed and providing operable space, heat, air conditioning, electric, telephone connections (two lines), desk, one four-drawer filing cabinet, drawing table, and access to drinking water and sanitation facilities.

3.6.2 Trailer-Type Mobile Office

The Contractor may, at its option, furnish and maintain a trailer-type mobile office acceptable to the Engineer and providing as a minimum the facilities specified above. The trailer shall be securely anchored to the ground at all four corners to guard against movement during high winds. Access to the trailer shall meet all state and federal requirements.

3.6.3 Sample Management Office

The Contractor shall provide the Engineer with a lockable sample management office, approximately 400 square feet in floor area, located where directed and providing operable space, heat, air conditioning, electric, work table along one wall, one four-drawer filing cabinet, and access to drinking water and sanitation facilities. A sea-type container would be a suitable enclosure.

3.7 NYSDEC Field Office

The Contractor shall provide the NYSDEC with an office trailer separate from the Engineer and Contractor office. The trailer shall be lockable and have a minimum floor area of 200 square feet. The Contractor shall supply heat, air conditioning, electric, telephone connections (two lines), telephone, answering machine, computer printer, desk, fax machine, one four-drawer filing cabinet, two chairs, drawing table, and access to drinking water and sanitation facilities. The trailer shall be securely anchored to the ground at all four corners to guard against movement during high winds. Access to the trailer shall meet all state and federal requirements.

3.8 Erosion and Sedimentation Control

In accordance with *New York Guidelines for Urban Erosion and Sediment Control* (New York 1997), an erosion and sedimentation control plan must be prepared for any construction activity that exceeds 5 acres in size. Because the total proposed excavation area for remediation of the soil is much less than 1 acre, a formal plan was not developed for the Operable Unit OU-2B and OU-2C Site. The entire site is only 0.7 acre. However, erosion and sedimentation controls will be incorporated into the overall scope of work as a Best Management Practice and to re-establish vegetation. Due to the nature of an excavation project, the majority of surface water that contacts disturbed areas of the site will be trapped by the excavation and prevented from leaving the site.

During excavation activities, erosion and sedimentation controls will be incorporated to minimize surface water contacting disturbed areas and to control runoff. A silt fence will be installed at strategic locations determined in the field. Water that accumulates in the excavations will be collected and managed in accordance with BSA discharge requirements.

Additional erosion and sedimentation controls will be necessary after the excavations are backfilled. These controls include seeding and mulching all disturbed areas of the site that remain exposed to the elements. Seeding and mulching requirements will satisfy the Buffalo Public Schools/Waterfront School requirements. As the school will be undergoing renovation immediately following the IRM, coordination of the final surface features will be done with the Buffalo Public Schools developer, LPCiminelli.

3.9 Health and Safety Plan/Community Air Monitoring Plan

This section provides requirements for preparing and implementing the Site Health and Safety (HASP). The requirements shall apply to all work performed by the Contractor.

The following shall be submitted in advance of field work and shall become a major component of this IRM work plan:

- corporate health and safety program
- site HASP
- worker training certification and medical clearance
- air monitoring logs
- equipment decontamination plan
- spill and discharge control plan

3.9.1 Regulatory Requirements

Work performed under this contract shall comply with applicable Federal, state, and local safety and occupational health laws and regulations. This includes, but is not limited to, Occupational Health and Safety Administration (OSHA) standards, 29 Code of Federal Regulations (CFR) 1910.120, "Hazardous Waste Site Operations and Emergency Response" and 29 CFR 1926.65, "Hazardous Waste Site Operations and Emergency Response." Matters of interpretation of standards shall be submitted to the appropriate administrative agency for resolution before starting work. Where the requirements of this IRM work plan, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply.

3.9.2 Safety and Health Program

OSHA Standards 29 CFR 1910.120(b) and 29 CFR 1926.65(b) require employers to develop and implement a written Health and Safety Program for employees involved in hazardous waste operations. The site-specific program requirements of the OSHA Standards shall be integrated into one site-specific document, the HASP. The HASP shall interface with the employer's overall Health and Safety Program. Any portions of the overall Health and Safety Program that are referenced in the HASP shall be included as appendices to the HASP.

3.9.3 Site Health and Safety Plan

A HASP shall be prepared covering onsite work to be performed by the Contractor and all subcontractors. The Health and Safety Manager shall be responsible for the development,

implementation and oversight of the HASP. The HASP shall establish, in detail, the protocols necessary for the anticipation, recognition, evaluation, and control of hazards associated with each task performed. The HASP shall address site-specific health and safety requirements and procedures based upon site-specific conditions. The level of detail provided in the HASP shall be tailored to the type of work, complexity of operations to be performed, and hazards anticipated. Details about some activities may not be available when the initial HASP is prepared and submitted. Therefore, the HASP shall address, in as much detail as possible, anticipated tasks, their related hazards, and anticipated control measures.

The HASP shall be submitted to the Engineer within 21 days of Notice to Proceed, or otherwise agreed upon timeframe. Deficiencies in the HASP will be revised to correct the deficiencies and resubmitted for acceptance. Onsite work shall not begin until the plan has been accepted. A copy of the written HASP shall be maintained onsite. As work proceeds, the HASP shall be adapted to new situations and new conditions. Changes and modifications to the accepted HASP shall be made with the knowledge and concurrence of the Health and Safety Manager, the Site Superintendent, and the Engineer. Should any unforeseen hazard become evident during the performance of the work, the Site Health and Safety Officer shall bring such hazard to the attention of the Health and Safety Manager, the Site Superintendent, and the Engineer, both verbally and in writing, for resolution as soon as possible. In the interim, necessary action shall be taken to re-establish and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public, and the environment. Disregard for the provisions of the accepted HASP shall be cause for stopping work until the matter has been rectified.

Topics required by 29 CFR 1910.120(b) (4) and 29 CFR 1926.65 (b) (4) and those described in this section shall be addressed in the HASP. Where the use of a specific topic is not applicable to the project, the HASP shall include a statement to justify its omission or reduced level of detail and establish that adequate consideration was given the topic. At a minimum, the following topics shall be addressed:

- health and safety organization
- site description and hazard evaluation
- health and safety risk or hazard analysis
- provisions for employee training

- use of personal protective equipment
- medical surveillance requirements
- air monitoring requirements (personnel and community)
- site control measures
- personnel and equipment decontamination procedures
- standard operating work practices
- confined space entry procedures
- emergency response procedures
- first aid procedures
- temperature extremes monitoring

Action levels shall be established for the situations listed below, at a minimum. The action levels and required actions (engineering controls, changes in personal protective equipment [PPE], etc.) shall be presented in the HASP in both text and tabular form.

- implementation of engineering controls and work practices
- upgrade or downgrade in level of personal protective equipment
- work stoppage and/or emergency evacuation of onsite personnel
- prevention and/or minimization of public exposures to hazards created by site activities

The Site HASP shall detail the minimum PPE ensembles (including respirators) and specific materials from which the PPE components are constructed for each site-specific task and operation to be performed, based upon the hazard/risk analysis. Components of levels of protection (B, C, D, and modifications) must be relevant to site-specific conditions, including heat and cold stress potential and safety hazards. Only respirators approved by the National Institute for Occupational Safety and Health shall be used. Onsite personnel shall be provided with appropriate personal protective equipment. Protective equipment and clothing shall be kept clean and well maintained. The PPE section of the HASP shall include site-specific procedures to determine PPE program effectiveness and for onsite fit-testing of respirators, cleaning, maintenance, inspection, and storage of PPE.

The Health and Safety Manager shall establish appropriate levels of protection for each work activity based on review of historical site information, existing data, an evaluation of the potential for exposure (inhalation, dermal, ingestion, and injection) during each task, past air monitoring results, and a continuing health and safety monitoring program. The Health and Safety Manager shall also establish action levels for upgrade or downgrade in levels of PPE from the following specified minimum levels of protection. Protocols and the communication network for changing the level of protection shall be described in the HASP. The PPE reassessment protocol shall address air monitoring results, potential for exposure, changes in site conditions, work phases, job tasks, weather, temperature extremes, individual medical considerations, etc.

The Health and Safety Manager shall prepare and implement an exposure monitoring/air sampling program to identify and quantify health and safety hazards and airborne levels of site-related substances in order to assure proper selection of engineering controls, work practices and personal protective equipment for affected site personnel. Available site information shall be reviewed and the exposure monitoring/air sampling program shall be expanded and/or revised for submittal as part of the HASP.

At a minimum, the personnel breathing zone and downwind perimeters of the work areas shall be monitored using real-time dust and vapor monitoring equipment. Action levels for airborne dust and vapor shall be determined for each COI. Action levels to trigger dust operations shall not be less than 380 micrograms/cubic meter ($\mu g/m^3$) average 1-hour standard (equivalent to 150 $\mu g/m^3$ for assessing 24-hour standard) or visible dust near the fence line.

3.9.4 Community Air Monitoring Plan

In addition to air monitoring to protect site personnel, the New York State Department of Health (NYSDOH) requires the implementation of a Community Air Monitoring Plan (CAMP) for all ground intrusion activities, including contaminated soil excavation and handling. This plan shall be prepared by the Contractor, in conjunction with the development of the HASP, and shall include real-time monitoring for both COIs and particulate both upwind and downwind of certain work activities at the site. The CAMP is not intended to establish safe working conditions for personnel onsite; it is meant to protect offsite receptors (including residences and businesses) from potential airborne releases. The contents of the CAMP shall be based on the

type of intrusive work being performed onsite (i.e., excavation, loading, and transportation of soil). The CAMP shall include, but not be limited to, the following activities:

- Selection of CAMP monitoring locations - monitoring locations shall be positioned at the property boundary, one upwind and three down wind, of potential COI-generating activities and at one location within the school (near the access hatch). Monitoring shall be performed at these locations. The Contractor shall identify each monitoring location and the rationale for its placement. In addition, the Contractor shall include a contingency for moving the monitoring locations based on the prevailing wind direction during site activities.
- Periodic monitoring – shall be performed for VOCs emissions during certain non-intrusive activities, such as soil and fill excavation, during the most likely time frame when emissions can occur. At a minimum, the Contractor shall collect instantaneous VOC measurements at the initiation and completion of excavation activities and continuous monitoring during working hours while the excavation is at depths of greater than 8 feet and under the school structure. Intermittent VOC measurements shall also be collected when health-related monitoring at the vicinity of the work detects VOCs above the CAMP action level. The Contractor shall specify the means, methods, and equipment to be used for periodic monitoring in the CAMP subject to approval by ESC Engineering.
- Documentation Monitoring – shall be performed by the Contractor for VOCs, naphthalene, methylnaphthalene, and particulate during all ground intrusive activities. During intrusive work, weekly samples shall be collected from five monitoring locations (1 upwind, 3 downwind, and 1 within the school) at the property boundaries. Summa canisters will be used to collect air samples over an 8-hour period. The Contractor shall specify the means, methods, and equipment to be used for documentation monitoring in the CAMP. While odor does not pose a health risk, it is a nuisance. At the first occurrence odor is detected at the monitoring perimeter (no closer than 20 feet downwind of the excavation, but within the property boundary), an instantaneous sample shall be collected to ensure no risk is posed. Appropriate response activities shall be described in the CAMP to reduce the generation of odors during site activities.

- Action and response levels – the Contractor shall specify the action and response levels for concentrations of COIs and particulate detected during monitoring. The project shall be temporarily shut down any time a reading at a CAMP monitoring station reaches 50 percent of any action level for any COI. The appropriate response activities shall be taken to control COIs before active remedial measures resume. Appropriate response activities shall be described in the CAMP should those action levels be exceeded during site activities.
- Documentation – the Contractor shall include in the CAMP a method for recording all measurements collected during the plan's implementation and all records shall be made available to NYSDOH, NYSDEC, and the Engineer, upon request. At a minimum, a daily log shall be kept to document monitoring results, wind speed, direction, and weather conditions.

3.10 Equipment Decontamination

Vehicles and equipment that come into contact with affected media shall be decontaminated prior to leaving the exclusion zone established for the Operable Unit OU-2B and OU-2C Site. Decontamination measures should be taken to prevent tracking of mud onto the public roads. Any tracked mud shall be cleaned immediately. The procedures for decontamination of vehicles and equipment shall be addressed in the HASP.

3.11 Spill and Discharge Control

The HASP shall include a Spill and Discharge Control Plan to be implemented in the event of an accidental release of potentially hazardous materials. The Spill and Discharge Control Plan shall contain the following elements:

1. Preventive Measures: The Contractor shall provide methods, means, and facilities required to prevent contamination of soil, water, atmosphere, uncontaminated structures, equipment, or material by the discharge of wastes from spills due to the Contractor's operations. Shovels, brooms, non-combustible absorbent materials, polyethylene sheeting, and PPE shall be maintained in accessible locations.

2. Emergency Measures: The Contractor shall provide equipment and personnel to perform emergency measures required to contain any spillage and to remove spilled materials, soils, or liquids that become contaminated due to spillage. The collected spill materials shall be properly disposed of at the Contractor's expense.
3. Decontamination Measures: The Contractor shall provide the equipment and personnel to perform decontamination measures that may be required to remove spillage from previously uncontaminated structures, equipment, or material. Disposal of decontamination residues and confirmation samples shall be performed at the Contractor's expense.
4. Notification Procedures: The Contractor shall notify the Engineer immediately after the release of potentially hazardous materials as well as the National Response Center and NYSDEC Hotline, as required (applicable phone numbers must be listed in the HASP).

The Contractor will be responsible for implementing the site HASP and CAMP. The plans will ultimately become a component of this IRM work plan. These plans will be prepared by the Contractor with support from ESC Engineering. The Contractor will be responsible for conducting the air monitoring and taking appropriate action based on the results. During mobilization and site setup activities, equipment and materials for health and safety, vapor and dust suppression, and air monitoring equipment will be transported to the site and assembled to satisfy the plan requirements.

3.12 Monitoring Well Abandonment

Before monitoring wells are abandoned, a round of water level measurements will be collected to determine the potentiometric surface of the groundwater at the time of remediation. This information will be used to determine the performance of the dewatering system proposed and the need for establishing additional temporary pumping locations during construction.

Monitoring wells and piezometers within the excavation areas will be properly abandoned before excavating activities begin. The monitoring wells will be abandoned in accordance with NYSDEC's Groundwater Monitoring Well Decommissioning Procedures

(NYSDEC 1996). Only monitoring wells located in proposed excavation areas will be abandoned at this time. These wells and piezometers include:

- MW-05
- PZ-2
- PZ-3
- PZ-4
- PZ-5
- MW-12
- PZ-6

RW-01 and RW-02 will be used in the dewatering of the excavation and will be removed during the excavation activities.

3.13 Survey Requirements

The Contractor will be responsible for the survey requirements associated with the proper execution of this project. The survey requirements will include, but not be limited to, the following:

- existing conditions, including identification of site features (Nearby school corners [location and elevation], manholes/sewer inlets, and property boundaries) and topographic contours
- elevation survey of the floors within the school over the proposed excavation and after backfilling operations have been completed
- survey control throughout the execution of the project
- establishing a confirmation sampling grid over the excavated areas
- as-built drawings, depicting final approved excavation contours, final backfill contours, and any permanent installations required by the project

The Contractor shall provide all materials, labor, and equipment required to conduct all survey work necessary for the project. The Contractor shall establish benchmarks as required to perform the work to the lines and grades indicated on the Drawings. The benchmarks shall be tied into the New York State Plane coordinate datum, or otherwise approved by the Engineer.

The Contractor shall use only independent New York-registered professional surveyors for surveying required to produce final products and measure quantities for payment purposes. Interim survey work may be conducted by the Contractor during the course of the project.

References shall be set and measurements taken using standard accepted surveying methods and equipment. The accuracy of the survey layout data shall be ±0.10 foot horizontal and ±0.10 foot vertical or as approved by the Engineer.

4.0 Remedial Activities

The Remedial actions to be completed under this IRM are those listed in the Scope of Work attached to the Order. The Scope of Work includes[2]

1. Install Dewatering System along proposed excavation
2. School closing (by others)
3. Install sheet pile barrier to prevent flow along the Wilkeson Slip (Sheet 4). The sheet pile barrier shall be installed along the eastern boundary of OU-2A to (1) segregate flow between OU-2A and OU-2B and (2) to provide support for the school property during the remediation of OU-2A.
4. Demolition (by others)
5. Initiate dewatering of area around excavation
6. Delineate work zones inside and outside building. (Note: no access to the portion of the building over the excavation will be allowed during the removal action.)
7. Clear surface soils that meet Site Specific Action Levels (SSALs [see 20 below]); stockpile for potential reuse on Buffalo Service Center Property.
8. Remove pavement within the limits of the excavation (Sheet 4) around sides of school outside limits of previous demolition
9. Cut crawl space slab (Sheet 5) into manageable units
10. Install polyethylene sheeting to isolate crawl space over excavation from rest of crawl space
11. Cross brace structure as needed (Note: plans of existing structure have been provided by the Buffalo Public Schools to determine what, if any, cross bracing is required.)
12. Air monitoring shall be conducted to insure no release of constituents of concern above levels of regulatory concern. Vapor mitigation will be implemented if any exceedence of standards at the property line is detected.
13. Excavate soils and Urban Fills as shown on Sheet 4. Excavation to the North will be limited by the location of the North wall of the Wilkeson Slip and protection of

[2] The numbering system matches the sequence given in the attachment to the Order.

the second row of caissons. (Note: urban fill that meets SSALs will not be excavated and will be left in place.)

14. Excavated soils that do not meet SSALs will be transported offsite for proper disposal.
15. Excavated urban fill that is not soil-like, shall be shipped offsite for disposal.
16. The sides and bottom of the excavation shall be sampled. The samples will be analyzed for the SSAL's defined in the Remedial Alternatives Report:

OU-2B and OU-2C **Surface Soil (24 inches)**	TAGM 4046 levels for all parameters
Subsurface Soil	10 mg/Kg total BTEX, 500 mg/Kg total PAHs, 1 mg/Kg (or TAGM value, whichever is greater) individual BTEX compounds, 50 mg/Kg individual PAHs, Presence of NAPL

17. If the SSALs are exceeded to the east, the excavation will be continued until the SSALs are met or the school property line is reached.
18. If the SSALs are exceeded to the west, the excavation will be continued until the SSALs are met or the sheet pile barrier is reached.
19. If the SSALs are exceeded on the south wall, the excavation will be continued until the SSALs are met or the bottom of the excavation extends off the school property.
20. The bottom of the excavation, to within 15 feet of the ground surface, will be filled with flowable fill or clay.
21. The excavation under the building (between the columns) will be filled to within 10 feet below ground surface with gravel to allow groundwater flow along the axis of the Wilkeson Slip.
22. The surface of the gravel will be covered with non-woven geotextile.
23. The excavation will be filled to the elevation of the base of the floor slab with flowable fill or clay.

24. Perforated tubing shall be placed along the length (west to east) of the structure (Sheet 5).
25. The zone under the sloped mud slab will be filled with gravel (Sheet 6).
26. The zone outside the building will be backfilled with compacted certified clean fill.
27. All storm water and foundation drainage facilities will be replaced in kind.
28. The crawl space floor slab and mud slab will be replaced in kind.
29. The crawl space floor and mud slab within the area shown on Sheet 6 will be sealed with epoxy.
30. The sump and perforated tubing will be manifolded together and tied into a discharge pipe rising though a pipe chase to be designated by others (Sheet 6).
31. An inline fan will be installed near the roofline on the vent riser.
32. The fan will be operated for a minimum period of 30 days prior to sampling. A summa canister sample will be collected to determine the concentration of BTEX and PAHs in the crawl space.

4.1 Groundwater Management

Groundwater in the vicinity of the excavation will be managed through a treatment system (Sheet 3) installed and operated on the adjacent Buffalo Service Center property, extraction using existing wells RW-1 and RW-2 (Sheet 4), dewatering wells specifically installed for this project (DW-01, DW-02, and DW-03), and sumps within the excavation. Groundwater within the fill in the Wilkeson Slip under Fourth Street and within the fill in the Erie Canal will be isolated from the City of Buffalo/Waterfront School property by installing a sheet pile barrier wall along the west side of the proposed excavation, east of the utility corridor along Fourth Street (Sheet 4).

4.1.1 Barrier Wall Installation

The limit of this project is the extent of soils exceeding SSALs within Operable Units OU-2B and OU-2C. The barrier wall will be installed at the location shown on Sheet 4 unless an alternate location further west can be approved prior to mobilization. The sheet pile barrier will be extended to the bedrock surface and shall extend beyond each side of the former slip to (1) minimize groundwater flow around the ends of the wall from the western portion of the slip, and

(2) to provide a clear delineation for possible future IRM's in Operable Unit OU-2A of the Buffalo Service Center property. The barrier wall will be designed following the February 18, 2005,[3] site visit to the Waterfront School property.

4.1.2 Well Installation

A pumping test was conducted by RETEC using recovery well RW-1 (Sheet 4). Well RW-1 is an angled well that screens three units: fill material onsite, fill in the former Wilkeson Slip, and alluvial materials (silty clay) beneath the fill under the Waterfront School. RETEC was able to sustain a pumping rate of 7 gallons per minute (gpm) for a period of 7 hours (the test was started at 22 gpm and stepped down over a 25 hour period) in RW-1. No record was given for drawdown in the pumping well. However, drawdown was noted in wells 45 feet to the west (4 feet drawdown) and 20 feet east (2 feet drawdown) of the pumping well along the axis of the Wilkeson Slip. Three piezometers located within 20-90 feet of RW-1 (wells located within the fill materials on the Buffalo Service Center Site) each had about 0.8 feet of drawdown after 32 hours of pumping. Continuous pumping of RW-1 caused an elliptically shaped cone of depression (due to the higher hydraulic conductivity in the former slip and in the surrounding fill/alluvial materials) within (and just outside) the former Wilkeson Slip. The maximum extent of influence was estimated to be approximately 190 feet north to south and 320 feet east to west.

The average saturated thickness across the site and within the former slip is approximately 16 feet. The results of the pumping test gave an estimated hydraulic conductivity (K) between 1.8 to 3.7×10^{-3} centimeters per second (cm/sec; or 5.1 to 10.49 feet per day).

Another consulting firm conducted slug tests in wells located on the adjacent Fourth Street Site (to the north) and determined that the K values for onsite materials were between 1.11×10^{-3} and 5.73×10^{-5} cm/sec. No information was available regarding the depths of the wells, water level measurements, or type of materials screened by these wells.

For purposes of the proposed excavation, pumps will be installed in the two angled borings and the three proposed dewatering wells. The estimated Total Dynamic Head will be 40 feet of water. The pumps in the angled wells will be capable of pumping 7 gpm and the pumps in the vertical wells (DW-01, DW-02, and DW-03) will be capable of extracting a

[3] The Waterfront School students will be out of the building on February 18, 2005 for an "In-Service" day when teachers and staff report but no classes are held.

minimum of 2 gallons per minute. The sump pump within the excavation will be capable of producing 20 gallons per minute.

4.1.3 Treatment System Installation

Groundwater samples taken from the adjacent Buffalo Service Center and from Operable Units OU-2B and OU-2C consistently meet the Buffalo Sewer Authority discharge criteria for all parameters except for benzene. The groundwater samples for the worst parts of the adjacent site do not meet the BSA benzene pre-treatment standard and as a contingency, a pre-treatment facility will be assembled on the Groundwater Treatment System Compound on the adjacent Buffalo Service Center Site. The pre-treatment system will be capable of treating 25 GPM of groundwater at an initial concentration of 1,300 μg/l to less than 250 μg/l (one half of the BSA discharge limit).

The pretreatment system (Sheet 3) will consist of:

- Equalization Tank – 1,000 gallon (40 minute min.) capacity
- Stacked Tray Air Stripper (QED Model EZStaker 2.5P)
- Bag Filters (to protect Granular Activated Carbon [GAC]; Krystal Klear Model L88302NAC10)
- GAC Filled Drums (50 gpm capacity so one set can be off line for change out without interrupting flow)
- Final Holding Tank – 2,000 gallon (80 minute min.) capacity

The system will be skid mounted and installed in an enclosed compound to protect the systems from damage during earthmoving activities.

4.1.4 Operation and Maintenance

The dewatering and treatment systems shall be maintained in accordance with the manufacturers' requirements. Sampling shall be conducted at the frequency required by the BSA. If the groundwater consistently meets the BSA criteria without treatment, the system bypass will be used to discharge directly to the BSA system.

The system will be started as shown on the Proposed Schedule (Sheet 7). The system will be operated 24-hours per day prior to and during the excavation activities. Existing recovery wells RW-01 and RW-02 will be removed as the excavation advances to their position. If it becomes apparent that the rate of ground intrusion into the excavation is less than can be

managed by the sump pump during the working shifts, only DW-01 and DW-02 will be operated 24 hours per day. These wells will be operated to extract groundwater from the east and west ends of the excavation.

4.2 OU-2B/OU-2C Soil Management

Soils excavated from the Operable Unit OU-2B and OU-2C Site will be removed from the City of Buffalo property. Soils meeting the SSALs will be used as fill on the Buffalo Service Center Site. Soils and fill not meeting SSALs will be transported offsite for proper disposal.

Before excavation work begins at these locations, the Contractor will prepare the area as follows:

- delineate work zones inside and outside of the school building (no access to the portion of the building located over the excavation will be allowed during excavation and backfill work)
- notify the Utility Location Services in the area to identify all public utilities
- place polyethylene sheeting to isolate the section of the crawl space that will remain in-tact from the excavation area
- install reinforcement of foundation and structure, as necessary (structural evaluation will be performed by others as a subcontractor to the Contractor)

4.3 Demolition

Demolition (by others) of portions of the Waterfront School is planned for 2005. The field work associated with the excavation of OU-2B and OU-2C will not begin until the proposed demolition is completed by others. The demolition will include:

- removal of the courtyard walls to grade
- removal of the bus “canopy” to grade

All below grade demolition associated with the courtyard walls and bus canopy required to remove soils above SSALs will be done under this IRM work plan. The anticipated demolition for this Scope of Work includes:

- removal of all subgrade structures within the limits of excavation (Sheet 4), that will be within 6-inches of final finish grade as defined by the Buffalo Public Schools
- removal of portions of the courtyard walls grade beams to permit access by excavation and backfilling equipment
- removal of the bus "canopy" slab that is below grade
- remove pavement within the limits of excavation along the applicable perimeter of the school
- cut the crawl space floor slab into manageable pieces (concrete will be removed as excavation advances beneath)
- removal of the drainage tile around the building within the limits of excavation

4.4 Temporarily Relocate "Clean" Material

As indicated in Section 2.0 and documented by various previous submittals listed in Section 2.2, samples with concentrations of BTEX and PAHs above the SSALs are present below the depth of 8 ft-bgs. As a conservative measure, the first 6 feet of soil (urban fill) will be stripped from OU-2B and OU-2C and be used as backfill or be appropriately managed offsite. Any construction debris or foundation materials (Large concrete, piping, etc.) will be removed from the materials before use as fill. Excavation constraints are provided on Sheet5.

4.5 Subsurface Soil Removal

The Contractor shall excavate soil and fill material that exceeds the SSALs to the initial limits as shown on the Drawings. Excavation to the North will be limited by the location of the North wall of the Wilkeson Slip and constraints identified to protect foundation caissons. The East, West, and South sides and bottom of the excavation shall be sampled for confirmation purposes. The North wall of the excavation will be sampled in advance of the excavation, as described in Section 3.1, Pre-Construction Sampling and Analysis. Confirmatory sampling and analysis is discussed in Section 4.6.

Excavation will continue to the East until the SSALs are satisfied or the school property line is reached. As the soil samples from PZ-2 meet the SSALs, it is understood that the excavation will not be required east of this location. Excavation will continue to the West until the SSALs are met or the sheet pile barrier is reached. Excavation will continue to the South

until the SSALs are met or the excavation reaches the school property line. The depth of the excavation will continue until the confirmation sampling demonstrates the underlying clay or fill satisfies the SSALs. The clay has been shown to be clean by all previous sampling and will not be removed within 5 feet of the base of the caissons under any circumstances (Sheet 5).

As the OU-2B and OU-2C excavations will potentially precede any remedial actions on the NYSDEC Fourth Street Site, sites to the east of the school, and the Buffalo Service Center Site, there is the potential that groundwater near the backfilled excavation will contain COIs. To prevent recontamination of the fill from these other sources, low permeability materials will be used along the east and south sides of the excavation. The dewatering wells will be operated, for a maximum of six months or until the groundwater concentrations meet the BSA criteria for direct discharge, whichever comes first.

4.6 Confirmatory Sampling and Analysis

ESC Engineering will conduct a sampling and analysis program to confirm achievement of the SSALs and to determine if additional excavation is warranted. As the excavation progresses, a survey grid will be established over the excavated surfaces. The grid will consist of 1,000 square feet (maximum) sub-areas that cover the entire excavation surface. The average width of the excavation is expected to be 75 feet; therefore the sample grid may consist of smaller sub-areas. Each sub-area will be given a designation determined in the field (e.g., OU-2B-180N). The designation "-180" will be the distance along the proposed excavation from the western barrier wall location and the designation "N" or "S' will be used for north or south of the excavation centerline. If the barrier wall is not installed, a survey monument or courtyard wall foundation pier will be used as the datum.

One discrete sample biased toward the area of highest contamination (using field screening techniques) will be collected from each 1,000 square foot sub-area and analyzed for the COIs. The results of the sample will be compared to the SSALs. As necessary, excavation will continue within sub-areas that exceed the SSALs. Only discrete areas within sub-areas will be excavated further. Sub-areas that satisfy the SSALs will not be excavated further. The SSALs include the following:

OU-2B and OU-2C **Surface Soil (24 inches)**	TAGM 4046 levels for all parameters
Subsurface Soil	10 mg/Kg total BTEX, 500 mg/Kg total PAHs, 1 mg/Kg (or TAGM value, whichever is greater) individual BTEX compounds, 50 mg/Kg individual PAHs, Presence of NAPL

Samples will be analyzed by a New York State Certified laboratory. Quality Assurance/Quality Control (QA/QC) samples will be collected during sampling events. One trip blank will be included in each sample container containing samples for VOC analysis. One duplicate soil sample will be collected for ever 20 samples, and analyzed for the same COIs. One equipment blank will be collected per day from all sampling equipment used during that day and analyzed for the same COIs.

4.7 Waste Management

The Contractor identified to conduct the excavation activities shall be responsible for the transportation and disposal of the soil and material removed from the site. As part of this role, the contractor shall designate one person to act as the Transportation and Disposal Coordinator (TDC) for this IRM work plan. The TDC shall coordinate the transportation and disposal requirements associated with this project. Based on existing data, the material proposed for excavation from OU-2B and OU-2C will be disposed offsite as a nonhazardous waste. The Contractor shall obtain approval from the disposal facility using the existing database or coordinate additional characterization requirements with ESC Engineering to obtain approval before field work begins. A "direct load" approach is planned.

As a contingency, the Contractor shall be prepared to address potential areas that contain NAPL. Visible pockets of NAPL shall be excavated and segregated from the nonhazardous material. Any NAPL shall be characterized separately and disposed of accordingly.

4.7.1 Transportation and Disposal Coordinator

The TDC shall serve as the single point of contact for transportation, disposal, and regulatory matters associated with waste management. The TDC shall be responsible for environmental compliance at the site including, but not limited to:

- determination of proper shipping names
- identification of marking, labeling, and placard requirements
- completion of appropriate waste profiles, hazardous waste manifests (as contingency only), and bills of lading for non-hazardous waste material, as necessary
- obtaining disposal facility weigh slips
- any other environmental documentation as required by local, state, and/or federal law

The TDC shall have, at a minimum, one year of experience in the management and transportation of hazardous waste. The TDC shall coordinate transportation and disposal activities with ESC Engineering oversight representatives. ESC Engineering shall sign all transportation documentation on behalf of National Fuel Gas.

4.7.2 Laws and Regulations

The proposed IRM work plan effort shall meet or exceed minimum requirements established by federal, state, and local laws and regulations, as applicable. These requirements are amended frequently, so the Contractor shall be responsible for complying with such amendments, as necessary.

4.7.3 Transportation

The Contractor shall use manifests for transporting hazardous wastes as required by 40 CFR 263 and any applicable state or local law or regulation. Transportation shall also comply with all requirements in the Department of Transportation 49 CFR regulations. The Contractor shall provide ESC Engineering with the EPA ID numbers, names, locations, and telephone numbers of each proposed waste transporter along with the bid documents for this work. Alternate transporters may not be considered acceptable, depending on the justification for use. All non-hazardous shipments will be accompanied by a bill of lading that documents shipping information, including transporter and disposal facility names and locations.

4.7.4 Treatment and Disposal of Hazardous Wastes

There is no known materials that exhibit the characteristics of hazardous waste within the Operable Unit OU-2B and OU-2C Site. Hazardous waste management is included only as a contingency for OU-2B and OU-2C. The Contractor shall provide ESC Engineering with the

EPA ID numbers, names, locations, and telephone numbers of each proposed waste treatment and disposal facility along with the bid documents for this effort. ESC Engineering and National Fuel Gas must approve the use of the selected disposal facilities before commencement of the IRM work plan activities. The Contractor shall ship hazardous wastes only to facilities that are properly permitted to accept such waste and are pre-approved by ESC Engineering.

4.7.5 Non-hazardous Waste Disposal

All non-hazardous waste shall be shipped to an approved RCRA Subtitle D landfill. The Contractor shall ship non-hazardous wastes only to facilities that are properly permitted to accept said waste streams and are pre-approved by ESC Engineering.

4.7.6 Waste Minimization

The Contractor shall minimize the generation of hazardous and non-hazardous waste generation to the maximum extent practicable. The Contractor shall take all necessary precautions to avoid mixing clean materials with suspected contaminated wastes.

4.8 Backfill

As indicated on the Drawings (bound separately), the excavation shall be backfilled with varying layers of material, each serving a dedicated purpose. The following material shall be incorporated into the backfill operations:

- Flowable fill shall be placed into the bottom of the excavation to within 15 feet of the pre-existing ground surface elevation. The flowable fill shall be comprised of a fly ash/cement mixture with a design compressive strength within a 50 to 100 pound-per-square-inch (psi) range. Use of flowable fill will facilitate backfill operations around foundation structures and provide relief from compaction requirements.
- Aggregate shall be placed along the portion of the excavation located beneath the building and shall extend to the limits of excavation toward the west. The purpose of the aggregate zone is to allow groundwater movement along the axis of the Wilkeson Slip. The fill material within the slip is currently understood to have a relatively higher permeability than the other portions of the site. Placement of the aggregate will promote flow along the slip. The aggregate gradation shall correspond to AASHTO No. 57 or similar locally available gradation, as approved by the Engineer. The surface of the aggregate shall be

covered with a non-woven geotextile fabric, 6 ounce per square yard as manufactured by US Fabrics, Inc. (US 160NW), or similar product approved by the Engineer. Perforated polyethylene tubing shall be placed near the center of the aggregate along the entire length (east to west) of the school structure. Water management is discussed in more detail in Section 4.1 of this IRM work plan. The perforated tubing shall be connected to a junction box at the east end of the excavation. A vertical riser shall be connected to the junction box and rise to a location outside improvements on the Waterfront School property. The vertical riser shall terminate in a sealed waterproof surface vault that can be used if future pumping of the fill is required.

- Clay or low permeability flowable fill will be placed in the remainder of the excavation extending from the top of the flowable fill and aggregate to the base of the new crawl space floor slab and between the gravel and along the south face of the excavation closest to the BSC Site. The material shall have a final in place permeability within the range of 1E-05 to 1E-06 centimeters per second. This relatively low permeability zone is incorporated to minimize the flow of groundwater from the NFG property (located directly to the south) to the school property. Pre-placement laboratory permeability testing shall be performed to verify the material satisfies the plan requirements.

  If clay is used, the material shall be placed in appropriate lift thickness to satisfy placement at a density at or greater than 90 percent of the maximum dry density of the material as determined by ASTM D 698. One test per borrow source is required to determine the moisture density relationship of the material. Field density measurements shall be obtained via ASTM D 2922. Field compaction testing shall be conducted at a frequency of 2 tests per lift, at randomly chosen locations.

  If flowable fill is used, compaction requirements will not be necessary provided a design mix within the range of 50 to 100 psi (long-term strength) is incorporated. The short-term strength of the flowable fill shall be sufficient to support

placement of the gravel zone. Laboratory permeability and strength tests shall verify the plan requirements are satisfied.

- Clean common fill (imported) shall be used to backfill the remainder of the excavation outside the limits of the school building. The common fill shall be classified as a sand, silt, clay, or loam material as determined by ASTM D 2487. The material chosen shall also be capable of establishing and sustaining vegetation. The loose lift thickness of each lift of common fill shall be no greater than 12 inches. Each loose lift thickness shall be compacted to provide for an in-place density at or greater than 90 percent of the maximum dry density of the material as determined by ASTM D 698. One test per borrow source is required to determine the moisture density relationship of the material. Field density measurements shall be obtained via ASTM D 2922. Field compaction testing shall be conducted at a frequency of 2 tests per lift, at randomly chosen locations.
- A vapor collection zone shall be installed beneath the sloped portion of the new mud slab, along the south end of the crawl space. The aggregate material used for construction shall satisfy the gradation requirements for AASHTO No. 57, or similar locally available gradation, as approved by the Engineer. The vapor extraction zone will include the sump adjacent to the area of the school that was constructed over the Wilkeson Slip (Sheet 6).

  The sump that shall be sealed is shown on Sheet 6. Within the gravel zone a horizontal 4-inch diameter high density polyethylene (HDPE) corrugated perforated tubing will be used to enhance collection of accumulated soil vapor. Schedule 80 polyvinyl chloride (PVC) piping shall be used to convey the collected soil vapors to the atmosphere above the school. An in-line centrifugal fan will maintain a vacuum on the system.

The soil-like materials imported for use as backfill (e.g., clay and common fill) shall be tested and determined free of contamination before the material will be approved for use. One

composite sample of the borrow source proposed for clay and common fill shall be collected and analyzed for the following parameters:

- VOCs — Method 8260
- semivolatile organic compounds — Method 8270
- pesticides — Method 8081
- polychlorinated biphenyls — Method 8082
- target analyte list metals — Method 6010/335.3

Laboratory test results shall be compared to NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4046 soil screening levels for residential scenarios to determine if the material is acceptable for use at the Waterfront School property. All constituent concentrations must be below the relevant criteria for the material to be acceptable.

After backfilling operations are complete, the ground surface shall be restored via seeding and mulching all disturbed finished surfaces with lawn-type species of grass vegetation commonly used in the Buffalo area. The Contractor shall coordinate the work with an agronomist that will test the common fill material and recommend a seed mixture and fertilizer requirements. Soil amendments may be incorporated as necessary.

4.9 *In-situ* Treatment Alternatives

If excavation confirmation sampling indicates that SSALs are not met at the school along the North excavation line (Sheet 4), COI concentrations will be addressed by applying *in situ* treatment technology. The ideal treatment technology to address residual COI following excavation would have the following properties:

- proven to address aromatic organic compounds
- capable of being efficiently delivered to the affected area
- persist in the subsurface to address contaminants as they are transported into the treatment area

Based on these properties, appropriate technologies to address residual COI concentrations include ISCO and biostimulation. ISCO reagents capable of oxidizing COIs are those that form radicals such as Fenton's Reagent, ozone, and persulfate. The often-used oxidant permanganate is not capable of oxidizing aromatics and is therefore not appropriate for this site.

The half-life of Fenton's reagent (hydroxy radical) and ozone are very short and would not persist in the subsurface for very long after an initial application. Continuous sparging of ozone or ozone and hydrogen peroxide that is used in proprietary technologies such as Perozone™ would be required to address contaminants as they migrate into the treatment zone. Other detractors associated with Fenton's reagent and ozone include pH dependent oxidation chemistry and formation of vapor phase contaminants as the result of hydroxy radical reactions or more directly by the oxidant itself (ozone is a toxic gas). Persulfate has greater subsurface longevity than the other radicals (months) and is easy to apply in a crystalline form within an open excavation. Persulfate however, has not been field tested at many sites and its oxidation chemistry is not fully understood.

Biostimulation in petroleum-affected sites often involves provision of dissolved oxygen that stimulated native bacteria to oxidize contaminants. Increasing dissolved oxygen concentrations by direct air sparging or in-situ application of an oxygen-emitting compound such as ORC® (manufactured by Regenesis) has been accomplished at numerous sites in New York. ORC® is preferred at this site because it is easily and efficiently delivered by direct application in an open excavation and it will maintain elevated dissolved oxygen concentrations for up to one year.

Because ORC® provides benefits that the other technologies assessed above do not, ORC will be available for use to address residual COI concentrations above SSALs along the north excavation line (Sheet 4, if necessary) following excavation activities. ORC® dosing will be calculated using the Regenesis ORC® calculation model. Model inputs will include site-specific information such as COI concentrations in excavation confirmation samples and existing groundwater monitoring data (e.g., biological oxygen demand data). The ORC will be blended into the upper 12-inches of the north face of the excavation. The application is a one time event and no monitoring is required.

If NAPL or other conditions are encountered to which ORC may not be appropriate, the selection of the contingency action will be coordinated with NYSDEC. Due to structural constraints, additional excavation will not be required further north.

4.10 Crawl Space Restoration and Vent System

The crawl space shall be replaced to match pre-existing conditions. A vent system will also be installed to induce a vacuum beneath the concrete. The thickness of the crawl space floor slab will be determined during the pre-construction sampling (See Section 3.1) effort. The new floor will be tied into the existing floor slab using No. 4 bars drilled every 12 inches on center. The pour-side of the bars shall be incorporated with a lubricated sleeve. All joints will be replaced to match pre-existing conditions. This work shall include the following:

- The crawl space floor slab and mud slab will be replaced in kind.
- The crawl space floor and mud slab within the excavation area will be sealed with an epoxy coating.
- The existing sump and vapor collection zone (installed beneath the sloped portion of the mud slab) will be manifolded together and tied into a discharge pipe. The top of the sump shall be sealed as shown on the Drawings or as approved by the Engineer. The pipe route and roof penetration shall be coordinated with appropriate representatives from the school and Engineer.
- The discharge pipe will be equipped with an inline fan installed near the roofline.
- Electrical requirements for the fan shall be coordinated with the school representatives.
- After 30 days of operation, an air sample from within the crawl space will be collected following Summa canister collection procedures. The air sample will be analyzed for BTEX and PAH COIs. As a conservative measure, the operation of the fan will continue indefinitely.

4.11 Construction Quality Assurance/Quality Control

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system. The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all construction operations, both onsite and offsite, and shall be keyed to the proposed construction schedule. The site project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Engineer for non-compliance with the quality requirements specified in the contract and work plans. The site

project superintendent in this context shall be the highest level manager responsible for the overall construction activities at the site, including quality and production. The site project superintendent shall maintain a physical presence at the site at all times, except as otherwise acceptable to the Engineer, and shall be responsible for all construction and construction related activities at the site. The work shall conform to the documents approved for construction, including all work plans and drawings.

The Contractor and its subcontractors shall comply with the construction documents prepared by the Engineer and HASP prepared by the Contractor, including the worker air monitoring and CAMP requirements. The Contractor is responsible for providing quality control during all phases of work. The Engineer is responsible for quality assurance.

Changes significantly affecting the approved construction documents or project schedule shall be brought promptly to NYSDEC's attention by the Engineer. Work found to be out of compliance with approved construction documents will be reviewed and halted, if necessary, until a satisfactory resolution is achieved.

ESC Engineering will provide Construction Quality Assurance (CQA) personnel during implementation of the remediation activities.

4.11.1 Responsibilities

The principal organizations involved in implementing the remediation at the site include, NYSDEC, the Owner, the Engineer, and the Contractor. Specific responsibilities and authority are delineated below to establish the lines of communication required to produce an effective decision-making process during execution of the work.

4.11.1.1 Regulatory Agency

The lead regulatory agency involved with this project is the NYSDEC. In this capacity, the NYSDEC will review construction documents for conformance with applicable requirements. The NYSDEC also has the authority and responsibility to review documentation to confirm that the work was effectively implemented.

4.11.1.2 Owner

NFG is ultimately responsible for the proper permitting, design, and construction of the project. NFG has retained ESC Engineering as the project engineer and quality assurance team. The Contractor (OSC) will be placed under contract following approval of the construction

documents. NFG has the authority to dismiss all non-regulatory organizations involved in design, CQA, and construction. It is NFG's ultimate responsibility to provide assurance to the regulatory agencies that the construction is conducted in accordance with the construction documents.

4.11.1.3 Engineer

ESC Engineering will function as Project Engineer and will provide CQA personnel. ESC Engineering's responsibilities under these separate functions are defined below.

As the Project Engineer, ESC Engineering's primary responsibilities will be to provide engineering technical support for NFG during construction. In this capacity, ESC Engineering will be responsible for monitoring of construction work and providing the contractor feedback from questions regarding the construction documents. In addition, ESC Engineering will be responsible for identifying, documenting, and correcting deviations from these documents.

John Black, P.E., or designee, has the responsibility to review proposed design revisions associated with field changes that deviate from the construction documents. They have the authority to approve the revisions on behalf of ESC Engineering and submit the proposed revisions to NFG and the NYSDEC for approval.

ESC Engineering will provide CQA personnel during implementation of the remediation activities. The responsibilities of the CQA personnel are to perform the verification activities to provide confidence that activities are performed in accordance with the construction documents. The CQA personnel for this project will consist of a CQA Officer and a CQA Inspector(s). The CQA Officer, Glen Rieger, has the responsibility and authority to halt any remediation activity or work that is not in conformance with the approved construction documents. Site-assigned CQA Inspectors performing verification activities report directly to the CQA Officer and have the responsibility to notify the CQA Officer of any deviation from the construction documents. The CQA Inspectors have the responsibility to report and the authority to investigate all deviations and nonconforming conditions to determine the source or root cause. The CQA Officer's responsibilities include:

- reviewing construction documents for clarity and completeness so that the work can be implemented correctly in a timely fashion
- educating CQA personnel
- scheduling and coordinating CQA inspection activities

- verifying and documenting that the test and monitoring equipment used is of the appropriate type and has been properly calibrated
- confirming that the test data, inspection, and monitoring activities have been properly documented and confirming that their results satisfy the construction documents, including the HASP
- providing NFG with CQA updates, identifying deficient work, and providing recommended corrective action measures, if necessary
- ensuring that any changes in testing equipment, personnel, or procedures do not adversely impact the inspection process

CQA Inspector responsibilities include:

- performing onsite inspections of the remediation to ensure compliance with construction documents
- verifying required tests, including the submitting of test samples (if required) to qualified laboratories for acquiring test results
- documenting the results of all inspection, test, and monitoring activities
- reporting nonconforming conditions as well as other deviations from the construction documents to the CQA Officer
- verifying the implementation of any corrective action measures.

4.11.1.4 Contractor

The Contractor's (OSC's) responsibility is to perform the work in accordance with the construction documents. Construction personnel, including the Contractor's Project Manager, will coordinate their work with the ESC Engineering CQA Officer and CQA Inspector(s).

4.11.2 Site Meetings

Periodic (a minimum of once per week) CQA meetings will be held during the implementation of the construction. As availability allows, meeting attendees will include the Contractor Project Manager and ESC Engineering's CQA Officer and/or Inspector, Health and Safety Officer, and Engineer. Representatives of the NYSDEC and representatives of the Owners may also attend, as necessary. Parties may participate by teleconference, as necessary.

Additional CQA meetings may be held at the site or via a telephone conference and will be used to discuss the project progress, construction issues and unanticipated site conditions, and deviations from the construction documents. Each meeting will be documented by the CQA Officer or CQA Inspector.

4.11.2.1 Initial Construction Quality Assurance Meeting

The initial CQA meeting will be conducted onsite prior to initiating work. Subjects proposed to be covered during this meeting include:

- providing appropriate parties with the finalized construction documents and HASP
- reviewing the responsibilities and authority of each party
- reviewing lines of authority and communication
- resolving identified conflicts within the construction documents
- reviewing the procedures and requirements for the tests and inspections to be performed
- reviewing methods for documenting and reporting inspection data (e.g., field book entries)
- reviewing storage of documents
- reviewing procedures for identifying and correcting deviations
- discussing proper storage requirements for construction materials
- reviewing the site health and safety plan as needed
- conducting a site walk to review and discuss work issues
- discussing the overall project schedule
- reporting of key submittals to the Engineer (if any)

4.11.2.2 Weekly Construction Quality Assurance Meetings

At the end of each work week, the CQA Inspector will communicate with the CQA Officer to discuss project activities. Discussion topics will include:

- previous week's activities and progress
- following week's planned activities
- anticipated or potential construction issues

- review of testing procedures, submittals, or inspection activities required for the current week's work
- coordination of CQA monitoring and inspection activities with the Contractor Project Manager.

The weekly meetings/telephone conferences will be documented by a CQA Inspector. The documentation (minutes) will be distributed to all participants and other project team members not available to participate.

5.0 Institutional Controls

Several institutional controls are planned for establishing provisions associated with the execution of this IRM work plan. NFG and ESC Engineering will work with the school district officials and legal authorities to create restrictions and requirements connected to the deed and future use of the remediated areas. The following institutional controls are planned:

- prohibit the use of groundwater for potable and non-potable purposes
- prohibit the destruction of the crawl space floor, including the epoxy coating and seal associated with the sump as long as the building will be occupied, unless conducted under a NYSDEC approved Work Plan and replaced with an approved equivalent
- maintain operation of the venting system

The order specifies:

10. a description of institutional controls to be implemented as well as written approval from the owner of the affected property if the remedy selected requires implementation of an institutional control at an offsite location or if the person responsible for the remedy is not the site owner (Section 5.0)

While a description of the proposed institutional controls is included in this Draft IRM Work Plan, a letter from the City of Buffalo (property owner) will not be requested until concurrence is received from the NYSDEC, NYSDOH, the Board of Education and the Buffalo Public Schools.

6.0 Citizen Participation Plan

ESC Engineering and NFG will implement a Citizen Participation Plan that incorporates activities outlined in the NYSDEC's publication, *Citizen Participation in New York's Hazardous Waste Site Remediation Program: A Guidebook,* dated June 1998. During this phase of the project, we are coordinating with NYSDEC to produce a Fact Sheet to inform the local residents, school staff, and parents of the school children of the upcoming remedial work. As the NYSDEC 4th Street Site will be under remediation on a similar timetable, the same protocols will be followed for the OU-2B and OU-2C activities. The distribution list for the 4th Street Site will be provided by NYSDEC for mailing of the Fact Sheet to local residents and the Buffalo Public Schools will distribute the sheets to occupants of the school.

A draft Fact Sheet will be prepared by NYSDEC for review by the Buffalo Public Schools, NFG, and ESC Engineering representatives. The Fact Sheet will provide a brief summary of activities conducted to date as well as a discussion of proposed activities required by the Consent Order. The final Fact Sheet will be distributed to the public before any intrusive work begins at OU-2B and OU-2C.

During the IRM, onsite personnel will have supplemental fact sheets available should the public or media approach the OU-2B/OU-2C Site during working hours. No one who is unaffiliated with the site will be allowed to enter the Site or Exclusion zones; therefore, to allay any concerns, the supplemental fact sheet will provide a means to deliver a consistent message.

7.0 Schedule

The schedule associated with implementation of the IRM work plan for OU-2B and OU-2C is presented as Sheet 7. Major milestones that must be satisfied to accommodate the overall project schedule include the following:

- submit final IRM Work Plan to NYSDEC March 25, 2005
- establish contracts with Contractor April 8, 2005
- receive NYSDEC approval Mid-April 2005
- begin dewatering program May 2, 2005
- secure landfill disposal approval May 20, 2005
- OU-2B work begins July 25, 2005
- OU-2C work begins August 1, 2005

The final IRM Work Plan will include all components of the remedial design and the Remediation Work Plan (Exhibit J to the Order). The design for the excavation includes the dewatering and treatment system, the confirmation sampling plan, and the backfill. All components will be clearly defined in the Work Plan. Because of the narrow window available to complete this excavation work, separate IRM and Remediation Work Plans are not feasible.

8.0 Project Closeout

As field work comes to an end, ESC Engineering will schedule a site walk through with NYSDEC. Any remaining work necessary to satisfy the intent of the IRM work plan will be identified and documented for follow-up action.

A draft final report will be prepared to include a description of activities conducted to comply with the requirements of this IRM work plan. The report will include a certification by a Professional Engineer that the work was conducted in full accordance with the approved IRM work plan. Based on input from the NYSDEC and the Buffalo Public School District, the report will be made final.

9.0 References

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Figure

Sheets

(Full scale versions under separate cover)

Appendix A – Fire Insurance Maps

Appendix B – Treatment Equipment Specifications