METROPOLITAN TRANSPORTATION AUTHORITY

LONG ISLAND RAIL ROAD

REMEDIAL INVESTIGATION WORK PLAN
for the
YAPHANK SITE
TOWN OF BROOKHAVEN
SUFFOLK COUNTY, NEW YORK

Prepared for:

METROPOLITAN TRANSPORTATION AUTHORITY
LONG ISLAND RAIL ROAD

Prepared by:

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APRIL 2003

Revised October 2003

REMEDIAL INVESTIGATION WORK PLAN
LONG ISLAND RAIL ROAD

YAPHANK SITE

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1.0 INTRODUCTION

The purpose of this Remedial Investigation Work Plan is to describe the detailed screening, sample collection and analytical procedures that will ensure high quality, valid data for use in a Remedial Investigation to be conducted at the Long Island Rail Road (LIRR) Yaphank site (Site Number V-00384-1), located in the Town of Brookhaven, Suffolk County, New York. The LIRR is investigating the Yaphank site as part of a Voluntary Cleanup Agreement (VCA) (Index Number W1-0907-02-02) with the New York State Department of Environmental Conservation (NYSDEC). A Sample Matrix, which outlines the investigation activities that will be conducted at the site, is provided as part of the Site-Specific Work Plan summarized in Section 5.0.

In addition, this Work Plan has been prepared in accordance with the NYSDEC guidelines for preparation of Quality Assurance and Quality Control Plans including the 2000 Analytical Services Protocol (ASP).

The Work Plan provides the following information relative to conducting the Remedial Investigation:

- Project/Site Background;
- Data Use Objectives;
- Sampling Program;
- Quality Assurance/Quality Control Samples;
- Sampling and Handling Procedures;
- Decontamination Procedures;
- Laboratory Sample Custody Procedures;
- Sample Documentation;
- Equipment Calibration and Preventative Maintenance;
- Control and Disposal of Investigation-derived Material;

- Documentation, Data Reduction and Reporting;
- Data Validation;
- Performance and System Audits; and
- Corrective Action.

Investigation activities and media addressed in this Work Plan include:

- Surface Soil Sampling;
- Soil Boring Construction and Subsurface Soil Sampling; and
- Groundwater Sampling.

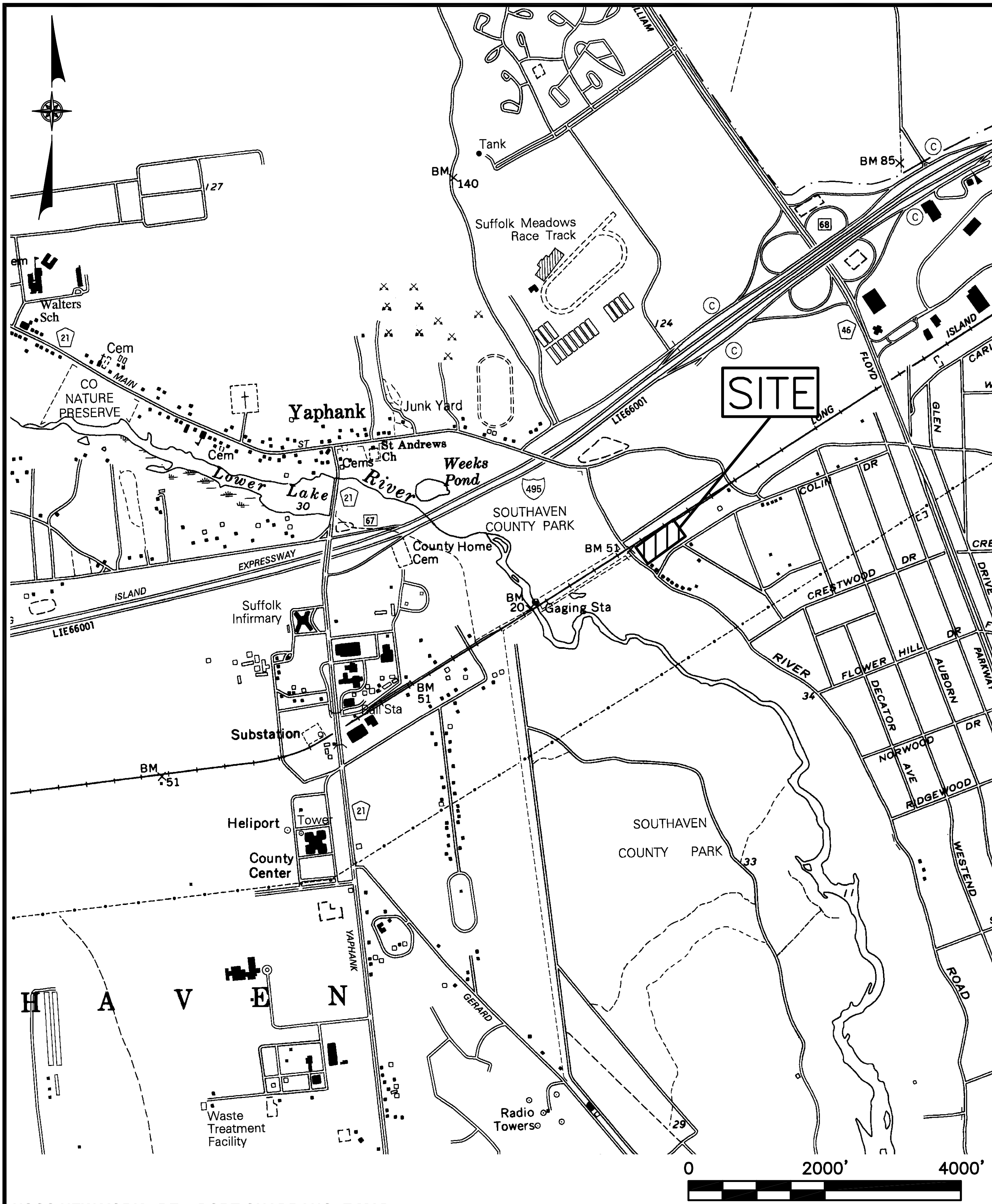
2.0 PROJECT SUMMARY

2.1 Site Description

The site is located in Yaphank, Town of Brookhaven, Suffolk County, New York (see Figure 2-1). The parcel of property under evaluation is approximately 3.5 acres in size and is located immediately east of River Road and south of the LIRR Main Line track. The site (Suffolk County tax identification number: Section 640, Block 1, portion of Lot 2) is owned and operated by the LIRR. The site is fenced and the primary access route is via River Road (see Figure 2-2). The site may also be accessed from Colin Drive via the entrance to the adjacent concrete plant.

As previously mentioned, the parcel of property under evaluation is approximately 3.5 acres in size. The site is currently undeveloped and is primarily open space with sparse vegetation. The site is not actively utilized by the LIRR. It appears that the site was formerly used by the LIRR to landfill railroad-related waste. Based on the findings of previous site investigations, the top layer of portions of the site has been noted to contain clinker (i.e., the solid residue remaining after coal is burned) and slag-like materials that vary in depth from 6 to 24 inches below grade. Portions of the site are also covered with railroad ballast. To the north of the site, across the Main Line track, is undeveloped property also owned by the LIRR. To the west, across from River Road, is Southaven Park, which is owned by Suffolk County. The Carmens River is located approximately 1,000 feet southwest of the site. Immediately to the south and east of the property is an active concrete plant/transfer facility (owned by Arriva Transport Corp.). Residential properties occupy the majority of the areas further to the south and east. Brookhaven National Laboratory, a USEPA National Priority List (NPL) site, is located approximately one mile to the north of the Yaphank site.

There is little topographic relief across the site, with the exception of a steep embankment on the southwestern portion of the site, and an underpass beneath an abandoned railroad siding on the northeastern portion of the site. Regional groundwater flow is to the southwest.



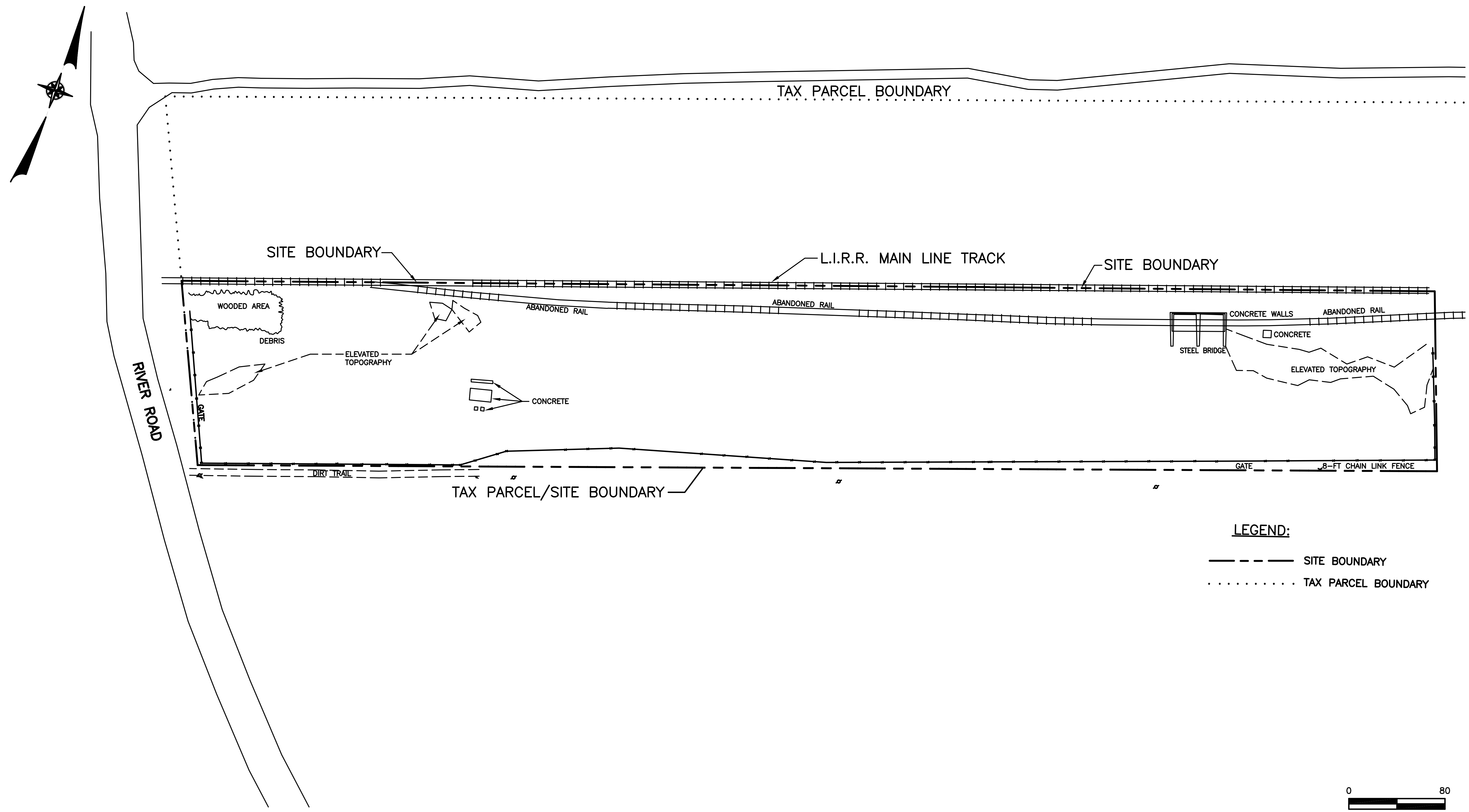
USGS NEW YORK - BELLPORT QUADRANGLE MAP

LONG ISLAND RAIL ROAD - YAPHANK SITE
REMEDIAL INVESTIGATION

Dvirka
and
Bartilucci
CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

SITE LOCATION MAP

FIGURE 2-1



SOURCE: 1997 SURVEY, COTILLA ASSOCIATES; 1999 SURVEY, YEC INC.; TAX MAPS;1969 AERIAL PHOTOGRAPH, LKB

LONG ISLAND RAIL ROAD - YAPHANK SITE
REMEDIAL INVESTIGATION

Dvirka and Bartilucci
CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

SITE PLAN

FIGURE 2-2

2.2 Site History

There are no known records regarding the prior disposal operations conducted at the Yaphank site, but anecdotal information indicates that this site was used as a general disposal area for railroad-related waste from the 1950s to the early 1970s. It is believed that waste was generated from railroad track maintenance activities and, possibly, from electric and diesel train repair shops. Records of waste type and/or quantities do not exist. Based on information compiled by the LIRR, disposed materials could have included batteries, spent drums, scrap metal, railroad ties, coal clinker (i.e., the solid residue remaining after burning coal), lead paint scrapings, waste liquids and miscellaneous construction debris. Previous subsurface sampling programs encountered railroad ties and what appeared to be coal clinker. The LIRR entered into an Order on Consent with the NYSDEC on February 23, 1996 to conduct a Preliminary Site Assessment (PSA) of the Yaphank site. The site was identified as Site Code 1-52-146 on the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites. The site has been assigned a Class 2a designation, which is defined as a "temporary classification assigned to sites that have inadequate and/or insufficient data for inclusion in any of the other classifications."

It is worthy to note that historical USGS maps depict a "U.S. Reservation" along the eastern side of River Road. Based on a phone interview conducted with a Brookhaven National Laboratory representative, this area was utilized in the early 1900s by the United States Government Atomic Energy Commission as a water supply well field. Groundwater was reportedly pumped from this location to a military installation referred to as Camp Upton, which was located approximately 1-1/2 miles to the north. A site inspection conducted to the southwest of the site confirmed the locations of a "drainage swale," "dike" and former building foundation in this area. The previously mentioned phone interview also confirmed that this building foundation was associated with a former pumping station.

2.3 Overview of Previous Investigations

The LIRR completed a preliminary soil and groundwater sampling program at the site in the early 1990's. As part of that program, 36 shallow soil samples were collected (to a maximum depth of 2 feet 8 inches) and analyzed for: Toxicity Characteristic Leaching Procedure (TCLP) parameters; volatile organic compounds (VOCs); semivolatile organic compounds (SVOCs); pesticides; polychlorinated biphenyls (PCBs); pH and metals. Based on a comparison of the analytical results to the Recommended Soil Cleanup Objectives presented in Appendix A of NYSDEC's Technical and Administrative Guidance Memorandum (TAGM) No. 4046, there were numerous exceedances of the NYSDEC cleanup objectives. Additionally, more than half of the shallow soil samples analyzed exceeded the TCLP regulatory limit for lead (5 mg/l).

In addition, as part of this preliminary assessment, several subsurface samples were collected for chemical analysis below the local water table during the installation of four monitoring wells. The subsurface soil samples were analyzed for VOCs, SVOCs, pesticides, PCBs, metals, pH, total petroleum hydrocarbons (TPHCs), and TCLP VOCs, SVOCs and metals. Exceedances of the NYSDEC cleanup objectives for metals were also detected in several of these samples.

During July and August of 1993, two rounds of groundwater samples were collected from the three monitoring wells installed on the southwestern portion of the property, including MW-1, MW-2 and MW-3. The three wells were installed hydraulically downgradient of the landfilled area. Upgradient well MW-4 was sampled in August of 1993. The approximate locations of these wells are depicted on Figure 5-2 presented in Section 5.0 of this Work Plan. Samples from these wells were analyzed for VOCs, SVOCs, pesticides, PCBs, metals, cyanide and TPHCs. The samples collected in July 1993 for metals analysis were comprised of unfiltered groundwater. The August 1993 groundwater samples included filtered and unfiltered samples for metals analysis.

VOCs and SVOCs were not detected above NYSDEC Class GA Groundwater Standards/Guidelines in both sample round samples. The results of analyses of the unfiltered groundwater samples collected in July 1993 from MW-1, MW-2 and MW-3 exhibited concentrations of beryllium, cadmium, chromium, copper, lead and zinc above the NYSDEC Class GA Groundwater Standards/Guidelines. The unfiltered samples collected in August 1993 exhibited concentrations of cadmium, lead and zinc above the NYSDEC Class GA Groundwater

Standards/Guidelines. In addition, the August 1993 sample collected from MW-4 exhibited lead above the NYSDEC standards/guidelines. For the filtered samples, which represent the dissolved constituents present in groundwater and are representative of actual groundwater quality, MW-1, the westernmost well, exhibited levels of cadmium and zinc above the NYSDEC standards/guidelines. The filtered samples from MW-3 exhibited an exceedance for lead; however, lead was not detected above the NYSDEC standards/guidelines in the unfiltered sample collected from this well.

A ground penetrating radar (GPR) study was also attempted in January 1993. However, this study was largely inconclusive due to the inability of the radar to penetrate the clinker layer overlying the majority of the site.

The LIRR completed a Preliminary Site Assessment (PSA) of the site in April 1998. The associated field program included the completion of soil borings, test pits and the installation and sampling of monitoring wells. Results of this program indicated elevated levels of several targeted compounds in on-site surface soil and subsurface soil samples. SVOCs and metals, including arsenic, copper, lead and mercury, were found above NYSDEC TAGM 4046 recommended soil cleanup objectives in the southwestern low-lying portion of the site. As a result, it was suspected that contamination may have migrated beyond site boundaries to the southwest. Samples collected from soil borings in the western half of the site also exhibited exceedances of the NYSDEC cleanup objectives for SVOCs and metals. Similarly, a sample collected from a soil boring in the central area of the eastern portion of the site and an additional sample collected from a boring in the center of the site exhibited SVOCs and metals exceeding the NYSDEC cleanup objectives. Soil samples collected from test pits in support of the PSA did not indicate any constituents in excess of the TCLP regulatory levels.

The chemical data associated with the groundwater samples collected from the installed monitoring wells indicate that site groundwater was not significantly impacted. However, the collected samples exhibited several metals, including thallium, methylene chloride and sodium at concentrations exceeding NYSDEC standards/guidelines.

A Supplemental PSA was conducted in 1999 in order to further delineate the extent of existing subsurface conditions. As part of the associated field program, on-site and off-site soil sampling was performed and additional on- and off-site monitoring wells were installed and sampled. An extensive water supply survey was also conducted to determine if any of the nearby public was utilizing groundwater within the vicinity of the site as a potable water supply or for other uses. Results of the Supplemental PSA identified additional on-site and off-site surface and subsurface soil which exhibited levels of several metals in excess of the NYSDEC soil cleanup objectives. Consistent with the initial PSA, groundwater sampling results associated with the Supplemental PSA indicated that groundwater was not significantly impacted by site conditions. Results of the water supply survey did not identify any active private water supply wells within a half-mile radius downgradient of the site. In addition, all occupied dwellings and businesses within a half mile radius downgradient of the site were identified as being connected to the public water supply system.

Based on the PSA and Supplemental PSA data, the site was subsequently divided into five major Areas of Concern (AOCs) (four on-site areas and one off-site area) based on the apparent trends in the observed concentrations of the detected chemical constituents. Recommendations were made for additional delineation sampling of surface and subsurface soil at each of the five AOCs. Furthermore, it was recommended that monitoring of groundwater be continued since this medium presents the most likely exposure pathway to off-site receptors.

Therefore, it was concluded that the next phase of sampling at the site would be conducted as a Focused Remedial Investigation (RI) under the NYSDEC's Voluntary Cleanup Program. In addition, pending the results of this focused RI, the Supplemental PSA recommended that Interim Remedial Measures (IRMs), including "hot spot" removal, be considered at the site.

2.4 Technical Approach

The Technical Scope of Work for the overall program is organized into the following six tasks:

Task 1 - Work Plan;

Task 2 – Draft/Final Health and Safety Plan;

Task 3 - Remedial Investigation;

Task 4 - Public Health Exposure Assessment;

Task 5 - Draft/Final Report; and

Task 6 - Feasibility Study.

2.4.1 Task 1 - Work Plan

This document was prepared to satisfy the requirements of presenting a Draft/Final Work Plan. As stated in Section 1.0, this document presents the generic and site-specific work plans to conduct a Remedial Investigation of the Yaphank site.

2.4.2 Task 2 - Draft/Final Health and Safety Plan

As part of this task, D&B will prepare a draft and final Health and Safety Plan (HASP) to address worker safety at the site. The HASP (provided under a separate cover) will outline our Project Team's health and safety program for this assignment. Site-specific information shall be provided in individual sections to allow quick access in emergencies. The HASP shall contain at a minimum:

- Project Team Key Personnel (including names, titles, telephone numbers and pager numbers);
- Responsibilities of Key Personnel;
- Emergency Telephone Numbers (Fire, Police, EMS, LIRR Movement Bureau, LIRR System Safety and any site-specific information);
- Map with route to nearest hospital;
- Text description of route to nearest hospital;

- Description of site and work to be performed;
- Delineation of site, including access points, security, sign-in log, location of HASP, decontamination area, equipment storage area, and waste staging area;
- Physical hazards which may be encountered; trenching/excavation hazards, confined space entry, hot work (welding), fall protection, lock-out/tag-out, heavy equipment, noise, etc.;
- Personal Protective Equipment (PPE) to be used on-site, and exposure monitoring levels or conditions where PPE upgrades are required;
- Instruction on proper use of PPE including donning/doffing, testing, decontaminating, and signs of PPE failure;
- Decontamination procedures for exposed workers;
- List of personnel decontamination materials and equipment, and their location on site;
- Methods for protecting equipment from contamination or decontaminating any equipment;
- List of equipment decontamination materials and equipment, and their location on site;
- Procedures to be followed in case of emergencies (i.e., fire, worker injury, etc.);
- Methods and procedures to be used to comply with OSHA exposure monitoring requirements; and
- Accident/Incident Reporting Forms and other forms used on-site for health and safety.

2.4.3 Task 3 – Remedial Investigation Field Program

The field investigation program will consist of the following elements:

- Surface Soil and Subsurface Soil Sampling;
- Groundwater Sampling (at existing Monitoring Wells); and
- Air Monitoring.

A Site-specific Work Plan summarizing all proposed field work in support of the Remedial Investigation is presented in Section 5.0.

2.4.4 Task 4 – Public Health Exposure Assessment

A qualitative public health exposure assessment will be prepared based upon the results of the Remedial Investigation, as well as the results of the previous investigations conducted at the Yaphank site.

The goals of the public health exposure assessment are to:

- Determine the potential human health risk under current/baseline site conditions, including identification of the contaminants of concern, contaminant migration pathways, routes of exposure and potential receptors;
- Identify areas, on-site and off-site, that may require remediation where significant impacts or potential impacts have been identified; and
- Provide a basis for determining contaminants that can remain on-site and off-site, while providing adequate protection of human health for both current and anticipated site use.

The approach that will be used to perform the public health exposure assessment is based on the approach that D&B have used to prepare numerous exposure assessments for Superfund sites which have been approved by NYSDEC and NYSDOH.

The contaminants of concern (COCs) will be developed for the site from validated investigation data and based on the exceedances of standards, criteria and guidelines (SCGs) selected for the site. The COCs will represent the most toxic, mobile and persistent contaminants at the site, as well as those contaminants which are detected most frequently and at the highest concentrations. Identification of the COCs will focus the exposure assessment on those contaminants which pose the greatest threat to human health.

Utilizing information from the Remedial Investigation, site reconnaissance and previous site investigations, the contaminant sources, migration pathways and human exposure points will be identified and evaluated. Potential human exposures to contaminants and contaminated media include ingestion, inhalation and dermal contact with waste, groundwater, surface soil, and subsurface soil. Potential receptors on-site will be adult workers and occasional adult visitors, while off-site potential receptors will include neighboring residents. The information and findings associated with the qualitative public health exposure assessment will be presented in the final report for this project.

With regard to the selection of SCG, the following will be used to screen the data to identify, ***on a preliminary basis***, the COCs.

- <u>Surface and Subsurface Soil</u> - NYSDEC Technical and Administrative Guidance Memorandum (TAGM) No. 4046, Determination of Soil Cleanup Objectives and Levels for initial screening; and
- <u>Groundwater</u> - NYSDEC Technical and Operational Guidance Series (TOGS) (1.1.1), Ambient Water Quality Standards and Guidance Values.

Exceedances of SCGs will identify the contaminants, media and areas of concern for the substation sites to determine if the potential of an unacceptable risk to human health exists based on current and anticipated use of the site, potential on-site and off-site receptors and potential contaminant migration pathways.

2.4.5 <u>Task 5 – Draft/Final Report</u>

As part of this task, the D&B Project Team will prepare a report that will thoroughly document the findings of the project and present clear and concise recommendations regarding any impacted media identified. The draft and final report will include site drawings, analytical results, a site location map, groundwater flow direction map and the results of all environmental analysis. In addition, as addressed in Task 4, a public health exposure assessment will also be presented as part of the draft/final report. Building upon the Step I Fish and Wildlife Impact Analysis completed as part of the 1998 PSA Report, the D&B Project Team will complete a

Step IIa Fish and Wildlife Impact Analysis in accordance with the NYSDEC guidance document entitled "Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites," dated October 1994. As part of the Step IIa Fish and Wildlife Impact Analysis, contaminants of concern and potential pathways of contaminant migration will be identified. Potential off-site migration of contaminants impacting fish and wildlife resources will also be evaluated. The findings of the Step IIa analysis will be presented in the final/draft report and the original 1998 Step I Fish and Wildlife Impact Analysis will be included as an Appendix to the draft/final report.

2.4.6 Task 6 – Focused Feasibility Study

A Focused Feasibility Study (Focused FS) will be conducted which will involve the identification and evaluation of proven remedial alternatives, as well as an evaluation of the effectiveness and implementability of the alternatives. It will be accomplished in two phases.

The first phase of the Focused FS will identify commercially available remedial technologies, which could potentially be applicable, taking into account site-specific considerations. As such, this phase will include the following:

- Identification and characterization of areas and media requiring remediation based on the results of the Remedial Investigation;
- Development of remedial action objectives specifying the contaminants and media of concern, exposure pathways and potential receptors;
- Development of general response actions for each exposure pathway; and
- Identification of potential remedial technologies, including a description of the technologies and a discussion of applicability to the site. In this step, technologies that are not technically viable and cannot be implemented at the site will be eliminated from further consideration.

Following development of the alternatives, which could comprise a single technology or a combination of technologies, the second phase of the Focused FS will include an evaluation of effectiveness and implementability of the proven remedial alternative for the site. The effectiveness evaluation will include consideration of the following:

- Potential effectiveness of process options in handling the estimated areas or volumes of media and meeting the remediation goals identified by the remedial action objectives;
- Potential impacts to human health and the environment during the construction and implementation phase; and
- Proven operation and reliability of the process with respect to the contaminants and conditions at the site.

Lastly, the remedial alternatives will be evaluated for the following criteria:

- Short-term impacts and effectiveness;
- Long-term effectiveness and performance;
- Reduction of toxicity, mobility or volume;
- Implementability;
- Overall protection of human health and the environment; and
- Cost.

It should be noted that the Focused FS will be conducted subsequent to the completion of the Draft/Final RI report.

2.5 Project Management

The schedule for implementation of this project is provided in Figure 2-3. Specific deadlines for completion of tasks and subtasks are established throughout the project schedule to ensure timely completion of the work.

Dvirka and Bartilucci Consulting Engineers (D&B) will be the prime consultant responsible for all substation site assessments. Firms that will be used as subconsultants and subcontractors for this project are summarized below:

LIRR
Remedial Investigation for the Yaphank Site

ID	Task Name
1	**LIRR Notice To Proceed**
2	**Task 1 - Work Plan**
3	Prepare Draft Work Plan
4	LIRR Review
5	Revise Work Plan
6	NYSDEC Review
7	Revise Work Plan
8	Issue Final Work Plan
9	**Task 2 - Health and Safety Plan**
10	Prepare Draft HASP
11	LIRR Review
12	Revise HASP
13	NYSDEC Review
14	Revise HASP
15	Issue Final HASP
16	**Task 3 - Remedial Investigation**
17	Field Work
18	Laboratory Analysis
19	**Task 4 - Exposure Assessment**
20	**Task 5 - Draft/Final Report**
21	Submit Draft Report to LIRR
22	LIRR Review
23	Revise Report
24	NYSDEC Review
25	Revise Report
26	Issue Final Report
27	**Task 6 - Feasibility Study**
28	Submit Draft Report to LIRR
29	LIRR Review
30	Revise Report
31	NYSDEC Review
32	Revise Report
33	Issue Final Report

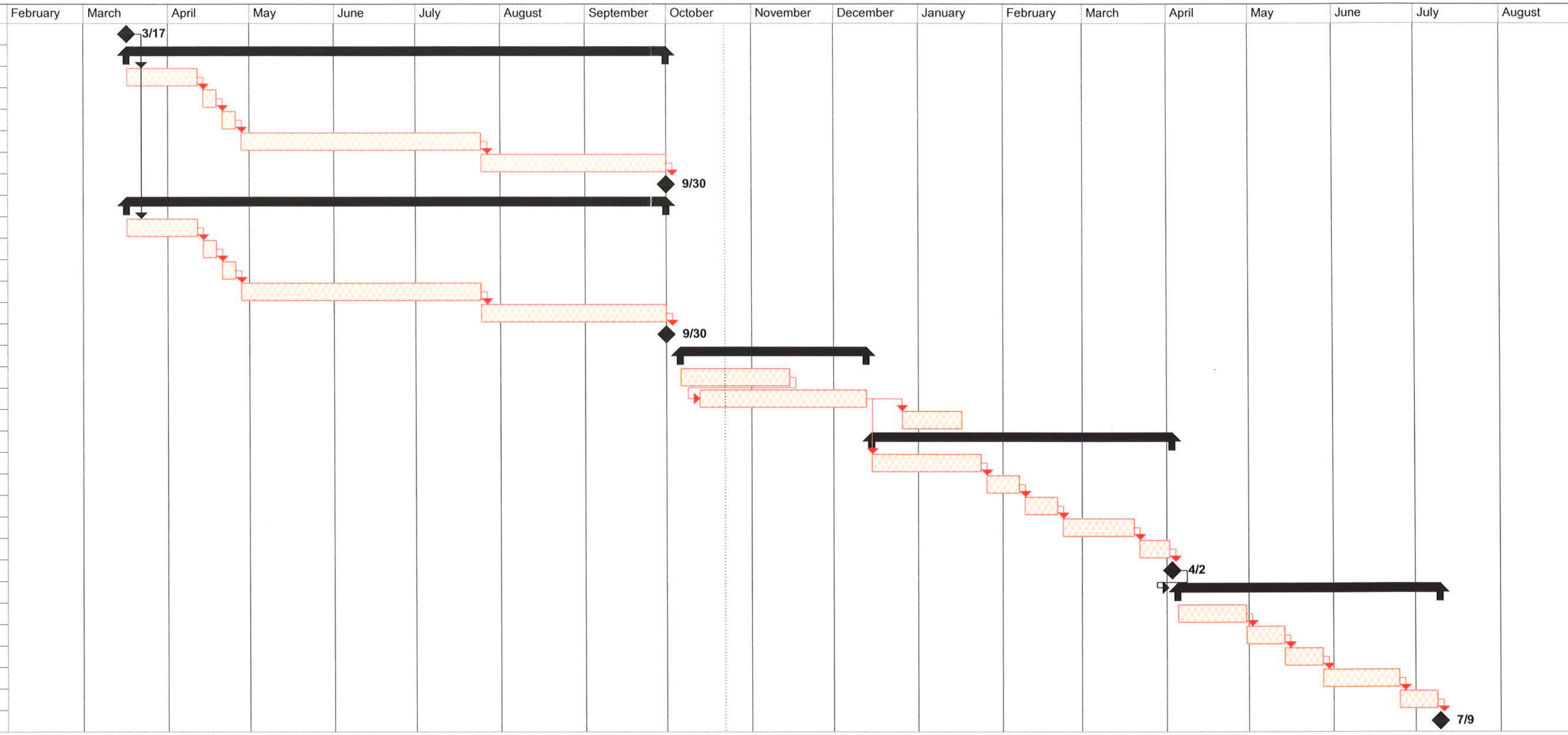


Figure 2-3

Task		Progress		Summary		External Tasks		Deadline
Split		Milestone		Project Summary		External Milestone	

Yaphank Schedule 2.mpp

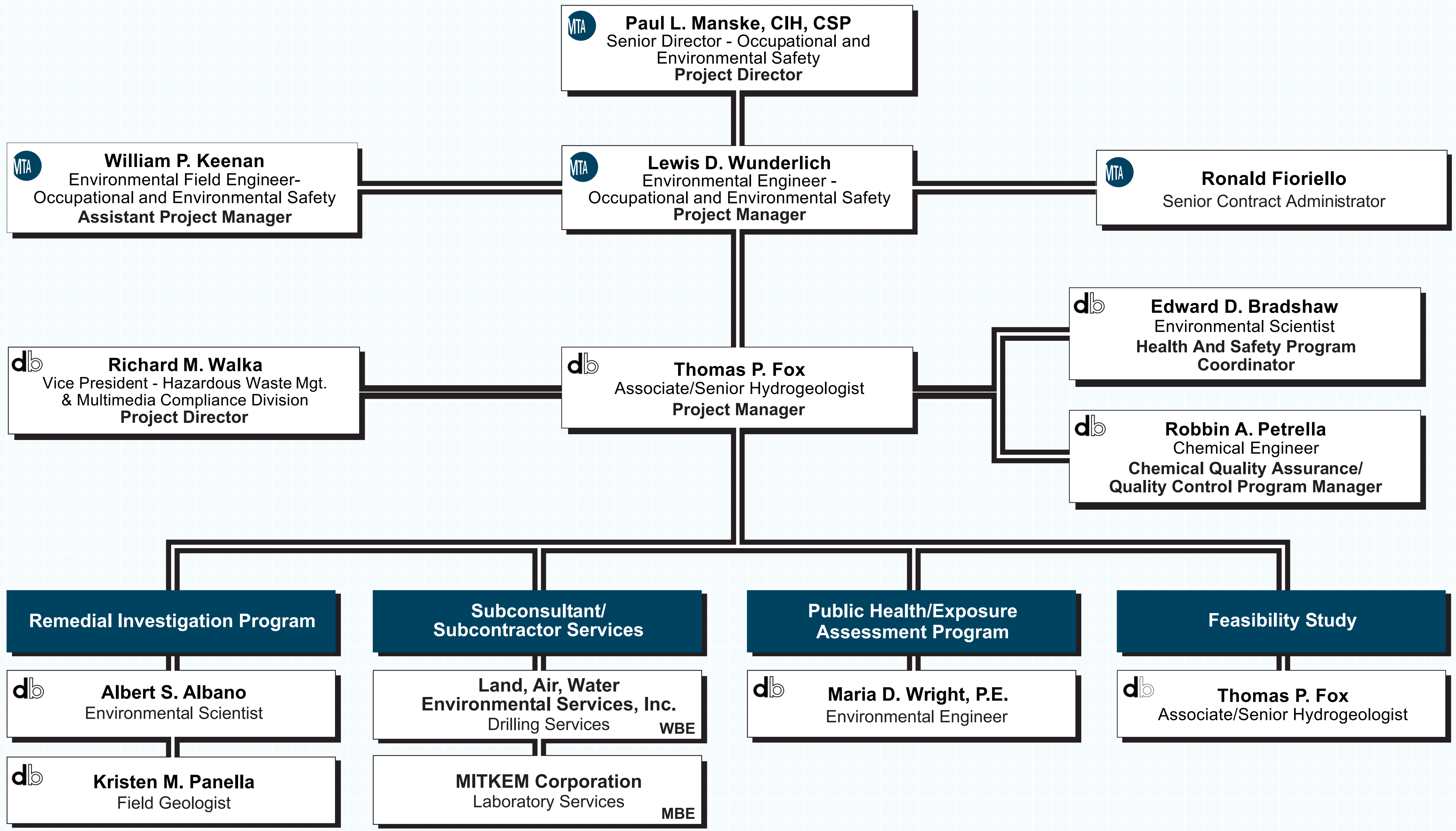
PROJECT TEAM SUMMARY

Firm	Category	Project Responsibility	Work Statement Participation
Dvirka and Bartilucci Consulting Engineers	Professional Consultant	Prime Consultant/ Engineering Services/ Overall Project Management	Tasks 1 through 6
Land, Air, Water Environmental Services, Inc.	Subcontractor	Drilling Services	Task 3
MITKEM Corporation	Subcontractor	Analytical (Laboratory) Services	Task 3

The project organization for this project, illustrating both management and project responsibility functions for the project team and key personnel, is provided in Figure 2-4.

Long Island Rail Road

PROJECT ORGANIZATION AND KEY STAFF
LONG ISLAND RAIL ROAD
REMEDIAL INVESTIGATION FOR THE YAPHANK SITE



Dvirka and Bartilucci
CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.
RLA/MTA1916OC(02/19/03)

FIGURE 2-4

3.0 SAMPLING AND ANALYSIS PLAN

The purpose of this Generic Work Plan is to provide general information on the elements of the field investigation that will be performed at the Yaphank site. Information relating to the specific number and locations of samples to be collected at the site is provided in the Site-Specific Work Plan presented in Section 5.0. Note that the Generic Work Plan includes a number of sampling and field activities that are not specified in Section 5.0. However, descriptions of these activities are provided with the understanding that there is a potential that these activities may be warranted in the future as additional site-specific information becomes available.

The following is a description of the various field activities that may be conducted to support a Remedial Investigation at the Yaphank site. For a detailed description of planned sampling and analytical procedures, refer to Section 4.0.

3.1 Surface Soil Sampling

Surface soil samples may be collected on-site at locations of known or suspected spill or disposal areas and areas of visually stained soil or stressed vegetation to determine the nature and extent of surficial soil contamination. The number of samples to be collected will be based upon the size of the area being investigated and surface observation. Samples will be collected at a depth of 0 to 2 inches below ground surface using either a disposable polyethylene scoop, decontaminated stainless steel trowel or a sterile wooden tongue depressor. If the area is paved, samples will be collected 0 to 2 inches below the pavement. Detailed sampling procedures are described in Section 4.5 of this Work Plan. Site-specific sampling methods, if different from this Generic Work Plan, will be provided in the Site-Specific Work Plan. Specific sampling locations and analytical methods will be described in the Site-Specific Work Plan.

3.2 Direct Push Soil Sampling

Direct push sampling techniques can allow for the relatively rapid collection of subsurface soil samples with minimal disturbance of the ground surface and generation of soil cuttings. Discrete subsurface soil samples can be collected with direct push equipment from various depths in the vicinity of the suspected contaminant source to determine the vertical extent of contamination. The geology of the site must be evaluated to determine if direct push (soil probe) sampling techniques are feasible. If probe sampling is not feasible at the site due to the subsurface geology, sampling will then be completed utilizing standard drilling techniques such as the hollow stem auger method in conjunction with split spoon sampling. The probes will be installed utilizing a decontaminated core tube sampler fitted with a disposable acetate liner. Detailed sampling procedures are provided in Section 4.5. Probe locations and analytical methods will be provided in the Site-Specific Work Plan. Probe holes will be abandoned according to procedures described in Section 3.5.

3.3 Direct Push Groundwater Screening and Sampling

Collection of groundwater samples utilizing direct push sampling techniques include utilization of a groundwater probe sampler. Direct push sampling techniques will be utilized to collect groundwater samples to define the horizontal and vertical extent of groundwater contamination.

The direct push sampling techniques are useful for preliminary contaminant plume delineation based on actual groundwater sampling. Drawbacks to this method include the fact that this is a one-time sample only. The geology and hydrogeology of the site must be evaluated to determine if it is amenable to direct push sampling techniques. Probe sampling is typically only applicable in unconsolidated deposits.

Groundwater probes will be installed utilizing a decontaminated screened sampler. The decontaminated probe and rods will be driven until the sampler tip is approximately 1-foot below the target sampling depth. Once that depth has been reached, the expandable drive point will be disengaged and the rods pulled back a distance of about 2 feet to expose the screened sampler. Disposable polyethylene tubing, equipped with a bottom check valve, will be used to convey groundwater to the surface for collection. Each sample, upon retrieval, will be analyzed in the field for pH, conductivity, turbidity and temperature.

If necessary, samples may be collected for iron and manganese to provide additional information for potential treatment of groundwater. Prior to the collection of metals samples, groundwater turbidity will be measured. If the turbidity is less than 50 nephelometric turbidity units (NTUs), one sample will be collected for total metals analyses. If turbidity is greater than 50 NTUs, a filtered sample will also be collected and analyses performed for both filtered and unfiltered. Refer to Section 4.0 for more detailed sampling procedures. Site-specific sampling locations and analytical methods will be provided in the Site-Specific Work Plan. Probe holes will be sealed and abandoned according to Section 3.5.

3.4 Monitoring Well Drilling and Groundwater Monitoring

As shown on Figure 5-2 provided in Section 5.0, there are a total of 12 existing groundwater monitoring wells located within the site. Based on existing data, this monitoring well network is sufficient to monitor site groundwater quality. Therefore, this Remedial Investigation scope of work does not include the installation of additional wells. However, a discussion of well installation techniques is provided in the event that further investigation indicates the need for additional permanent monitoring wells.

The design of a monitoring well should be based upon site-specific conditions and cannot be completed using a “one size fits all” method or material. The goal of monitoring well design is to construct wells that will produce depth and location-specific hydrogeologic and chemical data. Precautions must be made to ensure that well completion and development procedures minimize disturbance to the natural geologic environment and groundwater samples. Additionally, monitoring well installation techniques must minimize the potential for cross-contamination through the subsurface. The following is a discussion of the most common drilling techniques used to install monitoring wells.

3.4.1 Drilling Methods

The selection of drilling and well completion methods for monitoring well construction will be based on site-specific conditions, including geologic materials to be penetrated, anticipated depth of drilling, potential for cross-contamination and accessibility to boring locations on the site. The selection of an appropriate drilling method for the construction of monitoring wells will be based on minimizing both the disturbance of geologic materials penetrated and the introduction of air, fluids and mud. The use of drilling mud and additives will be avoided, where possible, because the introduction of any foreign material has the potential for interfering with the chemical quality of water obtained from the monitoring wells and the determination of aquifer characteristics through the use of slug tests.

3.4.1.1 - Hollow Stem Augers

The hollow stem auger method is among the most desirable drilling methods for the construction of monitoring wells. Hollow stem auger drill rigs are generally mobile, relatively fast and inexpensive to operate in unconsolidated materials. No drilling fluids are used and disturbance to the geologic materials penetrated is minimal. Depths of borings constructed using augers vary based upon soil types; however, borings up to 100 feet and greater are possible (maximum depth limit is about 200 feet). Clayey soils restrict the depth to which auger drilling can be accomplished. Augers typically cannot be used in bedrock, unless it is highly weathered, and the use of hollow stem auger drilling in heaving sand environments may also present difficulty.

3.4.1.2 - Cable Tool

The cable tool drilling method is relatively slow, but still offers advantages such as low cost per foot, the ability to create large diameter borings and the ability to increase permeability of bedrock. These considerations make it a useful choice for monitoring well construction in unconsolidated formations and relatively shallow consolidated formations. This method allows for the collection of formation samples and the detection of permeable zones. The installation of a steel casing as drilling progresses also provides a stable annulus for the construction of a monitoring well.

3.4.1.3 - Air Rotary

Rotary drilling methods operate on the principle of circulating either a fluid or air to remove the drill cuttings and maintain an open hole as drilling progresses. The different types of rotary drilling are named according to the type of fluid and the direction of fluid flow. Air rotary drilling forces air down the drill rods and back up the borehole to remove the drill cuttings. The use of air rotary drilling is best suited for use in hard rock formations. In soft, unconsolidated formations, a casing is driven to keep the formations from caving. In highly fractured formations, it is often difficult to maintain air circulation and casing may be required. The air from the compressor on the rig must be filtered to ensure that the oil from the compressor is not introduced into the geologic system to be monitored. The use of air rotary drilling techniques must be used with care in highly polluted or hazardous environments. Contaminated solids, water and vapors can be blown out of the hole and are difficult to contain. Protection of the drill crew and observers is correspondingly difficult.

3.4.1.4 - Air Rotary with Casing Hammer

Air rotary drilling with casing driving capability increases the utility of this type of drilling method. Typical air rotary problems associated with drilling in soft, unconsolidated and highly fractured formations are minimized. The utility of constructing monitoring wells in the casing prior to its removal also makes this type of drilling technique more appealing. Concerns about oil in the circulating air and containment of contaminant cuttings, water and vapor, must also be considered.

3.4.1.5 - Reverse Circulation Rotary

Reverse circulation rotary drilling has limited application for the construction of monitoring wells. Large quantities of fluid are circulated down the hole and pumped back to the surface through the drill stem. Mud rotary offers better control of contaminated cuttings and water removed from the borings, and does not cause exposure to vapors as in air rotary techniques. The hydrostatic pressure of the water in the borehole is used to maintain an open borehole. If permeable formations are encountered, large quantities of water will infiltrate into these formations, altering in-situ water quality. Similarly, water bearing units with differing hydrostatic heads will have the opportunity for free interchange of waters, altering the quality of water in the unit of lower hydrostatic head. Because of the large quantities of water normally required for this type of drilling, and the high potential for water to enter the formations to be sampled, this type of drilling is not typically utilized.

3.4.1.6 - Mud Rotary

Mud rotary drilling operates in the same fashion as the air rotary drilling technique, except that water and drilling mud are circulated down the drill pipe and back up the borehole to remove drill cuttings. Mud rotary drilling offers better control of contaminated cuttings and water removed from the boring and does not cause exposure to vapors as in air rotary techniques. The borehole is held open by the hydrostatic pressure of the circulating mud and the mud cake that develops on the borehole wall during the drilling process. Viscosity of the drilling mud is controlled to minimize the infiltration of the drilling fluid into porous formations penetrated by the drilling equipment. The use of drilling mud can cause groundwater chemistry or in-situ permeability to be altered by introduction of mud into the borehole. Monitoring wells installed in mud-rotary borings often require extra well development and may detect solutes attributable to the mud that cause an inaccurate assessment of groundwater chemistry. Under certain conditions, mud rotary techniques can be effective by using a continuous supply of potable water without additives. Alternatively, mud can be used to advance a boring to a depth several feet above the zone of interest, at which time mud can be replaced with potable water and the borehole continued to final depth.

Based upon the advantages and disadvantages of the various drilling methods described above, the preferred drilling methods are typically hollow stem augers for drilling in the overburden and mud rotary using potable water without additives in the bedrock. However, the final selection of the drilling method will be based on site-specific geologic and hydrostatic conditions. Alternate methods of drilling must be specified in the Site-Specific Work Plan together with the rationale for selection.

3.4.2 Subsurface Soil Sampling

Subsurface soil samples will be collected during construction of monitoring wells. Soil samples obtained from decontaminated split spoons will be observed and logged for geologic characteristics, odors and staining, and screened with an FID or PID.

3.4.3 Overburden Monitoring Wells and Microwells/Piezometers

Monitoring well and microwell/piezometer boreholes constructed in the overburden will typically be installed using decontaminated 4 1/4-inch ID hollow stem augers. If difficulties with "running sands" are encountered which hinder soil sampling, potable water will be added to the hollow stem augers to maintain a positive hydrostatic head. Additionally, if difficulties with elevated levels of explosive or toxic gases, such as methane and hydrogen sulfide are encountered, potable water or mud may be introduced into the hollow stem augers to suppress the gas. If the depth of boring or nature of unconsolidated deposits prevent the efficient use of 4 1/4-inch ID hollow stem augers, then other methods such as those described in Section 3.4.1 may be considered. The use of alternative drilling methods, if any, will be described and justified in the Site-Specific Work Plan.

The final depth of each borehole will be below the water table at a depth that will allow 6 inches of sand pack to be placed between the screen bottom and bottom of the boring, as well as allow the screen to intersect the water table. For mid-depth or deep overburden wells, the borings must be deep enough to allow 6 inches of sand pack between well screen bottom and boring bottom, and allow the screen to intersect the zone of concern. If the boring is drilled too deep, for any reason, the borehole must be filled to a depth of 6 inches below the planned screen location with a bentonite slurry or other suitable impermeable material. At a minimum, overburden borings will be constructed for the installation of monitoring wells and piezometers that screen the water table. The actual number and depth of borings, as well as analytical sampling methods, will be determined on a site-specific basis and contained in the Site-Specific Work Plan.

Cuttings generated from the construction of the boreholes will be handled in accordance with NYSDEC TAGM No. 4032 "Disposal of Drill Cuttings" dated November 1989. In general, this TAGM allows for on-site disposal of cuttings as long as certain criteria are met.

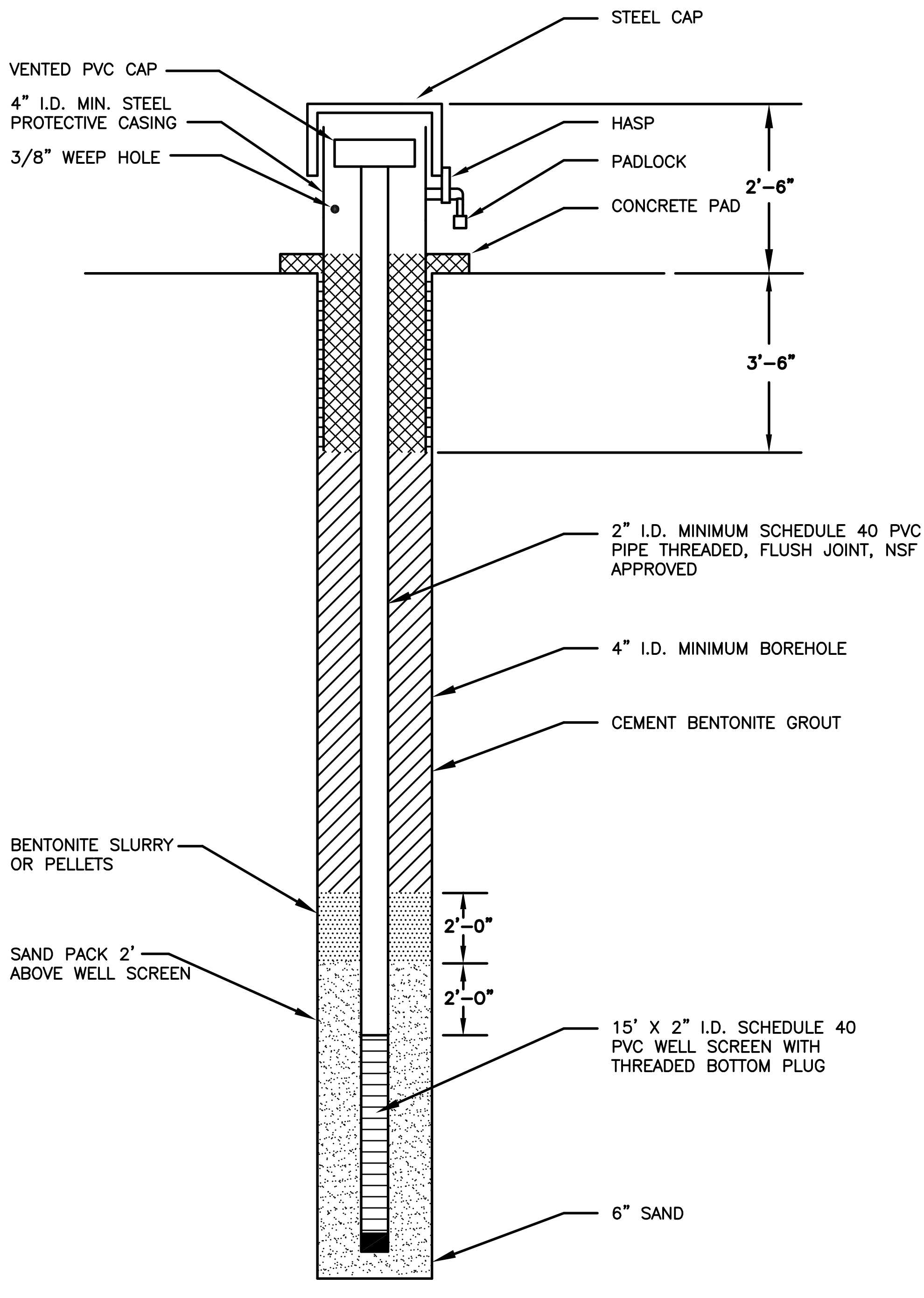
Monitoring wells will typically be installed for the purpose of groundwater sampling. Piezometers will typically be installed when sampling is not required, but water level data is necessary. The following discussion regarding monitoring wells also pertains to piezometers. The depth of overburden monitoring wells will be determined on the basis of the geology and hydrogeology of the site and the goals of the monitoring program. In the case of overburden wells, the goal in general is to monitor the potential effects of near surface contaminants on groundwater.

In order to properly define the movement of contaminants both vertically and horizontally, it is essential to collect depth-discreet water level data. Monitoring wells completed at the water table will provide a portion of the data needed to determine the vertical direction of groundwater movement. Water levels from several of these wells, if they are completed in the same hydrogeologic unit, will also provide information on the horizontal direction of shallow groundwater flow. If the overburden area of concern is relatively thick, then a series of mid-depth or deep monitoring wells will be required to properly assess groundwater conditions. The need for and depth of mid-depth or deep overburden wells will be provided in the Site-Specific Work Plan.

The diameter of monitoring wells should be the minimum practical size that will be compatible with the strength requirements of the well materials and allow for groundwater sampling. Small diameter monitoring wells will decrease the amount of water to be removed for well development and purging, and minimize the potential need for containment of contaminated water. Additionally, small diameter wells will minimize the potential impact on groundwater chemistry caused by disturbance during well drilling. Overburden monitoring wells will typically be constructed of decontaminated 2-inch ID, Schedule 40, 0.010-inch slot PVC well screen and threaded, flush joint PVC casing. No solvents will be utilized to construct the wells. These site-specific cases where non-aqueous phase liquids (NAPLs) are present or suspected, the use of stainless steel wire-wrap screens may be considered if the chemical is incompatible with PVC materials. In addition, when site-specific conditions dictate, different size screen openings may be utilized. Justification for the use of alternate screen material and size will be provided in the Site-Specific Work Plan.

The well screen in a monitoring well will be long enough to permit entry of water from the vertical zone to be monitored. The length of the screen will be kept to a minimum for water level data to be obtained from the well to represent information that is depth-discreet. In wells where the length of the screen is long, the resulting water level represents an average water level for the materials opposite the screen, and is sometimes insufficient to determine accurate groundwater flow characteristics. The overburden water table monitoring well screens will generally be 10 to 15 feet long. The screen will typically be installed with 5 feet above the water table in order to intercept the water table under varying seasonal groundwater elevations. The selection of screen lengths will be provided in the Site-Specific Work Plan. A generalized construction diagram for a well with a steel protective casing is shown on Figure 3-1. A generalized flush-mounted well construction diagram is shown on Figure 3-2. The type of well utilized will be based on site-specific considerations.

At the completion of borehole construction and soil sampling, the well screen and riser pipe will be lowered into the hollow stem auger and set at the desired depth. Sand pack of a grain size appropriate for the selected screen opening size and geologic conditions will be placed into the annular space to a minimum height of 2 feet above the top of the well screen using a tremie pipe or other suitable method. Generally, number 2 morie sand will be used. During this time, the auger will be slowly removed. The well pipe will also be pulled up no more than ½-foot to allow sand material to fill the borehole beneath the well screen. Upon completing the placement of the sand pack, a minimum 2-foot thick bentonite pellet, chip or slurry seal will be tremied in the annular space. Bentonite pellets or bentonite chips, if used, will be hydrated with potable water

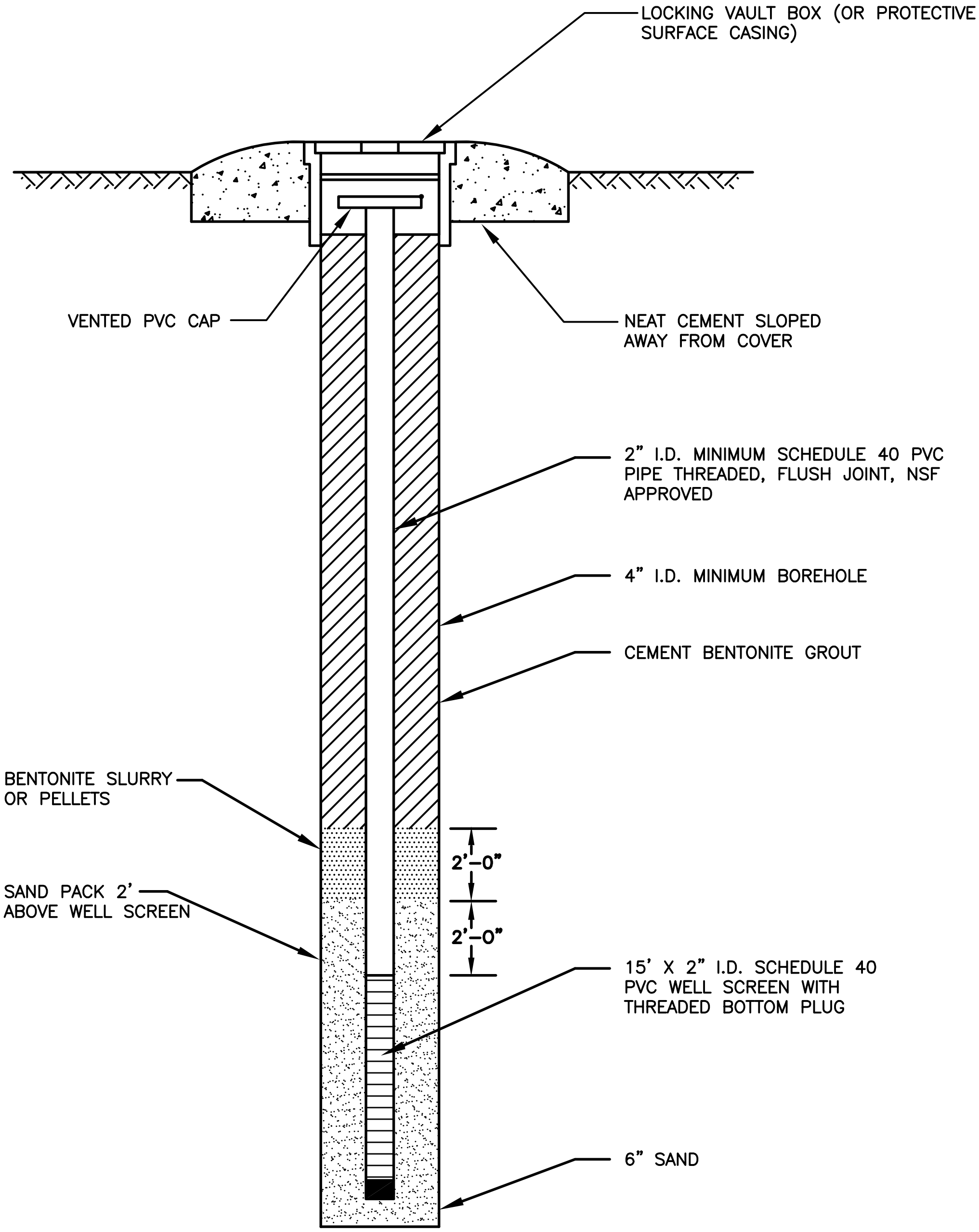


LONG ISLAND RAIL ROAD - YAPHANK SITE
SUPPLEMENTAL REMEDIAL INVESTIGATION

Dvirka and Bartilucci
CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

PLAN FOR CONSTRUCTION OF OVERBURDEN MONITORING WELLS

FIGURE 3-1



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PLAN FOR CONSTRUCTION OF MONITORING WELLS WITH LOCKING VAULT

FIGURE 3-2

and allowed to swell for a minimum of ½-hour before introducing the cement bentonite grout in the remaining annular space. The cement-bentonite grout will be pressure pumped into the annular space by the tremie method.

The monitoring wells will be completed with either a flush mount curb box or riser pipes. Wells completed with riser pipes will be constructed with approximately 2 ½ feet of riser above ground surface and protected with a locking steel casing with minimum diameter of 4 inches. The protective casing will be at least 5 feet in length and secured into the borehole using concrete sand or gravel mix. The surface seal will be completed with a 3-foot diameter formed concrete pad and will be constructed to drain surface water away from the well. The protective casing will have a locking cap and weep hole, and be marked with the monitoring well identification. In cases where monitoring wells will be installed in roadways, parking lots or through floors, flush mount protective casings will be used. In such cases, a locking water tight PVC well cap will be installed inside of a curb box with bolted, water tight cover. Protective casing types will be specified in the Site-Specific Work Plan.

3.4.4 Borehole and Monitoring Well Logging

All borehole construction and monitoring well installation will be logged and documented by a geologist. Notes will be kept in both bound field books and on Boring Logs and Monitoring Well Construction Logs (see Section 4.8). The Boring Logs will include the depths of stratigraphic changes, description of all samples, details of drilling techniques, listing of soil samples collected for laboratory analyses and measurements made with PIDs or FIDs. In addition, soil will be visually inspected for staining and checked for odors. Well construction specifications will be provided in the Monitoring Well Construction Logs. The Modified Burmeister Classification System will be used to describe soil samples recovered from the borings. A Daily Field Activity Report (see Section 4.8) will be completed whenever there are drilling activities (or any other field activities) undertaken as part of the investigation.

3.4.5 Monitoring Well Development

Monitoring wells will be developed by pumping and surging for 2 hours, or until the turbidity of the groundwater achieves a reading of 50 NTUs or less. Well development will be supplemented by measurements of field parameters, including temperature, pH and specific conductance. Development will continue until the field parameters stabilize for a minimum of three consecutive readings of 10 percent variability or less. When possible, well development water will be recharged on-site. All equipment used for the development of monitoring wells will be decontaminated prior to use and between wells (see Section 4.6).

3.4.6 Groundwater Level Measurement

Groundwater level measurements, where applicable, will be obtained from each of the wells installed as part of the Remedial Investigation. Existing wells may also be utilized for groundwater level measurements. If feasible, all groundwater level measurements will be made within an eight hour period of uniform weather conditions. The measuring points will be surveyed for location and elevation.

All water and LNAPL level measurements, where appropriate, will be made using a fixed reference point at each measurement location. Down hole instruments will be decontaminated between each measurement location (see Section 4.6). The static water level will be measured to the nearest 0.01-foot. Groundwater level data will be used to construct groundwater potentiometric surface maps and used to determine local horizontal flow direction, as well as vertical gradients. Where LNAPL is present, a corrected groundwater potentiometric surface elevation will be calculated in order to supplement the groundwater elevation data and provide a corrected groundwater elevation contour map, if necessary.

3.4.7 Groundwater Sampling

The depth to the water level in each well to be sampled will be measured in order to calculate the liquid bore volume necessary for purging. Depth to water will be measured with respect to a reference point established at the top of the well casing. Water level measurements will be obtained using a decontaminated electronic water level indicator.

The wells will be purged until a minimum of three to five bore volumes have been removed or until the well is dry, whichever occurs first. The number of bore volumes purged will be a function of the pH, temperature and conductivity, and will continue until stabilization of these parameters is achieved. Purge water will be recharged on-site, if possible. Refer to Section 4.11 for further discussion on containment and disposal of purge water.

Disposable polyethylene bailers with disposable nylon or polypropylene rope will be used for purging and sampling of the wells. Deep wells or wells that require large volumes of water to be removed may be purged and sampled using decontaminated, downhole pumps and decontaminated or disposable tubing. Once the well has been sufficiently purged, sampling will begin. If groundwater recovery is very slow, it may be necessary to wait several hours, or overnight, for sufficient volume to become available for the necessary sample analyses. Locations of the monitoring wells, and analytical sampling methods, will be provided in the Site-Specific Work Plan. Specific monitoring well sampling procedures are included in Section 4.5.

3.5 Probe Hole, Borehole and Well Abandonment

Direct push probe holes and soil borings which are not completed as monitoring wells will be fully sealed in a manner appropriate for the geologic conditions to prevent contaminant migration through the borehole. Sealing of the well or borehole will include the following methods: overboring or removal of the casing to the greatest extent possible followed by perforation of any casing left in place; removal of all casing and other well construction material within the upper 5 feet of the boring or within 5 feet of the proposed excavation level; sealing by pressure injection with cement bentonite grout using a tremie pipe to a depth extending the entire length of the boring to within 5 feet below the ground surface or the proposed excavation level; sealing the remaining 5 feet to ground surface with neat cement grout; and restoration of the sealed site to a safe condition. Well abandonment will follow the methods described in

"Groundwater Monitoring Well Decommissioning Procedures," NYSDEC Division of Hazardous Waste Remediation, dated May 1995.

3.6 Air Screening

In the event that intrusive subsurface activities such as test pitting or trenching are required at the site, ambient air monitoring will be performed. Appropriate ambient air screening instruments will be used to determine the necessary levels of personal protective equipment (see the Health and Safety Plan), as well as to provide data on contaminant concentrations in the background ambient air. Detailed monitoring procedures are summarized in the Health and Safety Plan (provided under separate cover).

In addition, to protect the downwind community from a potential airborne contaminant release during intrusive subsurface activities, a Community Air Monitoring Plan (CAMP) including real-time monitoring at the downwind perimeter of each designated work zone will be established. Air monitoring will occur for particulates (i.e., dust). Prior investigations did not identify the presence of VOCs at significant concentrations. Therefore, air monitoring for these compounds will not be required.

Particulate concentrations will be monitored in real-time at both the upwind and downwind perimeters of the Construction Work Zone (CWZ) or the Construction Exclusion Zone (CEZ). Monitoring equipment will be capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level, and will be equipped with an audible alarm to indicate exceedance of that level. Real-time monitoring will be conducted under the following conditions:

- If the downwind PM10 particulate level exceeds the upwind perimeter (background) level by 100 ug/m^3 for the 15-minute period, or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed;
- Work will continue using dust suppression techniques as long as the downwind PM10 particulate level remains less than 150 ug/m^3 greater than the upwind level. If the

level exceeds this value; however, work will be stopped and site work will be re-evaluated; and

- All readings will be recorded and available for State (DEC and DOH) personnel to review.

3.7 Surveying and Mapping

Sampling locations may be surveyed by a New York State licensed surveyor for horizontal and vertical control. Vertical and horizontal control of the monitoring well/piezometer casing will allow for calculation of groundwater elevations for the development of groundwater contour maps. The ground surface, protective casing, and measuring point in the inner casing will be surveyed.

Vertical and horizontal control of the soil borings allow for the preparation of geologic and hydrogeologic cross sections. Additional on- and off-site sampling points, such as surface soil and soil vapor survey locations, will be surveyed, if necessary.

Control points for use in the preparation of a topographic map of the study area will also be surveyed, if necessary. Coordination between the aerial photographer and the surveyor will be required in order to select the necessary control points for preparation of the topographic map.

4.0 QUALITY ASSURANCE/QUALITY CONTROL PLAN

The purpose of this Generic Quality Assurance/Quality Control (QA/QC) Plan is to describe the detailed sample collection and analytical procedures that will ensure high quality, valid data for the Remedial Investigation to be conducted at the Yaphank site.

4.1 Data Usage

The data generated from the sampling program will be used to determine the nature, extent and source(s) of impacted soil and groundwater at the site, prepare a public health exposure assessment, and identify, evaluate and recommend a cost-effective, environmentally sound, long-term remedial action plan. The data will also be utilized to monitor for the health and safety of workers at the site and potential off-site receptors.

4.2 Sampling Program Design and Rationale

The following presents a general discussion of the sampling that may be conducted in support of the Remedial Investigation.

- Surface Soil - Surface soil samples will be collected to determine the extent of impacted surface soil and establish relative background analytical data for the site area.
- Subsurface Soil - Subsurface soil samples will be collected to determine the extent of impacted subsurface soil and establish relative background analytical data for the site area.
- Groundwater - Groundwater samples will be obtained from monitoring wells and/or groundwater probes which will be installed as part of the Remedial Investigation or from existing monitoring wells, which were installed previously at and in the vicinity of the site. Groundwater samples will be collected to characterize groundwater quality.

For a detailed discussion of the sampling program and selection of sample matrices and locations, see the Site-Specific Work Plan provided in Section 5.0.

4.3 Analytical Parameters

Surface soil and subsurface soil samples collected from the Yaphank site will typically be analyzed for target analyte list (TAL) metals. In addition, a select number of soil samples will be analyzed for PAHs, phenol and pentachlorophenol. Groundwater samples will typically be analyzed for both filtered and unfiltered TAL metals and SVOCs.

Table 4-1 presents a summary of the parameters/sample fraction together with the typical sample location, type of sample, sample matrix, type of sample container, method of sample preservation, holding time and analytical method.

4.4 Data Quality Requirements

Data quality requirements and assessments are provided in the 6/00 NYSDEC ASP, which includes the detection limit for each parameter and sample matrix. Note that quantification limits, estimated accuracy, accuracy protocol, estimated precision and precision protocol are determined by the laboratory and will be in conformance with the requirements of the 6/00 NYSDEC ASP, where applicable. Table 4-2 presents a summary of the data quality requirements.

The methods of analysis will be in accordance with SW-846 and 6/00 NYSDEC ASP. Specific analytical procedures and laboratory QA/QC descriptions are not included in this QA/QC Plan, but will be available upon request from the laboratory selected to perform the analyses. The laboratory will be New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certified for organic and inorganic analyses and also be NYSDOH Contract Laboratory Protocol (CLP) certified.

Table 4-1

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Container Type/Size/No.	Sample Preservation	Maximum Holding Time	Analytical Method
Yaphank Site	Grab	Surface Soil	TAL Metals	Glass, clear/8 oz./1 ICHEM 200 series or equivalent	Cool to 4°C	26 days after VTSR for Hg analysis, 6 months for all other metals	6/00 NYSDEC ASP, Method ILMO 4.0

VTSR - Verified time of sample receipt at the laboratory.

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Container Type/Size/No.	Sample Preservation	Maximum Holding Time	Analytical Method
Yaphank Site	Grab	Subsurface Soil	TAL Metals	Glass, clear/8 oz./1 ICHEM 200 series or equivalent	Cool to 4°C	26 days after VTSR for Hg analysis, 6 months for all other metals	6/00 NYSDEC ASP, Method ILMO 4.0
	Grab	Subsurface Soil	PAHs, Phenol, Pentachlorophenol	Glass, clear/8 oz./1 ICHEM 200 series or equivalent	Cool to 4°C	5 days after VTSR for extraction, 40 days from extraction for analysis	6/00 NYSDEC ASP, Method 8270

VTSR - Verified time of sample receipt at the laboratory.

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Container Type/Size/No.	Sample Preservation	Maximum Holding Time	Analytical Method
Monitoring Wells/ Groundwater probes	Grab	Groundwater	SVOCs	Glass, amber/1 L/2 ICHEM 300 series or equivalent	Cool to 4°C	5 days after VTSR for extraction, 40 days after extraction for analysis	6/00 NYSDEC ASP, Method 8270
	Grab	Groundwater	TAL Metals	Plastic/1 L/2 ICHEM 300 series or equivalent	HNO_3 to pH <2 Cool to 4°C	26 days after VTSR for Hg analysis, 6 months for all others	6/00 NYSDEC ASP, Method ILMO 4.0

VTSR - Verified time of sample receipt at the laboratory.

Table 4-2

DATA QUALITY REQUIREMENTS
OBJECTIVES FOR PRECISION, ACCURACY AND COMPLETENESS

Parameter	Sample Matrix	CRDL* (ug/l)	Estimated Accuracy	Accuracy Protocol	Estimated Precision	Precision Protocol
Base Neutrals	Liquid Solid	10-50 330-1600	0.29 - 1.23 ug/l	Vol. IB, Chapter 4, Method 8270, Table 7	0.13 - 1.05 ug/l	Vol. IB, Chapter 4, Method 8270, Table 7
Acid Extractables	Liquid Solid	10-50 330-1600	0.29 - 1.23 ug/l	Vol. IB, Chapter 4, Method 8270, Table 7	0.13 - 1.055 ug/l	Vol. IB, Chapter 4, Method 8270, Table 7
Metals	Liquid Solid	0.2-5000 0.2-5000	--	Vol. IA, Chapter 3, Method 6010**, Table 4	--	Vol. IA, Chapter 3, Method 6010**, Table 4

*Contract Required Detection Limits

**and SW-846 Methods for: Mercury 7471

Table 4-2 (continued)

DATA QUALITY REQUIREMENTS
OBJECTIVES FOR PRECISION, ACCURACY AND COMPLETENESS

Matrix/Parameter	Precision (%)	Accuracy (%)
Soils		
Metals[b]	± 25	75-125
Groundwater		
Extractables[a]	See Table 2-2b	See Table 2-2b
Metals[b]	± 25%	75-125

NOTES:

(a) Accuracy will be determined as percent recovery of surrogate spike compounds and matrix spike compounds. Surrogate and matrix spike compounds for extractables are listed in Tables 4-2a. Precision will be estimated as the relative standard deviation of the percent recoveries per matrix.

(b) Accuracy will be determined as percent recovery of matrix spikes when appropriate or the percent recovery of a QC sample if spiking is inappropriate. Precision will be determined as relative percent difference of matrix spike duplicate samples, or duplicate samples if spiking is inappropriate.

(c) Precision will be determined as the average percent difference for replicate samples. Accuracy will be determined as the percent recovery of matrix spike samples or laboratory control samples, as appropriate.

Source: NYSDEC ASP

Table 4-2a

DATA QUALITY REQUIREMENTS
OBJECTIVES FOR PRECISION AND ACCURACY
OF EXTRACTABLE COMPOUNDS
BASED UPON RECOVERY OF SURROGATE AND
MATRIX SPIKE COMPOUNDS*

Surrogate Compounds	Matrix	Precision	Accuracy %
d5-Nitrobenzene	Water	≤ 20	35-114
	Solid	≤ 25	23-120
2-Fluorobiphenyl	Water	≤ 20	43-116
	Solid	≤ 25	30-115
d14-Terphenyl	Water	≤ 20	33-141
	Solid	≤ 25	18-137
d5-Phenol	Water	≤ 20	10-110
	Solid	≤ 25	24-113
2-Fluorophenol	Water	≤ 20	21-110
	Solid	≤ 25	25-121
2,4,6-Tribromophenol	Water	≤ 20	10-123
	Solid	≤ 25	19-122
2-Chlorophenol-d4 (Advisory)	Water	≤ 20	33-110
	Solid	≤ 25	20-130
1,2-Dichlorobenzene-d4 (Advisory)	Water	≤ 20	16-110
	Solid	≤ 25	20-130

Table 4-2a (continued)

DATA QUALITY REQUIREMENTS
OBJECTIVES FOR PRECISION AND ACCURACY
OF EXTRACTABLE COMPOUNDS
BASED UPON RECOVERY OF SURROGATE AND
MATRIX SPIKE COMPOUNDS*

	Matrix	Precision	Accuracy %
Matrix Spike Compounds			
1,2,4-Trichlorobenzene	Water	≤ 20	39-98
	Solid	≤ 25	38-107
Acenaphthene	Water	≤ 20	46-118
	Solid	≤ 25	31-137
2,4-Dinitrotoluene	Water	≤ 20	24-96
	Solid	≤ 25	28-89
Pyrene	Water	≤ 20	26-127
	Solid	≤ 25	35-142
N-Nitroso-Di-n-Propylamine	Water	≤ 20	41-116
	Solid	≤ 25	41-126
1,4-Dichlorobenzene	Water	≤ 20	36-97
	Solid	≤ 25	28-104
Pentachlorophenol	Water	≤ 20	9-103
	Solid	≤ 25	17-109
Phenol	Water	≤ 20	12-110
	Solid	≤ 25	26-90

Table 4-2a (continued)

DATA QUALITY REQUIREMENTS
OBJECTIVES FOR PRECISION AND ACCURACY
OF EXTRACTABLE COMPOUNDS
BASED UPON RECOVERY OF SURROGATE AND
MATRIX SPIKE COMPOUNDS*

	Matrix	Precision	Accuracy %
Matrix Spike Compounds (continued)			
2-Chlorophenol	Water	≤ 20	27-123
	Solid	≤ 25	25-102
4-Chloro-3-methylphenol	Water	≤ 20	23-97
	Solid	≤ 25	26-103
4-Nitrophenol	Water	≤ 20	10-80
	Solid	≤ 25	11-114

*Accuracy will be determined as percent recovery of these compounds. Precision will be estimated as the relative standard deviation of the percent recoveries per matrix.

Source: NYSDEC ASP

4.4.1 Data Representativeness

Representative samples will be collected as follows:

- Surface Soil - Samples will be collected at a depth of 0 to 2 inches using a dedicated polystyrene scoop or sterile wooden tongue depressor.
- Subsurface Soil (Probe) - Samples will be collected using a decontaminated core sampler and dedicated acetate tube liner.
- Groundwater (Probe) - Samples will be collected upon installation of the probe using dedicated polyethylene tubing equipped with a bottom check valve in order to purge the standing water and collect a representative groundwater sample.
- Groundwater (Monitoring Well) - Samples will be collected with a dedicated polyethylene bailer after the monitoring well has been purged of three to five well casing volumes until field measurements for pH, conductivity, temperature and turbidity have stabilized, or until the well is purged dry (whichever comes first) and the well has been allowed to recharge.
- Equipment Calibration - Field equipment used for air monitoring will be calibrated daily before use according to the manufacturer's procedures.
- Equipment Decontamination - Nondedicated sampling equipment will be decontaminated prior to use at each location according to the procedures described in Section 4.6.

4.4.2 Data Comparability

All data will be presented in the units designated by the methods specified by a NYSDOH ELAP and CLP certified laboratory, and the 6/00 NYSDEC ASP. In addition, sample locations, collection procedures and analytical methods from earlier studies will be evaluated for comparability with current procedures/methods.

4.4.3 Data Completeness

The acceptability of 100% of the data is desired as a goal for this project. The acceptability of less than 100% complete data, meeting all laboratory QA/QC protocols/ standards, will be evaluated on a case-by-case basis.

4.5 Detailed Sampling Procedures

Environmental samples will be collected as part of the Remedial Investigation of the Yaphank site. These may include groundwater, sediment, subsurface soil, and surface soil. Sample locations may consist of monitoring wells, dry wells, soil probe locations, groundwater probe locations, soil borings, and surface soils. Actual locations will be described in the Site-Specific Work Plan provided in Section 5.0.

General sampling approaches and equipment are described in this section. A summary of the Remedial Investigation sampling program, including sample media, depths, equipment, rationale and analytical parameters is provided in Section 5.0.

When taking soil samples, an attempt will be made to maintain sample integrity by preserving its physical form and chemical composition to as great an extent as possible. An appropriate sampling device (i.e., decontaminated or dedicated equipment) will be utilized to transfer the sample into the sample container. Every effort will be made to ensure that the sample is a proper representation of the matrix from which it was collected. The sample will be transferred into the sample bottle as quickly as possible, with no mixing, to ensure that the volatile fraction is not lost.

The materials involved in groundwater sampling are critical to the collection of high quality monitoring information, particularly where the analyses of volatile, pH sensitive or reduced chemical constituents are of interest. The materials for bailers and pump parts will be stainless steel and/or polyethylene.

There will be several steps taken after the transfer of the soil or water sample into the sample container that are necessary to properly complete collection activities. Once the sample is transferred into the appropriate container, the container will be capped and, if necessary, the outside of the container will be wiped with a clean paper towel to remove excess sampling material. The container will not be submerged in water in an effort to clean it. Rather, if necessary, a clean paper towel moistened with distilled/deionized water will be used.

The sample container will then be properly labeled. Information such as sample number, location, collection time and sample description will be recorded in the field log book. Associated paper work (e.g., Chain of Custody forms) will then be completed and will stay with the sample. The samples will be packaged in a manner that will allow the appropriate storage temperature to be maintained during shipment to the laboratory. Samples will be delivered to the laboratory within 48 hours of collection.

4.5.1 Sample Identification

All samples collected will be labeled with a sample identification code. The code will identify the site, sample location, sample matrix and series numbers for sample locations with more than one sample. Samples will be labeled according to the following system:

- Site: – Site name (i.e., Yaphank)
- Sample Type:
  - – Surface Soil "SS"
  - – Soil Boring or Probe "SB"
  - – Monitoring Well "MW"
  - – Groundwater Probe "GP"
- Sample Number: – For circumstances where more than one sample of the same type and/or from the same location will be collected, a consecutive sample number will be assigned. When more than one sample is collected from a borehole in a sampling round at different depths, the depth will be indicated on the sample container and in the field log book.
- Quality Assurance/ Quality Control (QA/QC):
  - – Matrix Spike "MS"
  - – Matrix Spike Duplicate "MSD"
  - – Field Blank "FB"
  - – Trip Blank "TB"

Based upon the above sample identification procedures, an example of a sample label may be:

Sample Type → SB-01 - MS ← QA/QC

↑

Sample Number

4.5.2 Sample Handling, Packaging and Shipping

All samples will be placed in the appropriate containers as specified in the 6/00 NYSDEC ASP. The holding time criteria identified in the ASP will be followed as specified in Table 4-1.

Prior to packaging any samples for shipment, the sample containers will be checked for proper identification and compared to the field log book for accuracy. The samples will then be wrapped with a cushioning material and placed in a cooler (or laboratory shuttle) with a sufficient amount of bagged ice or “blue ice” packs in order to keep the samples at 4°C until arrival at the laboratory.

All necessary documentation required to accompany the sample during shipment will be placed in a sealed plastic bag and taped to the underside of the cooler lid. The cooler will then be sealed with fiber (duct) or clear packing tape, and custody seals will be placed in such a manner that any opening of the cooler prior to arrival at the laboratory can be detected.

All samples will be shipped to ensure laboratory receipt within 48 hours of sample collection in accordance with NYSDEC requirements. The laboratory will be notified prior to the shipment of the samples.

4.5.3 Soil (Surface)

1. Be certain that the sample location is noted on Location Sketch.
2. If a dedicated sampling device is not used, be certain that the sampling equipment has been decontaminated utilizing the procedures outlined in Section 4.6.
3. Remove laboratory precleaned sample container from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form (see Section 4.8).
4. At the sample location, clear surface debris (e.g., vegetation, rocks, twigs, etc.). Collect an adequate amount of soil from a depth of 0 to 2 inches using a decontaminated or disposable scoop and/or sterile wooden tongue depressor. Transfer the sample directly into the sample container.
5. Return the sample container to the cooler.
6. If reusable, decontaminate the sampling equipment according to the procedures described in Section 4.6.

4.5.4 Soil (Probe)

1. Be certain that the sample location is noted on Location Sketch.
2. Remove laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form.
3. Drive the core sampler to the desired sampling depth.
4. Retrieve the core sampler and immediately after opening it, obtain an organic vapor measurement with a FID or PID.
5. Remove a sample aliquot from the soil probe using a disposable scoop or sterile wooden tongue depressor, place into the open sample container and replace the container cover.
6. Return the sample container to the cooler.

4.5.5 Soil (Borehole, Split Spoon)

1. Be certain that the sample location is noted on Location Sketch.

2. Be certain that the sampling equipment (split spoon) has been decontaminated utilizing the procedures outlined in Section 4.6.

3. Remove laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form (see Section 4.8).

4. Drill into the soil to the desired depth and drive the split spoon sampler.

5. Retrieve the split spoon and immediately after opening the split spoon, obtain an organic vapor measurement with a PID or FID, and fill out Boring Log Form (see Section 4.8).

6. Remove a sample aliquot from the split spoon using a disposable scoop or sterile wooden tongue depressor, place into the open sample container and replace the container cover.

7. Return the sample container to the cooler.

8. If reusable, decontaminate the sampling equipment according to the procedures described in Section 4.6.

4.5.6 Groundwater (Probe)

1. Be certain sample location is noted on Location Sketch.

2. Remove the laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form (see Section 4.8).

3. Obtain a sample by using a dedicated polyethylene tubing equipped with a bottom check valve.

4. Gently pour the sample into the sample container taking care not to spill on the outside of the container or overfill container and replace cover on the sample container. Samples for volatile organic analyses will have no air space in the sample vial prior to sealing. This is done by filling the vial such that there is a meniscus on top. Carefully slide the septum, Teflon side down, onto the top of the vial and cap the vial. Check for bubbles by turning the vial upside down and tapping it lightly. If bubbles appear, reopen the vial, remove the septum and add more sample (or resample). Replace the septum, recap and check for bubbles. Continue until vial is bubble-free.

5. After sample collection, obtain field measurements including pH, conductivity, temperature and turbidity.

6. If a sample is to be collected for metals analysis, the turbidity must be less than 50 NTUs. If the turbidity cannot be reduced to less than 50 NTUs, the sample will be filtered in the field or by the laboratory. Both the filtered and unfiltered portion of the sample will be analyzed.

7. Return sample containers to sample cooler.

4.5.7 Groundwater (Monitoring Well)

1. Measure the depth of water using a decontaminated water level indicator and compute the volume of standing water in the well.

2. Remove three to five times the volume of standing water from the well until field measurements (pH, conductivity, temperature and turbidity) stabilize, or until the well is dry, whichever occurs first. Turbidity should be less than 50 NTUs prior to collection of a sample for metals analysis.

3. Remove the laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form (see Section 4.8).

4. Obtain a sample by using a disposable polyethylene bailer.

5. If the turbidity of the sample is greater than 50 NTUs, the metals portion of the sample will be filtered in the field or by the laboratory. Both the filtered and unfiltered portion of the sample will be analyzed.

6. Gently pour the sample into the sample container taking care not to spill on the outside of the container or overfill container and replace the cover on the sample container. Samples for volatile organic analyses will have no air space in the sample vial prior to sealing. This is done by filling the vial such that there is a meniscus on top. Carefully slide the septum, Teflon side down, onto the top of the vial and cap the vial. Check for bubbles by turning the vial upside down and tapping it lightly. If bubbles appear, reopen the vial, remove the septum and add more sample (or resample). Replace the septum, recap and check for bubbles. Continue until vial is bubble-free.

7. Return sample container to sample cooler.

4.6 Decontamination Procedures

Whenever possible, all field sampling equipment should be sterile/disposable and dedicated to a particular sampling point. In instances where this is not possible, a field cleaning/

decontamination procedure will be used in order to mitigate cross contamination between sample locations. A decontamination station/pad will be established for all field activities. This will be an area located away from the source of contamination so as not to adversely impact the decontamination procedure, but close enough to the sampling locations to keep equipment transport handling to a minimum after decontamination.

4.6.1 Field Decontamination Procedures

All nondisposable equipment will be decontaminated at appropriate intervals (e.g., prior to initial use, prior to moving to a new sampling location and prior to leaving the site). Different decontamination procedures are used for various types of equipment that are used to collect samples. When using field decontamination, sampling should commence in the area of the site with the lowest contamination, if known or probable, and proceed through to the areas of highest contamination.

4.6.2 Decontamination Procedure for Drilling/Probing Equipment

All equipment such as drill rigs and other mobile equipment will receive an initial cleaning prior to use at the site. The frequency of subsequent cleanings while on site will depend on how the equipment is actually used in relation to collecting environmental samples. All wash/rinse solutions will be collected and recharged on site after testing, if possible. If an appropriate location for on-site recharge is not available, the next preferable option is to discharge to a municipal sewer system. Until an appropriate discharge alternative is determined, all wash/rinse solutions will be collected and contained on site in 55-gallon drums.

After the initial decontamination, cleaning may be reduced to those areas that are in close proximity to materials being sampled. Drill rig/probe items such as augers, drill/probe rods and drill bits will be cleaned in between sample locations.

Drilling/probing equipment will be decontaminated in the following manner:

- Wash thoroughly with nonresidual detergent (alconox) and tap water using a brush to remove particulate matter or surface film. Pressure washing will be utilized, if necessary, to remove any oil and/or tar accumulations on the back of the rig, auger flights, drill rods, drilling head, etc. Any loose paint chips, paint flakes and rust must also be removed;
- Steam clean (212°F); and
- Once decontaminated, remove all items from the decontamination area.

Also, following the general cleaning procedures described above, all downhole/drilling items, such as split spoon samplers, Shelby tubes, rock corers, or any other item of equipment which will come in direct contact with a sample during drilling, will be decontaminated by pressure washing and/or steam cleaning.

4.6.3 Decontamination Procedure for Sampling Equipment

Teflon, PVC, polyethylene and stainless steel sampling equipment decontamination procedures will be the following:

- Wash thoroughly with nonresidual detergent (alconox) and clean potable tap water using a brush to remove particulate matter or surface film;
- Steam clean (if necessary);
- Rinse thoroughly with tap water;
- Rinse thoroughly with distilled water and air dry; and
- All decontaminated equipment will be staged on clean plastic sheeting.

4.6.4 Decontamination Procedure for Well Casing and Development Equipment

Field cleaning of well casings will consist of a manual scrubbing to remove foreign material and steam cleaning, inside and out, until all traces of oil, grease and tar are removed.

This material will then be stored in such a manner so as to preserve it in this condition. Special attention to threaded joints will be necessary to remove cutting oil or weld burn residues, if necessary.

Materials and equipment that will be used for the purposes of well development will also be decontaminated by steam cleaning. An additional step will involve flushing the interior of any hose, pump, etc. with a nonphosphate detergent solution and potable water rinse prior to the development of the next well. This liquid waste will be disposed of on site, if possible after testing.

4.7 Laboratory Sample Custody Procedures

A NYSDOH ELAP and CLP certified laboratory meeting the requirements for sample custody procedures, including cleaning and handling sample containers and analytical equipment, will be used to analyze samples collected during the Remedial Investigation. The selected laboratory's Standard Operating Procedures will be made available upon request.

4.8 Field Management Documentation

Proper management and documentation of field activities is essential to ensure that all necessary work is conducted in accordance with the sampling plan and QA/QC Plan in an efficient and high quality manner. Field management procedures will include following proper chain of custody procedures to track a sample from collection through analysis, noting when and how samples are split (if required); preparing a Location Sketch; completing Sample Information Records, Chain of Custody Forms, and Boring, Drilling and Well Construction Logs; maintaining a daily Field Log Book; completing Daily Equipment Calibration Logs; preparing Daily Field Activity Reports; completing Field Change Forms; and filling out a Daily Air Monitoring Form. Copies of each of these forms are provided in Appendix A. Proper completion of these forms and the field log book are necessary to support the consequent actions that may result from the sample analysis. This documentation will support that the samples were collected and handled properly.

4.8.1 Location Sketch

For each sampling point, a Location Sketch will be completed using permanent references and distances to the sampling point noted, if possible.

4.8.2 Sample Information Record

At each sampling location, a Sample Information Record Form is filled out including, but not limited to, the following information:

- Site name;
- Sample crew;
- Sample location;
- Field sample identification number;
- Date;
- Time of sample collection;
- Weather conditions;
- Temperature;
- Sample matrix;
- Method of sample collection and any factor that may affect its quality adversely;
- Well information (groundwater only);
- Field test results;
- Analysis to be performed; and
- Remarks.

4.8.3 Chain of Custody

The Chain of Custody Form will be completed and is initiated at the laboratory with container preparation and shipment to the site. The form remains with the sample at all times and bears the name of the person assuming responsibility for the samples. This person is tasked with ensuring secure and appropriate handling of the containers and samples. When the form is complete, it will indicate that there was no lapse in sample accountability.

A sample is considered to be in an individual's custody if any of the following conditions are met:

- It is in the individual's physical possession; or
- It is in the individual's view after being in his or her physical possession; or
- It is secured by the individual so that no one can tamper with it; or
- The individual puts it in a designated and identified secure area.

In general, Chain of Custody Forms are provided by the laboratory selected to perform the analytical services. At a minimum, the following information will be provided on these forms:

- Project name and address;
- Project number;
- Sample identification number;
- Date;
- Time;
- Sample location;
- Sample type;
- Analysis requested;

- Number of containers and volume taken;
- Remarks;
- Type of waste;
- Sampler(s) name(s) and signature(s); and
- Spaces for relinquished by/received by signature and date/time.

For this particular study, forms provided by the laboratory will be utilized.

The Chain of Custody Form will be filled out and signed by the person performing the sampling. The original of the form will travel with the sample and will be signed and dated each time the sample is relinquished to another party, until it reaches the laboratory or analysis is completed. The field sampler will keep one copy and a copy will be retained for the project file. The sample bottle will also be labeled with an indelible marker with a minimum of the following information:

- Sample number;
- Analysis to be performed; and
- Date of collection.

A copy of the completed form will be returned by the laboratory with the analytical results.

4.8.4 Split Samples

Whenever samples are being split with another party, a Receipt for Samples Form will be completed and signed. A copy of the Chain of Custody Form will accompany this form.

4.8.5 Field Log Book

Field log books will be bound and have consecutively numbered, water resistant pages. All pertinent information regarding the site and sampling procedures will be documented. Notations will be made in log book fashion, noting the time and date of all entries. Information recorded in this notebook will include, but not be limited to, the following:

The first page of the log will contain the following information:

- Project name and address;
- Name, address and phone number of field contact;
- Waste generator and address, if different from above;
- Type of process (if known), generating waste;
- Type of waste; and
- Suspected waste composition, including concentrations.

Daily entries will be made for the following information:

- Purpose of sampling;
- Location of sampling point;
- Number(s) and volume(s) of sample(s) taken;
- Description of sampling point and sampling methodology;
- Date and time of collection, arrival and departure;
- Collector's sample identification number(s);
- Sample distribution and method of storage and transportation;
- References, such as sketches of the sampling site or photographs of sample collection;

- Field observations, including results of field analyses (e.g., pH, temperature, specific conductance), water levels, drilling logs, and organic vapor and dust readings; and
- Signature of personnel responsible for completing log entries.

4.8.6 Field Changes and Corrective Actions

Whenever there is a required or recommended investigation/sampling change or correction, a Field Change Form will be completed by the Field Operations Manager, and approved by a LIRR representative and the NYSDEC Project Manager, if required.

4.9 Calibration Procedures and Preventive Maintenance

The following information regarding equipment will be maintained at the project site:

1. Equipment calibration and operating procedures which will include provisions for documentation of frequency, conditions, standards and records reflecting the calibration procedures, methods of usage and repair history of the measurement system. Calibration of field equipment will be performed daily at the sampling site so that any background contamination can be taken into consideration and the instrument calibrated accordingly.
2. A schedule of preventive maintenance tasks, consistent with the instrument manufacturer’s specific operation manuals, that will be carried out to minimize down time of the equipment.
3. Critical spare parts, necessary tools and manuals will be on hand to facilitate equipment maintenance and repair.

Calibration procedures and preventive maintenance, in accordance with the NYSDEC 6/00 ASP, for laboratory equipment, will be contained in the laboratory’s standard operating procedures (SOP), which will be available upon request.

4.10 Performance of Field Audits

During field activities, the QA/QC officer will accompany sampling personnel into the field, in particular in the initial phase of the field program, to verify that the site sampling program is being properly conducted, and to detect and define problems so that corrective action can be taken early in the field program. All findings will be documented and provided to the Field Operations Manager.

4.11 Control and Disposal of Contaminated Material

During construction and sampling of the monitoring wells and soil borings, contaminated waste, soil and water may be generated from drill cuttings, drilling fluids, decontamination water, development water and purge water. All soil cuttings generated during the Remedial Investigation will be handled in a manner consistent with NYSDEC Technical and Administrative Guidance Memorandum (TAGM) No. 4032, Disposal of Drill Cuttings.

All water generated during the investigation, including decontamination water, drill water and purge water, will be contained in Department of Transportation (DOT) approved 55-gallon drums for proper off-site transportation and disposal.

DOT approved 55-gallon drums will be used for the containment of soil cuttings and water, and for disposal of personal protective clothing and disposable sampling equipment (i.e., bailers, scoops, tongue depressors, etc.). The drums will be marked, labeled with a description of the contents and from what location they were collected. All drums will be sealed and stored on site in a secure area.

4.12 Documentation, Data Reduction and Reporting

Mitkem Corporation, a NYSDOH ELAP and CLP certified laboratory meeting the New York State requirements for documentation, data reduction and reporting will be used for all laboratory analysis. All data will be cataloged according to sampling locations and sample identification nomenclature that is described in Section 4.5.1 of this Work Plan. The laboratory analysis will be reported in the NYSDEC ASP Category B deliverables format.

4.13 Data Validation

As described in Section 4.12 above, summary documentation regarding data validation will be completed by the laboratory using NYSDEC forms contained in the 6/00 NYSDEC ASP and submitted with the data package.

A Data Validation Summary Report (DUSR) will be prepared in lieu of a full data validation. The analytical and usability processes will be conducted in conformance with the NYSDEC ASP dated June 2000 and NYSDEC Guidance for the Development of Data Usability Summary Reports.

The DUSR will be prepared by reviewing and evaluating the analytical data. The parameters to be evaluated in reference to compliance with analytical method protocols include all chain-of-custody forms, holding times, raw data (instrument print out data and chromatograms), calibrations, blanks, spikes, controls, surrogate recoveries, duplicates and sample data. If available, field sampling notes will also be reviewed and any quality control problems will be evaluated as to their effect on the usability of the sample data.

The DUSR will describe the samples and analysis parameters reviewed. Data deficiencies, analytical protocol deviations and quality control problems will be described and their effect on the data discussed. Re-sampling and re-analysis recommendations will be made, if necessary.

The DUSR shall be prepared by our company QA/QC officer, Ms. Robbin Petrella. Ms. Petrella meets the personnel requirements listed in the DUSR Guidance Document. A copy of her résumé is included in Appendix B.

4.14 Performance and System Audits

Mitkem Corporation, a NYSDOH ELAP and CLP certified laboratory which has satisfactorily completed performance audits and performance evaluation samples will be used to perform sample analyses for the Remedial Investigation.

4.15 Corrective Action

A NYSDOH ELAP and CLP certified laboratory will meet the requirements for corrective action protocols, including sample "clean up" to attempt to eliminate/mitigate matrix interference.

The 6/00 NYSDEC ASP protocol includes both mandatory and optional sample cleanup and extraction methods. Cleanup is required by the 6/00 NYSDEC ASP in order to meet contract required detection limits. There are several optional cleanup and extraction methods noted in the 6/00 NYSDEC ASP protocol. These include florisil column cleanup, silica gel column cleanup, acid-base partition, steam distillation and sulfuric acid cleanup for PCB analysis.

High levels of matrix interference may be present in waste, soil and sediment samples. This interference may prevent the achievement of ASP detection limits if no target compounds are found. In order to avoid unnecessary dilutions, the optional cleanup methods noted in the 6/00 NYSDEC ASP will be required to be performed by the laboratory as necessary.

4.16 Trip Blanks

The primary purpose of a trip blank is to detect other sources of contamination that might potentially influence contaminant values reported in actual samples, both quantitatively and qualitatively. The following have been identified as potential sources of contamination:

- Laboratory reagent water;
- Sample containers;

- Cross contamination in shipment;
- Ambient air or contact with analytical instrumentation during preparation and analysis at the laboratory; and
- Laboratory reagents used in analytical procedures.

A trip blank will consist of a set of 40 ml sample vials filled at the laboratory with laboratory demonstrated analyte free water. Trip blanks will be handled, transported and analyzed in the same manner as the samples acquired that day, except that the sample containers themselves are not opened in the field. Rather, these sample containers only travel with the sample cooler. The temperature of the trip blanks will be maintained at 4°C while on site and during shipment. Trip blanks will return to the laboratory with the same set of bottles they accompanied in the field.

The purpose of a trip blank is to control sample bottle preparation and blank water quality as well as sample handling. Thus, the trip blank will travel to the site with the empty sample bottles and back from the site with the collected samples in an effort to simulate sample handling conditions. Contaminated trip blanks may indicate inadequate bottle cleaning or blank water of questionable quality. Trip blanks will be implemented only when collecting water samples, including field blanks, and analyzed for volatile organic compounds only.

4.17 Method Blanks/Holding Blanks

A method blank is an aliquot of laboratory water or soil which is spiked with the same internal and surrogate compounds as the samples. The purpose of the method blank is to define and determine the level of laboratory background contamination. Frequency, procedure and maximum laboratory containment concentration limits are specified in the 6/00 NYSDEC ASP. A holding blank is an aliquot of analyte-free water that is stored with the environmental samples in order to demonstrate that the samples have not been contaminated during laboratory storage. This blank will be analyzed using the same analytical procedure as the samples.

4.18 Matrix Spikes/Matrix Spike Duplicates and Spiked Blanks

Matrix spike samples are quality control procedures, consistent with 6/00 NYSDEC ASP specifications, used by the laboratory as part of its internal Quality Assurance/Quality Control program. The matrix spikes (MS) and matrix spike duplicates (MSD) will be aliquots of a designated sample (water or soil) which are spiked with known quantities of specified compounds. These QA/QC samples will be used to evaluate the matrix effect of the sample upon the analytical methodology, as well as to determine the precision of the analytical method used. A matrix spike blank will be an aliquot of analyte-free water, prepared in the laboratory, and spiked with the same solution used to spike the MS and MSD. The matrix spike blank (MSB) will be subjected to the same analytical procedure as the MS/MSD and used to indicate the appropriateness of the spiking solution by calculating the spike compound recoveries. The procedure and frequency regarding the MS, MSD and MSB samples are defined in the 6/00 NYSDEC ASP.

4.19 Field Blank (Field Rinsate Blank)/Equipment Blank

The field blank will consist of an aliquot of analyte-free water, supplied by the laboratory, which is opened in the field and is generally poured over or through a sample collection device after it is decontaminated, collected in a sample container and returned to the laboratory as a sample for analysis. It is a check on sampling procedures and cleanliness (decontamination) of sampling devices. Generally, a field blank will be collected daily or for a “batch” of sample matrices collected in the same manner (such as water and soil/sediment) up to a maximum of 20 samples. Field blanks will be analyzed for the suite of chemicals analyzed for in the environmental samples collected in that “batch.” Field blanks will not be analyzed when using dedicated or disposable (one use only) sampling equipment unless directed otherwise.

5.0 SITE-SPECIFIC WORK PLAN

The purpose of the Site Specific Work Plan is to describe the specific field investigation tasks and associated chemical analysis to be conducted as part of the Remedial Investigation at the Yaphank site. The proposed sample locations are provided on Drawing 1, which is provided in the map pocket at the end of this section. However, it should be noted that the exact locations of the samples will be determined in the field and will be based on field conditions, equipment access and utility clearance. The existing groundwater monitoring wells are depicted on Figure 5-1. Descriptions of the sampling and analysis to be conducted at the Yaphank site are provided below:

5.1 Surface and Subsurface Soil Sampling

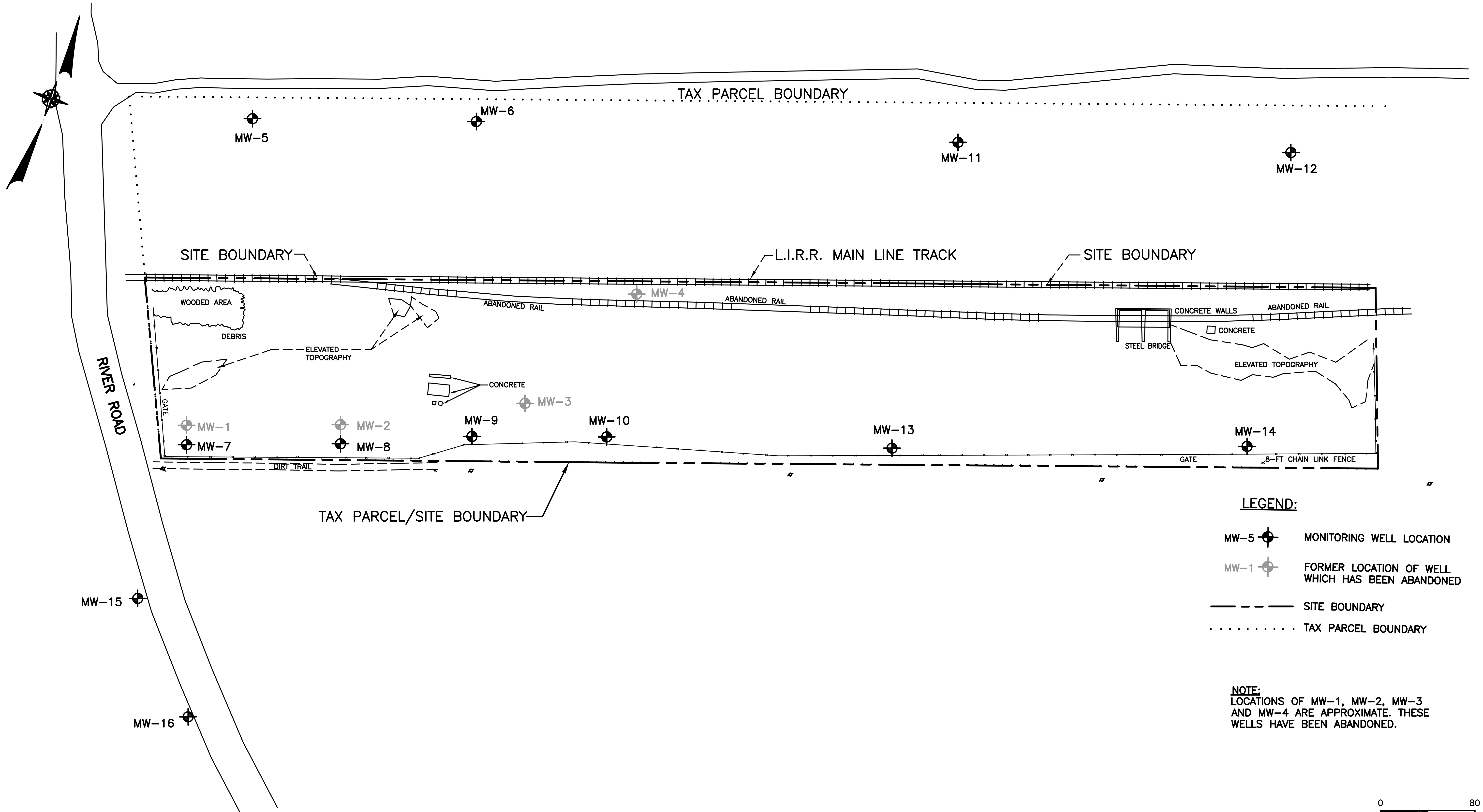
The location, number and type of soil samples to be collected are summarized in Table 5-1. However, a brief summary of the soil sampling to be conducted is provided below:

5.1.1 AOC Number 1 (Drainage Swale Parcel)

Additional investigation will be conducted in the off-site drainage swale and former building foundation within Area of Concern Number 1 to further evaluate the potential of storm water runoff from the site having an adverse impact on this area.

1. Thirteen surface soil samples will be collected and analyzed from within the drainage swale to determine if surface soil has been impacted. Samples will be analyzed for target analyte list (TAL) metals by EPA Method ILMO 4.0.

2. Ten soil probes will be advanced for the collection and analysis of subsurface soil samples within the drainage swale to determine if subsurface soil has been impacted. Samples will be analyzed for TAL metals by EPA Method ILMO 4.0. In addition, a select number of samples will be analyzed for PAHs, phenol and pentachlorophenol by Method 8270. Subsurface soil samples that exhibit staining, nonnative materials such as clinker, or other evidence of impacted soil, may be selected for chemical analysis. In addition, one sample of visually clean soil will be collected below areas exhibiting visual impacts in order to define the vertical extent of these areas.



SOURCE: 1997 SURVEY, COTILLA ASSOCIATES; 1999 SURVEY, YEC INC.; TAX MAPS;1969 AERIAL PHOTOGRAPH, LKB

LONG ISLAND RAIL ROAD - YAPHANK SITE
REMEDIAL INVESTIGATION

Dvirka and Bartilucci
CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

GROUNDWATER MONITORING WELL LOCATION MAP

FIGURE 5-1

TABLE 5-1
Long Island Rail Road
REMEDIAL INVESTIGATION
Sampling and Analysis Summary
Yaphank Site

AREA OF CONCERN (AOC)	SAMPLE POINT ID	SOIL PROBES: No. of Probes	SOIL PROBES: No. of Geoprobe Samples	SOIL SAMPLING INTERVAL	ANALYSES*: TAL Metals (ILMO 4.0)	ANALYSES*: PAHs, Phenol and Pentachloro-phenol (8270)	ANALYSES*: SVOCs (8270)	COMMENTS
AOC No. 1 Drainage Swale Parcel	SS-53 through SS-65	--	--	0-2"	13	--	--	--
	SB-25 through SB-34	10	40	0-8' bgs. Cont.	40	3	--	Collect samples from 0-2', 2-4', 4-6', and 6-8' bgs. Place the 4-6' and 6-8' samples on-hold pending analysis of shallower samples.
AOC No. 2 Southwestern Low-lying parcel	SS-66 through SS-71	--	--	0-2"	6	--	--	--
	SB-17 through SB-24	8	32	0-8' bgs. Cont.	32	3	--	Collect samples from 0-2', 2-4', 4-6', and 6-8' bgs. Place the 4-6' and 6-8' samples on-hold pending analysis of shallower samples.
AOC No. 3 Western Parcel	SS-72 through SS-80	--	--	0-2"	9	--	--	--
	SB-35, SB-37, SB-40 and SB-41	4	40	0-20' bgs Cont.	12	1	--	Collect and analyze samples from three 2-foot intervals from between 0' and 20' bgs at each boring.
	SB-36	1	10	0-20' bgs Cont.	3	--	--	Collect and analyze samples from three 2-foot intervals from between 0' and 20' bgs at each boring. **Do Not** select sample from 5-7' bgs for chemical analysis. This interval was previously analyzed during PSA.
	SB-38	1	10	0-20' bgs Cont.	3	1	--	Collect and analyze samples from three 2-foot intervals from between 0' and 20' bgs at each boring. **Do Not** select sample from 10-12' bgs for chemical analysis. This interval was previously analyzed during PSA.
	SB-39	1	10	0-20' bgs Cont.	3	--	--	Collect and analyze samples from three 2-foot intervals from between 0' and 20' bgs at each boring. **Do Not** select sample from 10-12' bgs for chemical analysis. This interval was previously analyzed during PSA.
	SB-42 and SB-43	2	20	0-20' bgs Cont.	10	1	--	Collect and analyze samples from 0-2' and 2-4' bgs. Also select three additional samples from each boring between 4' and 20' bgs for analysis.
AOC No. 4 Central Parcel	SS-81 through SS-84	--	--	0-2"	4	--	--	--
	SB-44 through SB-46 and SB-48 through SB-52	8	80	0-20' bgs Cont.	24	2	--	Collect and analyze samples from three 2-foot intervals from between 0' and 20' bgs at each boring.
	SB-47	1	10	0-20' bgs Cont.	3	1	--	Collect and analyze samples from three 2-foot intervals from between 0' and 20' bgs at each boring. Do Not select sample from 10-12' bgs for chemical analysis. This interval was previously analyzed during PSA.

TABLE 5-1 (continued)
Long Island Rail Road
REMEDIAL INVESTIGATION
Sampling and Analysis Summary
Yaphank Site

AREA OF CONCERN (AOC)	SAMPLE POINT ID	SOIL PROBES		SOIL SAMPLING INTERVAL	ANALYSES*			COMMENTS
		No. of Probes	No. of Geoprobe Samples		TAL Metals (ILMO 4.0)	PAHs, Phenol and Pentachloro-phenol (8270)	SVOCs (8270)	
AOC No. 5 Eastern Parcel	SS-85 through SS-87	--	--	0-2"	3	--	--	--
	SB-53 and SB-54 and SB-59 through SB-62	6	78	0-26' bgs Cont.	18	1	--	Collect and analyze samples from three 2-foot intervals from between 0' and 26' bgs at each boring.
	SB-55	1	13	0-26' bgs Cont.	3	1	--	Collect and analyze samples from three 2-foot intervals from between 0' and 26' bgs at each boring. **Do Not** select sample from 7-9' bgs for chemical analysis. This interval was previously analyzed during Supplemental PSA.
	SB-56	1	13	0-26' bgs Cont.	3	--	--	Collect and analyze samples from three 2-foot intervals from between 0' and 20' bgs at each boring. **Do Not** select sample from 6-8' bgs for chemical analysis. This interval was previously analyzed during Supplemental PSA.
	SB-57	1	13	0-26' bgs Cont.	3	--	--	Collect and analyze samples from three 2-foot intervals from between 0' and 20' bgs at each boring. **Do Not** select sample from 8-10' bgs for chemical analysis. This interval was previously analyzed during Supplemental PSA.
	SB-58	1	13	0-26' bgs Cont.	3	1	--	Collect and analyze samples from three 2-foot intervals from between 0' and 20' bgs at each boring. **Do Not** select sample from 12-14' bgs for chemical analysis. This interval was previously analyzed during Supplemental PSA.
Background	SS-88 through SS-91	--	--	0-2"	4	--	--	--
	SB-63 and SB-64	2	4	0-8' bgs Cont.	4	--	--	Collect and analyze samples from two 2-foot intervals from between 0' and 8' bgs at each boring.
Groundwater	12 Existing Monitoring Wells	--	--	--	12**	--	12	--

NOTES:

bgs: below ground surface.

Cont.: Continuous 2-foot soil sampling.

* Number of samples for analysis includes the "on-hold" samples.

** Filtered and Unfiltered Samples.

5.1.2 AOC Number 2 (Southwestern Low-lying Parcel)

As indicated in the Supplemental PSA Report, elevated concentrations of inorganic constituents were observed in the shallow soil of this area. In order to sufficiently characterize the extent of impacted soil in this area, the following technical scope of work has been developed:

1. Six surface soil samples will be collected and analyzed from the southwestern low-lying parcel (on-site and off-site) to delineate the horizontal extent of impacted soil. Samples will be analyzed for TAL metals by EPA Method ILM0 4.0.

2. Eight soil probes will be advanced for the collection and analysis of subsurface soil samples within the southwestern low-lying parcel (on-site and off-site) to delineate the vertical and horizontal extent of impacted soil. Selected samples will be analyzed for TAL metals by EPA Method ILM0 4.0. In addition, a select number of samples will be analyzed for PAHs, phenol and pentachlorophenol by Method 8270. Subsurface soil samples that exhibit staining, nonnative materials such as clinker, or other evidence of impacted soil, may be selected for chemical analysis. In addition, one sample of visually clean soil will be collected below areas exhibiting visual impacts in order to define the vertical extent of these areas.

5.1.3 AOC Number 3 (Western Parcel)

Elevated concentrations of inorganic constituents were found in surface and subsurface soil within this AOC. As such, a delineation sampling plan has been designed to address this area, which consists of the following:

1. Nine surface soil samples will be collected and analyzed from the western parcel (on-site) to delineate the horizontal extent of impacted soil. Samples will be analyzed for TAL metals by EPA Method ILM0 4.0.

2. Nine soil probes will be advanced for the collection and analysis of subsurface soil samples within the western parcel (on-site and off-site) to delineate the vertical and horizontal extent of impacted soil. Selected samples will be analyzed for TAL metals by EPA Method ILM0 4.0. In addition, a select number of samples will be analyzed for PAHs, phenol and pentachlorophenol by Method 8270. This includes re-advancing three soil borings in the locations of former borings SB-1, SB-2 and SB-3 to sample above and below previously sampled intervals. Subsurface soil samples that exhibit staining, nonnative materials such as clinker, or other evidence of impacted

soil, may be selected for chemical analysis. In addition, one sample of visually clean soil will be collected below areas exhibiting visual impacts in order to define the vertical extent of these areas.

5.1.4 AOC Number 4 (Central Parcel)

Impacted soil in this AOC appears to exist primarily at depth. However, some elevated concentrations of inorganics also exist in shallow soil along the southern boundary of the site in this area. As a result, the following sampling plan has been developed with emphasis on determining the areal extent of impacted soil in this AOC.

1. Four surface soil samples will be collected and analyzed from the central parcel (off-site) to delineate the horizontal extent of impacted soil. Samples will be analyzed for TAL metals by EPA Method ILM0 4.0.
2. Nine soil probes will be advanced for the collection and analysis of subsurface soil samples within the central parcel (on-site and off-site) to delineate the vertical and horizontal extent of impacted soil. Selected samples will be analyzed for TAL metals by EPA Method ILM0 4.0. In addition, a select number of samples will be analyzed for PAHs, phenol and pentachlorophenol by Method 8270. This includes re-advancing one soil boring at the location of SB-4 to sample above and below previously sampled intervals. Subsurface soil samples that exhibit staining, nonnative materials such as clinker, or other evidence of impacted soil, may be selected for chemical analysis. In addition, one sample of visually clean soil will be collected below areas exhibiting visual impacts in order to define the vertical extent of these areas.

5.1.5 AOC Number 5 (Eastern Parcel)

Similar to AOC Number 4, it appears that impacted soil exists primarily at depth within this AOC. However, a localized exceedance of inorganics does exist in shallow soil in the southeastern corner of the site. As a result, the following sampling plan has been developed with emphasis on determining the areal extent of impacted soil in this AOC.

1. Three surface soil samples will be collected and analyzed from the central parcel (off-site) to delineate the horizontal extent of impacted soil. Samples will be analyzed for TAL metals by EPA Method ILMO 4.0.

2. Ten soil probes will be advanced for the collection and analysis of subsurface soil samples within the central parcel (on-site and off-site) to delineate the vertical and horizontal extent of impacted soil. Selected samples will be analyzed for TAL metals by EPA Method ILMO 4.0. In addition, a select number of samples will be analyzed for PAHs, phenol and pentachlorophenol by Method 8270. This includes re-advancing one soil boring at the locations of SB-5, SB-14, SB-15 and SB-16 to sample above and below previously sampled intervals. Subsurface soil samples that exhibit staining, nonnative materials such as clinker, or other evidence of impacted soil, may be selected for chemical analysis. In addition, one sample of visually clean soil will be collected below areas exhibiting visual impacts in order to define the vertical extent of these areas.

5.1.6 Background Sampling

In order to identify relative "background" conditions for soil in the vicinity of the site, surface and subsurface soil sampling will be conducted to the north of the LIRR tracks within a wooded, undisturbed area. Background samples will also be collected to the north of the site, along the east shoulder of River Road. Sampling locations are depicted on Drawing 1.

1. Two surface soil samples will be collected from the undisturbed, wooded area located to the north of the LIRR tracks. In addition, two surface soil samples will be collected to the north of the site, along the eastern shoulder of River Road. All four samples will be analyzed for TAL metals by USEPA Method ILMO 4.0.

2. One soil boring will be advanced from 0 to 8 feet below grade within the undisturbed, wooded area to the north of the LIRR tracks. In addition, another boring will be advanced to the north of the site, along the eastern shoulder of River Road. Two samples will be collected from each boring location for analysis of TAL metals by USEPA Method ILMO 4.0.

5.2 Groundwater Sampling

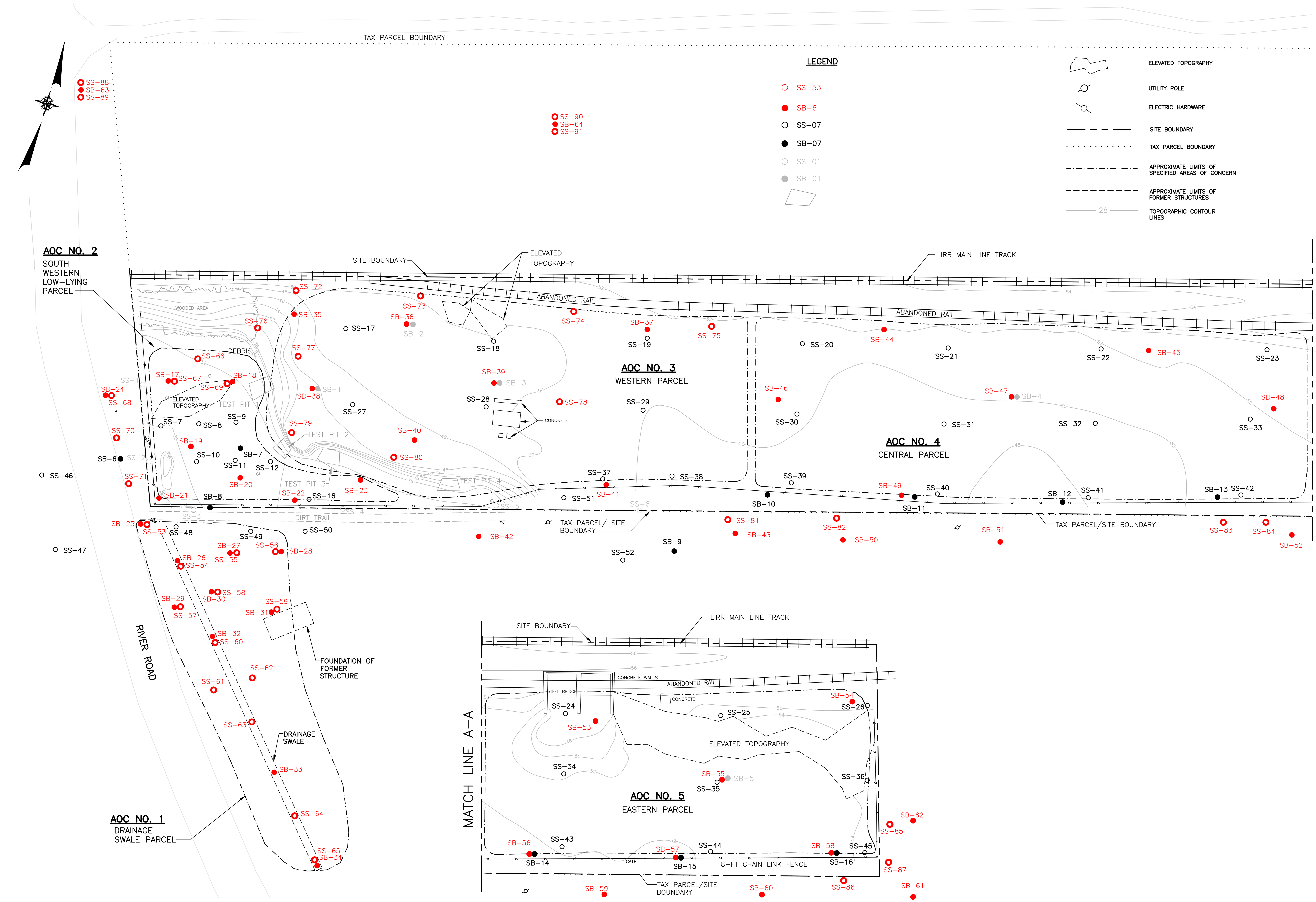
Groundwater samples will be collected at each of the 12 existing monitoring wells. Samples will be collected for analysis of TAL metals (EPA Method ILMO 4.0) and SVOCs (EPA Method 8270). Groundwater level measurements will be also obtained from each of the wells within an 8-hour period. In the event that an existing well cannot be located or has been damaged and considered unusable, the well will be replaced in accordance with the well installation method described under Section 3.4.

5.3 Health and Safety

D&B will be responsible for ensuring that the Health and Safety Plan (provided under a separate cover) and all work associated with this project is performed in accordance with safe working practices, including applicable Occupational Safety and Health Administration (OSHA) requirements. All site personnel will have hazardous waste operations and emergency response (HAZWOPER) training in accordance with 29 CFR 1910.120, will be certified for confined space entry (if necessary), will be trained and certified in the proper use of personal protective equipment (PPE), and will have knowledge and understanding of construction standards. Certifications regarding training and expertise will be submitted to the LIRR prior to the start of work. Prior to the start of field activities at the substations, all project personnel who will be working on LIRR property will be required to complete a track safety course administered by LIRR.

5.4 Waste Disposal

D&B has made provision to contain all investigation derived waste in DOT approved 55-gallon drums. The LIRR will be responsible for the proper characterization, off-site transportation and disposal of the investigation derived waste.



NOTES.

1. DATUMS:

   VERTICAL – 1988 NAVD

   HORIZONTAL – 1983 NAD

2. PROPERTY LINES SHOWN ARE TAKEN FROM A PLAN PROVIDED BY THE LONG ISLAND RAILROAD, DATED JUNE 30, 1916, LAST REVISED DECEMBER 31, 1958, TITLED RIGHT OF WAY AND TRACK MAP, STATION 3121+00 TO 3175+00.

3. BASE MAP PREPARED BY COTILLA ASSOCIATES, NORTHPORT, NEW YORK SURVEY DATA OBTAINED IN THE FIELD NOVEMBER 1997.

4. ADDITIONAL POINTS SURVEYED BY YEC,INC., VALLEY COTTAGE, NEW YORK ON JULY 12, 1999 AND ADDED TO THIS MAP. DATUMS: VERTICAL-1986 NAVD, HORIZONTAL-ASSUMED POINTS SURVEYED INCLUDE: MW-9 THROUGH MW-16; SB-6 THROUGH SB-16; SS-7 THROUGH SS-48, SS-50, SS-51, SS-52.

5. THE BASE MAP WAS UPDATED IN AUGUST 1999 BY YEC, INC. BASED ON 1999 SURVEYED LOCATIONS OF MW-9 AND MW-10. THE BASE MAP WAS REDUCED BY A FACTOR 0.7467 FROM THE BASE MAP 0,0 LOCATION.

0 30' 60'

SCALE: 1"=30'

SOURCE: 1997 SURVEY, COTILLA ASSOCIATES; 1999 SURVEY, YEC INC.; TAX MAPS;1969 AERIAL PHOTOGRAPH, LKB

Dvirka and Bartilucci
Consulting Engineers
A Division of William F. Cosulich Associates, P.C.

LONG ISLAND RAIL ROAD–YAPHANK SITE
REMEDIAL INVESTIGATION

SAMPLE LOCATION MAP – SURFACE AND SUBSURFACE SOIL

DRAWING 1

APPENDIX A

FIELD FORMS

EXHIBIT 1

LOCATION SKETCH

DVIRKA
AND
BARTILUCCI

LOCATION SKETCH

Project ______________________ Sample Crew ______________________

Sample(s) Location(s) ______________________

Sample(s) and/or Well Number(s) ______________________

____

Location of sample points, wells, borings, etc., with reference to three permanent reference points. Measure all distances, clearly label roads, wells and permanent features.

EXHIBIT 2

SAMPLE INFORMATION RECORDS

DVIRKA
AND
BARTILUCCI

SAMPLE INFORMATION RECORD

SITE ______________________ SAMPLE CREW ______________________

SAMPLE LOCATION/WELL NO. ______________________

FIELD SAMPLE I.D. NUMBER ______________________ DATE ______________________

TIME ____________ WEATHER ______________________ TEMPERATURE ____________

SAMPLE TYPE:

GROUNDWATER ______________________ SEDIMENT ______________________

SURFACE WATER/STREAM ______________________ AIR ______________________

SOIL ______________________ OTHER (Describe, i.e., septage, leachate) ______________________

WELL INFORMATION (fill out for groundwater samples):

DEPTH TO WATER ______________________ MEASUREMENT METHOD ______________________

DEPTH OF WELL ______________________ MEASUREMENT METHOD ______________________

VOLUME REMOVED ______________________ REMOVAL METHOD ______________________

FIELD TEST RESULTS:

COLOR ______________ pH ______________ ODOR ______________

TEMPERATURE (°F) __________ SPECIFIC CONDUCTANCE (umhos/cm) ______________

OTHER (OVA, Methane meter, etc.) ______________________

____

CONSTITUENTS SAMPLED:

__________ __________ __________ __________

__________ __________ __________ __________

REMARKS: ____

____

____

WELL CASING VOLUMES

GAL/FT				
	1-1/4" = 0.077	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.10	2-1/2" = 0.24	3-1/2" = 0.50	6" = 1.46

SIR

DVIRKA
AND
BARTILUCCI

WATER SUPPLY SAMPLE INFORMATION RECORD

Name: ______________________________

Address: ______________________________

Telephone: ______________________________

Date and Time Sampled: ______________________________

Sample Location: ______________________________

Sample Number: ______________________________

Well Information: ______________________________

Depth and Type of Well: ______________________________

Date Constructed: ______________________________

Type of Construction and Diameter: ______________________________

Driller: ______________________________

Estimated Usage (gpm): ______________________________

Water Use(s): ______________________________

Type of Treatment Device and Location: ______________________________

Date and Location Last Sampled: ______________________________

Homeowner's Perception of Water Quality: ______________________________

Comments: (Use of bottled water, etc.) ______________________________

____

____

____

____

____

____

____

____

WSS

Sketch of Lot, Building, and Well and Septic System Location

Sketch of Water Treatment System and Sampling Locations

Photograph of Water Treatment System

EXHIBIT 3

CHAIN OF CUSTODY FORM

MITKEM CORPORATION
175 Metro Center Boulevard
Warwick, Rhode Island 02886-1755
(401) 732-3400 • Fax (401) 732-3499
email: mitkem@mitkem.com

CHAIN-OF-CUSTODY RECORD

REPORT TO		INVOICE TO		
COMPANY	PHONE	COMPANY	PHONE	LAB PROJECT #:
NAME	FAX	NAME	FAX	
ADDRESS		ADDRESS		TURNAROUND TIME:
CITY/ST/ZIP		CITY/ST/ZIP		

CLIENT PROJECT NAME:	CLIENT PROJECT #:	CLIENT P.O.#:	REQUESTED ANALYSES

SAMPLE IDENTIFICATION	DATE/TIME SAMPLED	COMPOSITE	GRAB	WATER	SOIL	OTHER	LAB ID	# OF CONTAINERS													COMMENTS
	/																				
	/																				
	/																				
	/																				
	/																				
	/																				
	/																				
	/																				
	/																				
	/																				
	/																				
	/																				

TSF#	RELINQUISHED BY	DATE/TIME	ACCEPTED BY	DATE/TIME	ADDITIONAL REMARKS:	COOLER TEMP:
1		/		/		
2		/		/		
3		/		/		

EXHIBIT 4

RECEIPT OF SAMPLES FORM

DVIRKA AND BARTILUCCI

Receipt for Samples

Project Name: ______________________

Project Address: ______________________

Project Number: ______________________

Field Log Book Reference Number: ______________________

Sampled By: ______________________

Split With: ______________________

SAMPLE NUMBERS	DATE	TIME	COMP	GRAB	SPLIT SAMPLES	LOG BOOK PAGE NO.	TAG NUMBERS	SAMPLE LOCATION	NO. OF CONTAINERS	REMARKS

Transferred by (Signature)		Received by (Signature)			Telephone
Date	Time	Title	Date	Time	

EXHIBIT 5

TEST PIT LOG FORM

DVIRKA AND BARTILUCCI

TEST PIT LOG

TEST PIT LOCATION SKETCH MAP

N

TEST PIT NO.	
PROJECT NO./NAME	LOCATION
EXCAVATOR/EQUIPMENT/OPERATOR	
INSPECTOR/OFFICE	START/FINISH DATE
ELEVATION OF: GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL)	CONDITION OF PIT
REMARKS:	

DEPTH	SAMPLE INTERVAL	OVA SCREEN	DESCRIPTION OF MATERIALS	REMARKS
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

NJDEPTPL

EXHIBIT 6

BORING LOG FORM

Dvirka and Bartilucci CONSULTING ENGINEERS	Project No.: Project Name:	Boring No.: Sheet __ of __ . By:
Drilling Contractor: Driller: Drill Rig: Date Started:	Geologist: Drilling Method: Drive Hammer Weight: Date Completed:	Boring Completion Depth: Ground Surface Elevation: --- Boring Diameter:

Depth (ft.)	Soil Sample				PID Per 6" (ppm)	Sample Description	USCS
	No.	Type	Blows Per 6"	Rec. (feet)			
-0-							
-1-							
-2-							
-3-							
-4-							
-5-							
-6-							
-7-							
-8-							
-9-							
-10-							

Sample Types:
SS = Split Spoon
HA = Hand Auger
GP = Geoprobe Sampler
CC = Concrete Core

NOTES:

♦1539/BLANKLOG/KW

EXHIBIT 7

DRILLING LOG FORM

DVIRKA
AND
BARTILUCCI

DRILLING LOG

DRILLING CONTRACTOR		BORING NUMBER ______
Driller ______	PROJECT NAME ______	Sheet ____ of ____
Inspector ______		Boring Location ______
Rig Type ______	PROJECT # ______	
Drilling Method ______	Location/Address ______	
Drive Hammer Weight ______		

GROUNDWATER OBSERVATIONS

Water Level			
Time			
Date			
Casing Depth			

Weather ______

Date/Time Start ______

Date/Time Finish ______

Plot Plan

Sample Depth	Sample Number	SPT	PID/FID Reading	FIELD IDENTIFICATION OF MATERIAL	WELL SCHEMATIC	COMMENTS

Soil Stratigraphy Summary ______

… PENETRATION TEST

EXHIBIT 8

WELL CONSTRUCTION LOG FORM

WELL CONSTRUCTION LOG

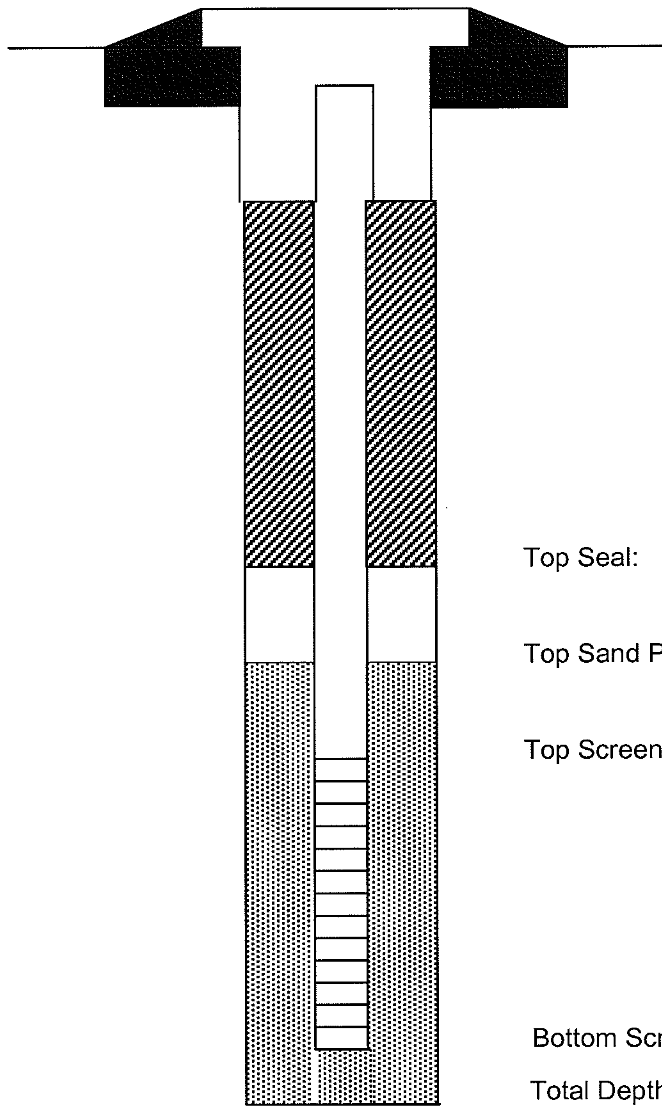
SITE ______________________ JOB NO. ________ WELL NO. ________

TOTAL DEPTH ______ SURFACE ELEV. __________ TOP RISER ELEV. ________

WATER LEVELS (DEPTH, DATE, TIME) __________ DATE INSTALLED __________

RISER	DIA	_____	MATERIAL	________	LENGTH	_______		
SCREEN	DIA	_____	MATERIAL	________	LENGTH	_______	SLOT SIZE	_____
PROT CSG	DIA	_____	MATERIAL	________	LENGTH	_______		

SCHEMATIC



Ground Surface

Surface Seal Type:

Grout Type:

Top Seal:

Seal Type:

Top Sand Pack:

Top Screen:

Sand Pack Type:
Size:

Bottom Screen:

Total Depth of Boring:

EXHIBIT 9

DAILY EQUIPMENT CALIBRATION LOG FORM

DVIRKA
AND
BARTILUCCI

DAILY EQUIPMENT CALIBRATION LOG

Project Name: ______________________________

Project Number: ______________________ Calibrated By: ______________________

Date	Instrument Name and Model Number	Calibration Method	Time	Readings and Observations

EXHIBIT 10

DAILY FIELD ACTIVITY REPORT

DVIRKA
AND
BARTILUCCI

DAILY FIELD ACTIVITY REPORT

Report Number: ____________ Project Number: ____________ Date: ____________

Field Log Book Page Number: ______________________________

Project: ______________________________

Address: ______________________________

Weather: (AM) ____________ Rainfall: (AM) ______ Inches
(PM): ____________ (PM) ______ Inches

Temperature: (AM) ______ °F Wind Speed: (AM) ______ MPH Wind Direction: (AM) ______
(PM) ______ °F (PM) ______ MPH (PM) ______

Site Condition: ______________________________

Personnel On Site:

Name	Affiliation	Arrival Time	Departure Time

Subcontractor Work Commencement: (AM) ____________ (PM) ____________

Subcontractor Work Completion: (AM) ____________ (PM) ____________

DB-DFAR

DVIRKA
AND
BARTILUCCI

DATE: ______________________

DAILY FIELD ACTIVITY REPORT

Work performed today by subcontractor(s) (includes equipment and labor breakdown):

DB-DFAR

DVIRKA
AND
BARTILUCCI

DATE: ______________________

DAILY FIELD ACTIVITY REPORT

General work performed today by D&B: ______________________

____
____
____
____
____

List specific inspection(s) performed and results (include problems and corrective actions):

____
____
____
____
____
____

List type and location of tests performed and results (include equipment used and monitoring results):

____
____
____
____
____

Verbal comments received from subcontractor (include construction and testing problems, and recommendations/resulting action):

____
____
____
____
____

Prepared by: ______________________ Reviewed by: ______________________

DB-DFAR

EXHIBIT 11

FIELD CHANGE FORM

DVIRKA
AND
BARTILUCCI

FIELD CHANGE FORM

Project Name: ____________________

Project Number: ____________________ Field Change Number: __________

Location: ____________________ Date: __________

Field Activity Description: ____________________

Reason for Change: ____________________

Recommended Disposition: ____________________

____________________ __________

Field Operations Officer (D&B Consulting Engineers) (Signature) Date

Disposition: ____________________

____________________ __________

On-site Supervisor (NYSDEC) (Signature) Date

Distribution: Project Manager (D&B)
Project Manager (NYSDEC)
Field Operations Officer
On-site Supervisor (NYSDEC)

Others as Required: __________

EXHIBIT 12

FIELD AUDIT FORM

DVIRKA AND BARTILUCCI

FIELD AUDIT FORM

Site: ____________________ Date: ____________________

Persons On-site: ____________________ QA/QC Officer Conducting Audit: ____________________

Project: ____________________

1. Is safety equipment in use (hardhats, respirators, gloves etc.): YES NO

2. Is a decontamination station, equipment and supplies on site and in working order:

Methanol	YES	NO
Alconox	YES	NO
D.I. Water	YES	NO
Scrub Brushes	YES	NO
Steam Cleaner	YES	NO

Comments: ____________________

3. Is the decontamination pad set up so water is contained: YES NO

Comments: ____________________

4. Is the site/investigation areas secured (fence, markers, etc.) or otherwise in accordance with project requirements: YES NO

Comments: ____________________

DVIRKA AND BARTILUCCI

FIELD AUDIT FORM
(continued)

5. Is contaminated material properly stored and in a secure area or otherwise in accordance with project requirements: YES NO

   Are the drums of waste (water, soil, ppe) labeled properly: YES NO

   Comments: ______________________________

   ____

   ____

6. Are field forms filled out properly, legibly and timely:

Field Log Book	YES	NO
Chain of Custody	YES	NO
Equipment Calibration Log	YES	NO
Daily Field Activity Report	YES	NO
Location Sketch	YES	NO
Sample Information Record	YES	NO
Equipment Usage Form	YES	NO
Boring Logs	YES	NO

   Comments: ______________________________

   ____

   ____

7. Is the proper sampling and field measurement equipment, including calibration supplies on site: YES NO

   Comments: ______________________________

   ____

   ____

DVIRKA
AND
BARTILUCCI

FIELD AUDIT FORM
(continued)

8. Are there adequate sample containers, including deionized water for QA/QC:

	Field Blanks	YES	NO
	Trip Blanks	YES	NO

Comments: ______________________

____

____

9. Is the equipment decontaminated in accordance with project requirements:

	Sampling equipment	YES	NO
	Construction equipment	YES	NO

Comments: ______________________

____

____

10. Is field measurement equipment calibrated:

	Daily	YES	NO
	Properly	YES	NO

Comments: ______________________

____

____

11. Are samples collected and labeled properly: YES NO

Comments: ______________________

____

____

DVIRKA
AND
BARTILUCCI

FIELD AUDIT FORM
(continued)

12. Are samples stored at 4°C: YES NO

Comments: ______________________________

____

____

13. Are coolers properly sealed and packed for shipment including Chain of Custody taped to underside of lid: YES NO

Comments: ______________________________

____

____

14. Is a copy of the Field Investigation Work Plan available on site: YES NO

Comments: ______________________________

____

____

15. Is a copy of each equipment manual on-site: YES NO

Comments: ______________________________

____

____

16. Is a copy of the QA/QC Plan available on site: YES NO

Comments: ______________________________

____

____

DVIRKA
AND
BARTILUCCI

FIELD AUDIT FORM
(continued)

17. Are investigation personnel familiar with the Work Plan and QA/QC Plan: YES NO

Comments: ______________________

____

____

18. Are quality control samples taken:

Trip Blanks YES NO

Field Blanks YES NO

Comments: ______________________

____

____

19. Are samples shipped in a timely and appropriate manner: YES NO

Comments: ______________________

____

____

20. Has the laboratory been contacted regarding planned shipment of samples: YES NO

Comments: ______________________

____

____

21. Certification - Based upon my audit at the above project, I hereby certify/do not certify compliance with QA/QC requirements for the project:

______________________ ______________________

Dated Signed

DVIRKA
AND
BARTILUCCI

FIELD AUDIT FORM
(continued)

General Comments: ______________________

____

____

____

EXHIBIT 13

NYSDEC SAMPLE IDENTIFICATION, PREPARATION AND ANALYSIS SUMMARY FORMS

To be included with all lab data and with each workplan

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE IDENTIFICATION AND ANALYTICAL REQUIREMENT SUMMARY

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

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
SEMIVOLATILE (BNA)
ANALYSES

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

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
VOLATILE (VOA)
ANALYSES

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

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
PESTICIDE/PCB
ANALYSES

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

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
SEMIVOLATILE (BNA)
ANALYSES

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

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
INORGANIC ANALYSES

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

APPENDIX B

RÉSUMÉ OF THE D&B QA/QC OFFICER

ROBBIN A. PETRELLA

QUALITY ASSURANCE OFFICER

EDUCATION

SUNY at Buffalo, B.S. (Chemical Engineering) - 1986

PROFESSIONAL EXPERIENCE

Ms. Petrella's professional quality assurance/quality control (QA/QC) experience spans 15 years. During this time, she served as a Sample and Data Analyst for two large environmental laboratories. Ms. Petrella was responsible, as Data Review Group Leader, for supervision of data validation and QA/QC coordination between the laboratory and its clients. Her technical experience includes both the analysis and review of environmental samples using numerous protocols, including those developed by the United States Environmental Protection Agency (USEPA), New York State Department of Environmental Conservation (NYSDEC), and New Jersey Department of Environmental Protection (NJDEP).

Since joining the firm, Ms. Petrella has been responsible for preparing Quality Assurance/Quality Control Plans and Waste Analysis Plans for a number of large private sector clients. These include Chemical Waste Disposal Corporation, the International Business Machines Corporation and Northrop Grumman Corporation. She also has prepared overall QA/QC programs for Northrop Grumman's on-site laboratories.

Ms. Petrella has prepared QA/QC Plans and data validation/usability reports for remedial investigation and feasibility studies conducted at numerous New York State Registry Sites, including those in the Towns of Cheektowaga, Schodack, and North Tonawanda, as well as the Villages of Croton-on-Hudson and Brentwood, New York. These tasks involved evaluation of the laboratory data to determine compliance with NYSDEC Analytical Services Protocols (ASP), as well as to determine the usability of the data particularly if it was not consistent with ASP requirements.

Ms. Petrella has assisted in the preparation and performance of air sampling programs for remedial investigation/feasibility studies (RI/FS) conducted at landfill/Superfund sites in Wallkill, New York and East Northport, New York. She has also performed water supply sampling for an RI/FS in Rensselaer County, New York, and a surface and subsurface water and soil sampling program as part of an RI/FS in Elmira, New York.

Ms. Petrella has acted as the QA/QC officer, and prepared and performed field audits for Superfund site investigations in Tonawanda, New York; Owego, New York; Brookhaven, New York; and Hornell, New York, and for a major railroad facility in New York City. She also has assisted in the preparation of laboratory contracts for analytical services for hazardous waste studies in Schodack, New York; Jamaica, New York; and the New York State Superfund Standby contract.

Ms. Petrella is responsible for performing laboratory audits on all laboratories having contracts with the firm as part of the New York State Superfund Program. She has been certified by the USEPA in both organic and inorganic data validation by successfully completing courses authorized by the USEPA. These certifications have also been accepted by the NYSDEC.

Ms. Petrella is responsible for the data validation of all data packages from ongoing hydrogeologic investigation and landfill closure investigations in Brookhaven and Hauppauge, New York. She also is responsible for validation of all data collected during field investigations for a large aerospace corporation, a major utility on Long Island, and manufactured gas plants across Long Island.

Ms. Petrella has acted as Project Manager for a standby project with the NYSDEC and a groundwater treatment project located in New Jersey.

Ms. Petrella has been instrumental in the design and implementation of the firm's GIS\Key Database system. In that role, she is responsible for the maintenance of the system and training of personnel in its use. She also is responsible for all updates to the GIS\Key program and communicates on a regular basis with the GIS\Key venders with regard to system improvements and network administration. Currently, there are seven ongoing projects that use GIS\Key, five of which are MGP sites. Ms. Petrella is responsible for entering and reporting of all chemistry data from GIS\Key.

Ms. Petrella also has conducted indoor and outdoor air sampling programs as part of MGP site field investigations. She has conducted interviews with homeowners as part of the air sampling program. She also is responsible for data validation of all the data from the air sampling programs.

Ms. Petrella is presently the Quality Assurance/Quality Control officer for the firm and responsible for reviewing all work relating to Quality Assurance/Quality Control for hazardous waste, hazardous substance, manufactured gas plant and solid waste projects undertaken by the firm. She also is responsible for preparation and maintenance of the Corporate Quality Assurance Manual, and for inventory and maintenance of the firm's field/sampling and monitoring equipment. As the QA/QC Officer, she reports directly to the Principal-in-Charge of the Environmental Remediation Division.