DRAFT WORK PLAN
FOR
SUPPLEMENTAL REMEDIAL AREA
(NORTH OF FORMER METRO NORTH PROPERTY)

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EXECUTIVE SUMMARY

Shaw Environmental & Infrastructure, Inc. (Shaw) has been retained by the New York City School Construction Authority (SCA) to prepare a Supplemental Remedial Area (SRA) Work Plan for the area located immediately north of the former Metro North property (Mott Haven Site) located at 672 Concourse Village West, Bronx, New York. The Mott Haven Site is currently being addressed under the Brownfield Cleanup Program (BCP) Agreement between the New York State Department of Environmental Conservation (NYSDEC) and SCA. This Work Plan describes the proposed remedial action for the area located immediately north of the Mott Haven Site and is hereafter referred to as the Supplemental Remedial Area (SRA). The SRA consists of an approximately 60 feet by 50 feet area north of the BCP area on the Mott Haven Site.

Shaw completed site investigation activities at the Mott Haven Site, and the subject SRA, between March and September 2005. These investigative activities were completed as two separate phases. The Remedial Investigation (RI) activities, completed pursuant to the NYSDEC approved Remedial Investigation Work Plan (RIWP) (July 2005), were performed between March and August 2005. A Supplemental Investigation (SI) was performed to the north and west of the Mott Haven Site under the existing platform between August and September 2005, to identify off-site contamination which may be impacting the Mott Haven Site. These SI activities were based on a Scope of Work (SOW) presented to NYSDEC and New York State Department of Health (NYSDOH) on July 14, 2005.

The findings of the site investigations identified a small pocket of soil and groundwater contamination in the SRA at concentrations above NYSDEC Recommended Soil Cleanup Objectives (RSCOs) and groundwater quality standards, specifically associated with volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). The most elevated VOC and SVOC compounds detected include benzene, toluene, ethylbenzene, and xylenes (BTEX), and polynuclear aromatic hydrocarbons or PAHs (e.g. naphthalene, chrysene, benzo(a)anthracene, benzo(a)pyrene, phenanthrene). The organic contaminant with the highest detected concentration was naphthalene. The highest levels of contamination identified were generally confined to a small pocket of contamination in the center of the SRA, at a depth corresponding to the top of the zone of saturation (water table).

Remedial Action Objectives (RAOs) have been established to ensure that the proposed SRA remedy is protective of human health and the environment. The RAOs proposed for the SRA are:

- Ensure that on-site contaminant concentrations in soil and groundwater will not result in exposure to school occupants; and
- Maintain existing groundwater quality at the downgradient property line.

To achieve the above remedial action objectives, the small pocket of contaminated soil, an area approximately 60 feet by 50 feet, and to a depth of approximately 15 feet (the SRA), will be stabilized and isolated using an in situ solidification technology.

An evaluation of the proposed remedy demonstrates that it will be protective of human health and the environment. The proposed remedy utilizes solidification to physically and chemically bind the contaminants in the stabilized mass. Further, the use of cement and other additives to create the solid mass also significantly reduces the hydraulic conductivity of the stabilized mass, thereby isolating the mass from the upgradient groundwater flow.

Following implementation, the effectiveness of the remedy will be confirmed through a Bench Scale Stabilization Study, the collection of cores drilled through the solidified mass, Toxicity Characteristic Leaching Procedure (TCLP) analysis on selected cores samples for SVOCs and VOCs, and one year of groundwater monitoring downgradient of the area.

1.0 INTRODUCTION

Shaw Environmental & Infrastructure, Inc. (Shaw) has been retained by the New York City School Construction Authority (SCA) to prepare a Supplemental Remedial Area (SRA) Work Plan for a small pocket of soil contamination in the area located immediately north of the former Metro North property (Mott Haven Site) located at 672 Concourse Village West, Bronx, New York (**Figure 1**). The Mott Haven Site is currently being addressed under the Brownfield Cleanup Program (BCP) Agreement between the New York State Department of Environmental Conservation (NYSDEC) and SCA. This Work Plan describes the proposed remedial action for a small pocket of contaminated soil in the area located immediately north of the BCP area of the Mott Haven Site. This area is hereafter referred to as the Supplemental Remedial Area (SRA)(**Figure 2**). The SRA consists of an approximately 60 feet by 50 feet area north of the Mott Haven BCP area (Block 2443/Lot 78) on the Borough of Bronx tax assessor's map.

1.1 Existing Site Conditions

The SRA is adjacent to the northwest corner of the Mott Haven Site which is a vacant lot located in a topographic depression. According to the United States Geological Survey (USGS) 7.5-minute Quadrangle Map, *Central Park, NY-NJ,* dated 1995, the approximate elevation of the SRA is 20 feet above mean sea level. The properties to the west and east are approximately 30 feet higher in elevation than the SRA. An approximate 30-foot high stone or concrete retaining wall borders the site to the west.

The properties immediately to the north of the Mott Haven Site are constructed on a concrete platform approximately 30 feet above the SRA. The properties to the south are at approximately the same elevation as the SRA. The topography of the area around the SRA gently slopes to the south and east; the immediate area of the SRA is relatively flat.

1.2 Historic Site Conditions and Surrounding Land Use

A review of historical records (Sanborn Fire Insurance maps) shows that the SRA and much of the Mott Haven Site operated as a rail yard from prior to 1891 to approximately 1975.

Properties in the vicinity of, and adjacent to, the SRA are potential sources of contamination to the SRA. These include the historical presence of a gasoline service station and a manufactured gas plant (MGP). The exact location of the MGP relative to the SRA cannot be determined from the Sanborn maps. A Phase I Environmental Site Assessment (ESA), completed by URS Corporation (2001), indicated that an auto repair shop and gasoline filling station were historically located at the southwestern corner of East 156th Street and Sheridan Avenue/Concourse Village West, adjacent to and immediately west of the SRA. By 1977 the filling station was no longer depicted on the map, but the auto repair shop remained. According to the URS Report, the MGP operated prior to 1891 to 1946.

Further details about the historic site conditions and surrounding land use, including a review of the Sanborn Maps are found in Section 4.5 of the Remedial Investigation (RI) Report (2005).

2.0 SUMMARY OF SITE INVESTIGATIONS

The following is a summary of the site investigations completed at the Mott Haven Site, with a focus on the SRA. Specific details and findings of all the investigation activities can be found in the RI Report (2005).

Shaw completed site investigation activities at the Mott Haven Site and the SRA between March and September 2005. These investigative activities were completed as two separate phases. The RI activities on the area of the Mott Haven Site, completed pursuant to the NYSDEC approved Remedial Investigation Work Plan (RIWP) (2005), were performed between March and August 2005. A Supplemental Investigation (SI) was performed to the north and west of the Mott Haven Site, including the SRA, between August and September 2005, to identify off-site contamination which may be impacting the Mott Haven Site. These SI activities were based on a Scope of Work (SOW) presented to NYSDEC and NYSDOH on July 14, 2005.

Pursuant to the RIWP and the Supplemental Investigation SOW, the following activities were conducted: geophysical investigations; installation of twenty-three (23) soil gas points / implants and collection of soil vapor samples; installation of forty-seven (47) soil borings; excavation of nine (9) test pits; installation of twenty (20) groundwater monitoring wells; installation of eight (8) bedrock soil borings; site reconnaissance on surrounding properties; laboratory analysis of soil gas, soil and groundwater samples; and permeability tests to assess the hydraulic characteristics of the shallow aquifer beneath the Mott Haven Site.

2.1 SRA Field Activities

As part of the site investigation activities, the following field activities were conducted within the area of the SRA:

- Geophysical survey using ground penetrating radar (GPR) and a precision utility locator (PUL);
- Advancement of five soil borings to 15 feet and two borings to bedrock including the collection of continuous soil samples;
- Installation of two groundwater monitoring wells and collection of samples; and
- Conducted a slug test to collect of aquifer hydraulic property data.

2.1.1 Geophysical Investigation

A geophysical investigation was conducted by Hager-Richter Geoscience, Inc. (Hager-Richter) of Orange, New Jersey, between August 1 and 4, 2005, to assure that underground utilities were not present at locations where subsurface investigations were planned. The geophysical investigation included the use of precision utility locator (PUL) and ground penetrating radar (GPR). Hager-Richter identified, and marked storm and sanitary lines that dropped down along the existing platform support columns and then fed into the two major sanitary lines running beneath the platform. Several boring locations were moved based on the geophysical investigation.

2.1.2 Drilling and Sampling

Five soil borings, SB-47 and SB-48, and PSB-1, PSB-2, and PSB-3 were drilled on two separate occasions by Aquifer Drilling & Testing, Inc. (ADT) of New Hyde Park, New York, at the locations shown on **Figure 3**. The borings were advanced to 15 feet (ft) below ground surface (bgs) with a Geoprobe® drill rig using a 2-inch diameter, 5-foot long macrocore sampler to collect soil samples. Two additional borings (PBSB-1 and PBSB-2) were also advanced to bedrock with a hollow stem auger (HSA) drill rig to collect soil samples and to determine if dense non-aqueous phase liquids (DNAPLs) were present. Each boring was continuously sampled with a 2-in. split spoon and logged for soil type, odors, and other relevant visual observations. No evidence of DNAPL was encountered. A Community Air Monitoring Program (CAMP) was implemented during the performance of all intrusive activities.

<u>Sampling Protocol</u>

A portion of each soil sample was collected and placed in a sealed plastic bag, allowed sufficient time for the samples gases to equilibrate, and screened with a photoionization detector (PID). Soil samples were collected for laboratory analysis from the depth interval with the highest PID reading. If the PID readings were zero, or insignificant, the soil sample was collected from the interval at the inferred water table interface. If gross contamination was evident (i.e., visual observations or strong odor), three soil samples were collected from the soil boring; one from the vadose zone above the zone of impact, one from the interval with the highest PID reading and one from near the bottom of the boring. All sampling data and information is summarized in **Table 1**.

Select soil samples were analyzed for some or all of the following parameters, including: Target Compound List volatile organic compounds plus the next 10 tentatively identified compounds (TCL VOC+10), TCL semi-volatile organic compounds (SVOCs) plus the next 20 tentatively identified compounds (TCL SVOC+20), Target Analyte List (TAL) metals, cyanide, pesticides, herbicides, and polychlorinated biphenyls (PCBs).

Sample results are presented in **Tables 2** and **3**.

2.1.3 Monitoring Well Installation, Development, and Sampling

Two monitoring wells, MW-14 and MW-15 were installed with a Geoprobe® drill rig By ADT to a depth of at least five feet below the water table surface using 3 1/4- inch inside diameter rods on April 28, 2005. The two wells consisted of 1-inch diameter threaded well casing with a minimum of ten feet of 0.01-inch slot size polyvinyl chloride (PVC) screen with a fine grain filter pack sand (e.g., Morie #0) to 1.0 feet above the screen (to minimize turbidity during purging and sampling). The screen was set straddling the water table, generally seven feet below and three feet above. Approximately 1.5 feet of bentonite chips was placed above the sand and hydrated with clean water. The surface completion of each well consists of a flush-to-grade, watertight and lockable well cover set into concrete. Monitoring well construction details are presented in Appendix B of the RI Report.

Monitoring well development was initiated no sooner than 24 hours after the completed installation of the monitoring wells. The monitoring wells MW-14 and MW-15 were sampled following the U.S. Environmental Protection Agency (USEPA) low-flow sampling technique.

Groundwater samples from the two monitoring wells were analyzed for TCL VOC+10, TCL SVOC+20, Pesticides/PCBs, herbicides, TAL Metals, and cyanide. Results from this sampling event are presented in **Tables 4** and **5**.

2.1.4 Slug Tests

On September 21, 2005, Shaw conducted slug withdrawal tests (e.g. “slug out”) in seven monitoring wells in the area of the Mott Haven Site, including MW-14 in the SRA, to assess the range of hydraulic conductivity of the shallow aquifer beneath the Mott Haven Site. In Situ MiniTROLLs (pressure transducer and datalogger) were placed in each of the wells along with a 5-foot long “slug” constructed of PVC weighted with sand sealed inside of the PVC. The miniTROLLs and Slugs were installed the day before the test to allow the miniTROLL to equilibrate to the temperature of the aquifer and allow the water displaced by the slug when it was initially placed into the well (raising the water level above the static water level) to equilibrate.

Water level measurements during each test were recorded logarithmically by the miniTROLL. Approximately one second after the miniTROLL was programmed to collect the water levels, the slug in the well was removed from the water as quickly as possible, resulting in a lowering of the water level. The miniTROLL recorded the water level rise as it returned to equilibrium conditions.

The water level measurements were downloaded in the field onto a hand held computer and transferred onto a desktop computer for analysis. The water level recovery data were analyzed using AQTESOLV Version 3.5 software. The hydraulic conductivity value from the slug withdrawal test in MW-14 was 1.96 x 10^{-4} centimeters/second (cm/sec), and the hydraulic conductivity values across the Mott Haven Site ranged from 3.72 x 10^{-4} centimeters/second (cm/sec) to 2.09 x 10^{-5} cm/sec.

2.2 Findings

The results of the investigations in the SRA north of the Mott Haven Site indicated the following:

- VOCs were detected in the analyzed soil samples. Several of these VOCs exceed their Recommended Soil Cleanup Objectives (RSCOs). Compounds that exceeded their applicable RSCOs include: benzene, toluene, ethylbenzene and xylenes (BTEX), naphthalene, and acetone. BTEX compounds are usually associated with lighter petroleum products similar to gasoline and naphthalene is associated with MGP wastes.

- Several soil samples had SVOCs that exceed the applicable RSCOs. These compounds include: naphthalene, benzo(a)anthracene, chrysene, benzo(a)pyrene, pyrene, benzo(b)fluoranthene, benzo(k)fluroanthene, indeno(1,2,3-cd)pyrene, 2-methylnaphthalene, and phenanthrene. Most of these compounds are associated with heavier petroleum products similar to MGP waste.

- Metal concentrations above the RSCOs were detected in all of the soil boring samples; most metal concentrations exceed USA Eastern Background Standards. These concentrations are considered to be consistent with background conditions typically found in urban areas and not related to SRA contamination.

- Pesticides, PCBs, or herbicides were not detected in any of the analyzed soil samples.

- Several VOCs (cis-1,2-dichloroethene, naphthalene, benzene, toluene, ethylbenzene, xylenes, isopropylbenzene, N-propylbenzene, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, and p-isopropylbenzene) were detected in excess of the applicable groundwater quality standards in the groundwater samples.

- Three SVOCs (naphthalene, 2,4-dimethylphenol, and phenol) were detected at concentrations in groundwater samples above the applicable groundwater standards.

- Four inorganic constituents were detected at concentrations above the groundwater quality standards in the groundwater samples. The exceedances included iron, magnesium, manganese, and sodium. These detections are considered to be associated with background conditions typical of urban settings.
- Pesticides, PCBs, or herbicides were not detected in any of the groundwater samples; and
- The average hydraulic conductivity of the aquifer is 1.44×10^{-4} cm/sec or 0.41 feet per day (ft/day). Aquifer hydraulic data presented in Section 3.9 of the RI Report indicates that the direction of groundwater flow is from the northwest to the southeast with a horizontal hydraulic gradient of 0.02 feet per foot (ft/ft), and assuming an effective porosity of 30%, the average rate of groundwater flow across the SRA is about 10 feet per year.

To summarize, soil and groundwater contamination was detected at concentrations above NYSDEC RSCOs and groundwater quality standards for several VOC and SVOC compounds, in a small area to the north of the Mott Haven BCP area. The most elevated VOC and SVOC compounds detected include BTEX, and the polynuclear aromatic hydrocarbons or PAHs (e.g. naphthalene, chrysene, benzo(a)anthracene, benzo(a)pyrene, phenanthrene).

2.3 Sources of Contamination and Contamination Distribution

The VOC and SVOC contamination found in both the soils and groundwater from the SRA can be attributed to two (2) upgradient sources of contamination: a historic manufactured gas plant identified in the area northwest of the Site and a historic gasoline service station located to the west of the SRA.

The coal tar waste generated during the MGP operation is a dark-colored liquid with a viscosity similar to light oil. This material contains high levels of SVOCs (in particular PAHs) including naphthalene, which is considered to be a "signature compound" of coal tar. While VOCs such as BTEX are also present in MGP waste, these constituents are a minor component compared to the SVOC fraction. In addition, VOCs tend to dissipate/degrade quickly, leaving heavier SVOCs behind, naphthalene in particular.

Figure 4 depicts the distribution of naphthalene detected in the soil, showing concentrations generally an order of magnitude higher than the RSCO of 13,000 ppb. Evidence of coal tar was observed principally in the northwest corner of the Mott Haven Site (BCP area) (SB-45) and the SRA (SB-47, SB-48), and also 300 feet upgradient of the SRA to the northwest, off site in the area of MW-18. A soil sample from MW-18 exhibited a concentration of naphthalene (220,000 ppb) which besides SB-45 (in the Mott Haven BCP area) was the highest naphthalene concentration detected during the RI.

Figure 5 shows the location of a cross section through the SRA, and **Figure 6** shows the distribution of naphthalene in soil along the cross section; the highest levels of contamination (above RSCOs) horizontally extend slightly more than 40 feet northward of the BCP area and vertically range between 3 to 9 ft bgs. As shown on **Figure 4**, the highest levels of contamination extend laterally approximately 30 feet eastward from the retaining wall. The selected remedy will extend 60 feet toward the north from the BCP area and 50 feet eastward from the retaining wall providing approximately 20 feet of buffer around the contamination (see **Figure 10**).

Incidental spills and releases intrinsic in MGP operations and/or surface water transport of coal tar contaminated sediments from adjacent off site dumping (in the area around MW-18, for example) are the likely causes of the coal tar contamination seen in the SRA and the northwest corner of the Mott Haven Site.

The presence of VOCs (specifically BTEX) in the SRA is likely related to the historic operation of a gasoline filling station/auto repair shop adjacent to and immediately upgradient of the SRA which operated prior to the mid 1970's. Significant VOC contamination was identified in the groundwater beneath the area of the filling station/auto repair facility. **Figure 7** depicts the concentration of BTEX detected in the groundwater and confirms the likely source of the VOCs on the SRA as the historic service station.

3.0 PROPOSED REMEDIAL ACTION

Based on the investigations and a review of the subsurface analytical data from the SRA and adjacent contaminated properties, a remedial action strategy for the SRA has been developed to eliminate any potential soil contaminant migration and ensure that the remedy is protective of human health and the environment.

3.1 Remedial Action Objectives

Remedial Action Objectives (RAOs) have been established to ensure that the proposed SRA remedy is protective of human health and the environment. The RAOs provide the basis on which to evaluate the effectiveness of the SRA remedy. VOCs and SVOCs are present in soil and groundwater in excess of RSCOs and Part 703 groundwater quality standards. Accordingly, the RAOs proposed for the SRA are:

1. **Ensure that on-site contaminant concentrations in soil and groundwater will not result in exposure to school occupants**.
   Since there is no use of the groundwater underlying the SRA, and no other potential for school occupants to contact subsurface contaminants, there will be no exposure to groundwater or soil. However, as an added safeguard, the contaminants will be physically and chemically bound in a solid mass that eliminates any potential leaching of the contaminants from the soil as well as significantly reduces the hydraulic conductivity of the solidified mass, thereby isolating the mass from the upgradient groundwater flow.

2. **Maintain existing groundwater quality at the downgradient property line.**
   Implementation of the SRA remedy, which involves the solidification of the soil mass to a depth well below the water table, will physically and chemically bind the contaminants as well as significantly reduce the hydraulic conductivity to eliminate any potential contaminant contributions to groundwater.

3.2 Remedial Actions

To achieve the remedial action objectives outlined above, the following remedial actions are proposed to be completed at the SRA:

- Solidify the contaminated soil matrix using grout injection to a depth interval corresponding to 2-15 ft bgs in an area approximately 60 feet by 50 feet immediately north of the BCP area (shown on **Figure 8**) to eliminate any potential leaching of the contaminants from the soil and to significantly reduce the hydraulic conductivity of the solidified mass.

3.2.1 In Situ Solidification

The main purpose of the in situ solidification is to eliminate any potential leaching of contaminants from the soil matrix into the groundwater system underlying the SRA. Standard and conventional remedial actions (i.e., soil removal) could not be used because of engineering constraints. There are ten platform support columns and associated pile caps within the SRA. The pile caps are located at the base of the columns, with the top of the pile cap approximately one foot below grade. The pile caps transfer the weight supported by the column evenly to the end-bearing piles below the pile cap. Removal of the soil surround the pile caps and end-bearing piles could risk structural integrity to the support of the platform. The locations of the pile caps are shown on **Figure 9**.

Another advantage of the in situ solidification is that the solid mass has a significantly reduced hydraulic conductivity, thereby isolating the mass from the upgradient groundwater flow. In situ solidification will be achieved using the jet grout technique which is essentially the same technique that will be used to install the hydraulic barrier along the western side of the Mott Haven Site. The process creates a continuous soil/cement monolith, as shown on **Figure 10**, by simultaneously mixing the in situ soil and injecting a cement grout mixture. The soil is mixed by forcing grout through the exit nozzle of the grout monitor (part of the drill rods) under high pressure and a high exit velocity. Near cylindrically-shaped columns of cement treated soil are created by simultaneously rotating and slowly withdrawing the grout monitor. The rate of rotation and withdrawal rate will determine the degree of mixing and diameter of the grout columns; it is expected that the individual grout columns will be 13 feet long (2 to 15 ft below grade) with a four foot diameter.

As part of the remedy for the Mott Haven Site, nine jet grout columns will be installed as part of the western hydraulic barrier (jet grout wall) along 20 feet of the retaining wall in the southwest corner of the SRA as shown on **Figure 9**. These nine hydraulic barrier grout columns will be approximately 4 ft diameter and will extend to approximately 28 feet bgs; seven of the nine hydraulic barrier jet grout columns will be installed adjacent to the retaining wall, the other two hydraulic barrier jet grout columns will be placed in the next row of columns away from the retaining wall to help tie the Waterloo Barrier® into the jet grout wall. In addition to creating a hydraulic barrier, these nine hydraulic barrier jet grout columns are intended to provide additional structural support to the retaining wall. The SRA stabilization jet grout columns will also enhance the structural integrity of the retaining wall.

The area to be treated is approximately 60 ft long by 50 ft wide (**Figure 9**). The depth of the in situ solidification will be from 2 to 15 ft bgs based on the data presented in Section 2 and on **Figure 6**. **Figure 9** depicts the area of remediation and approximate locations of the jet grout columns. Four-foot diameter grout columns will be created by the equipment (same as the jet grout wall along the west side of the BCP area). In order to ensure that the contaminated soil in the SRA is solidified, the spacing of the individual jet grout columns (approximately 366 individual columns) will be approximately 3 feet from center to allow for substantial (approximately one foot) overlap as shown on **Figure 9**. This overlap will ensure that all of the contaminated soil is solidified, even if there are some heterogeneities that restrict the jet grout from creating a full 2 ft radius. The outline of the 4 ft diameter jet grout columns along portions of the exterior of the SRA on **Figure 9** show the degree of overlap of the jet grout columns with this spacing.

To ensure that the jet grouting process contains all contaminants inside the SRA, the jet grout columns along the east and north sides of the SRA will be completed first. Once these lines and rows are completed, the rest of the columns will be completed in a general north to south direction (i.e., the last columns to be installed will be near the Waterloo Barrier®. Jet grout columns adjacent to the Waterloo Barrier® will not impact the steel of the Waterloo Barrier® wall.

There are ten pile caps located within the SRA (F**igure 9**). The pile caps are located at the base of the columns, with the top of the pile cap approximately one foot below grade. The pile caps transfer the weight supported by the column evenly to the end-bearing piles below the pile cap. Jet grout columns will be placed around the pile caps, but none will be placed by drilling through the pile caps. The jet grout columns will reach beneath portions of the pile cap, and will, in some cases, brush up against the end-bearing piles. Since the end-bearing piles are transferring the column loads down to bedrock, and not carrying the load through friction, the jet grouting operation is not expected to have any significant effect on the structural integrity of the piles, pile caps, or platform columns.

Groundwater quality will be monitored downgradient for one year after completing the in situ solidification program to confirm the success of the technology (i.e., verify that none of the contamination in the SRA is leaching out and migrating further downgradient). A monitoring well to be installed at the east end of the Waterloo Barrier® (as described in the BCP area Remedial Area Work Plan) will be sampled to monitor downgradient groundwater quality. The monitoring well will be sampled monthly for the first three months, and then quarterly for the next three quarters. The groundwater samples will be analyzed for VOCs and SVOCs.

3.3 Remedy Analysis

The goal of the SRA remedy is to prevent potential migration of contaminants and be protective of human health and the environment.

3.3.1 Contaminants of Concern and Extent of Contamination

The contaminants of concern (COC) for the SRA include VOCs and SVOCs. The principal VOCs involved are the BTEX compounds related to a potential gasoline release located in an upgradient area to the west of the SRA, and the principal SVOCs are PAHs related to wastes generated by former MGP operations in the vicinity of the SRA. Naphthalene in particular is considered a “signature compound” of MGP operations.

3.3.1.1 Groundwater

The highest concentrations of BTEX were detected upgradient of the SRA as shown on **Figure 7**, with concentrations well above the NYSDEC groundwater standards. Concentrations of BTEX above the NYSDEC groundwater standards were also detected in monitoring wells within the SRA. No significant concentrations of BTEX were detected in any of the monitoring wells downgradient of the SRA. High naphthalene concentrations were detected in the monitoring well upgradient of the SRA (MW-18, 1400 micrograms per liter [µg/L]) and in the two monitoring wells within the SRA (MW-15, 1600 µg/L; and MW-14, 950 µg/L).

3.3.1.2 Soil

The highest concentrations of VOCS in soil were detected in samples from the soil boring upgradient of the SRA (MW-18). Elevated SVOC concentrations were detected in soil samples from the boring upgradient of the SRA (MW-18) and soil borings located in the SRA. This is exemplified on **Figure 4** which shows the naphthalene concentrations detected in soil. The highest naphthalene concentration, 220,000 micrograms per kilogram, was detected in samples from both MW-18 and MW-12. The highest concentrations of both the VOCs and SVOCs in the SRA were in samples collected from the approximate depth of the water table (4 to 6 ft bgs); the shallow (0 to 3 ft. bgs) and deeper (>10 ft. bgs) soil samples generally had significantly lower concentrations (**Figure 6**).

3.4 Remedy Evaluation

To ensure that the proposed remedy will meet the RAOs, Shaw evaluated the remedy as follows:

- Protection of Human Health and the Environment – This remedy will protect human health and the environment. The in situ solidification will eliminate the possibility of human contact with the contaminated soil or groundwater in the SRA because the contaminants will be encapsulated within the grout monolith. The contaminants will be kept from potentially leaching into the groundwater and the significantly lower hydraulic conductivity of the monolith will isolate the mass from the upgradient groundwater flow. These two factors will virtually eliminate groundwater contamination from the SRA;
- Long-term Effectiveness & Permanence – The grout monolith will be permanent and will keep the contaminants from potentially leaching into the groundwater. The grout monolith will have significantly greater strength than the existing in situ soils and will remain stable and isolated indefinitely. The proposed remedy will have a permanent and very effective long-term impact on protecting human health and the environment;
- Reduction of Toxicity, Mobility, or Volume – The proposed remedy will essentially eliminate the mobility and toxicity of the contaminants in the soil by encapsulating them within the grout monolith. The volume of contamination will remain unchanged;
- Short-term Effectiveness & Impacts – There will be minimal short term impacts to the workers and the surrounding community because the remediation will occur in situ. There may be some

return of the mixed grout to the ground surface, however, this mixed grout will be wet and no dust will be generated. Risks to workers during the implementation of the in situ solidification will be minimal, but include incidental ingestion, dermal contact and vapor inhalation from the returned grout mixture. These minimal risks will be mitigated by the development and use of site-specific health and safety practices including the implementation of a community air monitoring program (CAMP);

- Implementability – There are engineering constraints on the proposed remedy. The large retaining wall along the west side of the SRA is partially supported by the soils within the SRA. Ten support columns and associated pile caps and end-bearing piles are also located within the SRA and provide all of the support for the existing platform in this area. The overhead platform is approximately 25 feet above the existing grade and limits the use of equipment in the SRA. Despite these constraints, the technical feasibility for implementing this proposed remedy is high. The solidification of the soil matrix will strengthen the soil and, therefore, will not impact the support of the retaining wall. As indicated above, the jet grouting is not expected to impact the structural integrity of the end-bearing piles, pile caps or columns. The jet grout in situ solidification process, already proposed as part of the BCP area remediation, can be implemented with equipment that can operate with a 25-foot overhead. Both the contaminant type and in situ soils are conducive to in situ solidification;
- Cost Effectiveness – Costs for in situ solidification range from $200 to $300 per cubic yard of treated material. This cost does not include costs for site preparation, bench scale testing, engineering fees and short-term (i.e., approximately one year) groundwater monitoring. Once completed, the only cost associated with the remedy is the implementation of a short-term groundwater monitoring program to assess the impact on the downgradient groundwater quality;
- Land Use – The SRA is beneath an existing platform. The area beneath the existing platform has no current use other than to allow access to beneath the platform for maintenance of utilities and the platform structure itself. The completion of the in situ solidification will not change the current, or long-term, land use.

3.5 Remedy Recommendation

The proposed remedy, which involves in situ solidification of the contaminated soils, will be protective of human health and the environment. The remedy essentially eliminates the potential leaching of contaminants from the soil into the groundwater and the significantly lower hydraulic conductivity of the monolith will isolate the mass from the upgradient groundwater flow.

4.0 REMEDIAL ACTION DESIGN

The following sections present the overall remedial action design for the SRA.

4.1 Soil Remediation

The following provides a description of the soil remediation program.

4.1.1 In Situ Solidification

In situ solidification will be achieved using the jet grout technique which is essentially the same technique that will be used to install the hydraulic barrier along the western side of the Mott Haven Site. The process creates a continuous soil/cement monolith by simultaneously mixing the in situ soil and injecting a cement grout mixture. The soil is mixed by forcing grout through the exit nozzle of the grout monitor (part of the drill rods) under high pressure and a high exit velocity. Near cylindrically-shaped columns of cement treated soil are created by simultaneously rotating and slowly withdrawing the grout monitor. The rate of rotation and withdrawal rate will determine the degree of mixing and diameter of the grout columns; it is expected that the individual grout columns will be 13 feet long (2 to 15 ft below grade) with a four foot diameter.

The jet grout wall will extend 20 feet into the SRA (**Figure 9**), on the western side, along the retaining wall. The western side of the SRA will extend another 40 feet using jet grout columns to 15 ft bgs. The Waterloo Barrier® will be used for the southern wall of the SRA, with jet grout columns installed to 15 ft bgs to enclose the north and east sides of the SRA.

The area to be treated is approximately 60 ft long by 50 ft wide (**Figure 9**). The depth of the in situ solidification will be from 2 to 15 ft bgs based on the data presented in Section 2 and on **Figure 6**. **Figure 9** depicts the area of remediation and approximate locations of the jet grout columns. Approximately 366 four-foot diameter grout columns, spaced approximately 3 feet from center, will be installed to form a single cement monolith. This overlap will ensure that all of the contaminated soil is solidified, even if there are some heterogeneities that restrict the jet grout from creating full 2 ft radius. The outline of the 4 ft diameter jet grout columns along portions of the exterior of the SRA on **Figure 9** show the degree of overlap of the jet grout columns with this spacing.

To ensure that the jet grouting process contains all contaminants inside the SRA, the jet grout columns along the east and north sides of the SRA will be completed first. Once these lines and rows are completed, the rest of the columns will be completed in a general north to south direction (i.e., the last columns to be installed will be near the Waterloo Barrier®. Jet grout columns adjacent to the Waterloo Barrier® will not impact the steel of the Waterloo Barrier® wall.

There are ten pile caps located within the SRA (F**igure 9**). The pile caps are located at the base of the columns, with the top of the pile cap approximately one foot below grade. The pile caps transfer the weight supported by the column evenly to the end-bearing piles below the pile cap. Jet grout columns will be placed around the pile caps, but none will be placed by drilling through the pile caps. The jet grout columns will reach beneath portions of the pile cap, and will, in some cases, brush up against the end-bearing piles. Since the end-bearing piles are transferring the column loads down to bedrock, and not carrying the load through friction, the jet grouting operation is not expected to have any significant effect on the structural integrity of the piles, pile caps, or platform columns.

Prior to starting the jet grouting program, monitoring wells MW-14 and MW-15 will need to be abandoned in accordance with regulatory criteria. In addition, there are storm water drains from the platform which run down three columns within the SRA. Based on design drawings for the existing platform, some of these storm water lines run underground through the SRA to a collector line, outside the SRA. The exact layout of the buried storm water lines within the SRA is not known; the observed location of the lines is not exactly as shown on the design drawings. Any storm water lines running underground within the SRA area will either be sealed in place with concrete to protect them from the jet grouting operations, or rerouted at shallower depths (i.e., above the cement monolith).

4.2 Detailed Technical Performance Requirements

Technical performance requirements will be developed to ensure that the remedial design meets or exceeds the remedial action objectives described in Section 3.1. The following sections outline the technical performance requirements developed for the remedial design.

4.2.1 Bench Scale Stabilization Study

The purpose of the bench scale stabilization study is to determine the required process, stabilization reagent blend, and reagent dosage required for the stabilization process. The objective of the stabilization study is to immobilize the leachable contaminants. Specifically, it will be shown that leachable contaminants, principally PAHs and other organic compounds have been immobilized by the matrix. The leachability will be measured using the Toxicity Characteristic Leaching Procedure (TCLP). The “before and after treatment” leachable concentrations will be compared to NYSDEC groundwater quality standards to demonstrate the efficacy of the process.

Soil samples will be collected that represent 1.) hot spot levels of contaminants and 2.) averaged levels of contaminants. The objective for analyzing the two different samples is to demonstrate that all contaminated materials will be immobilized with the cement monolith, preventing any potential migration of contaminants. Each sample will be mixed until it is visually homogeneous. The soil samples will then be physically and chemically characterized. Physical characterization will include bulk density, solid content, and pH. The untreated soil samples will be chemically characterized for total and leachable (via TCLP) SVOCs and VOCs (the samples for total VOC analysis will be collected for analysis prior to mixing).

Portions of the homogenized soil samples will be mixed with varying amounts of Portland cement, water, powdered activated carbon, and other cement additives that may be in use by the BCP area jet grouting contractor. The cement additives (plasticizers to help make the grout mixture more fluid) may be used by the jet grouting contractor to improve the workability of their grout. The treated materials will be allowed to cure and then extracted TCLP samples will be analyzed for SVOCs and VOCs.

In addition to the Bench Scale Stabilization Study, the performance testing of the jet grout hydraulic barrier, running 300 feet along the western length of the Mott Haven Site, will also be used to help ensure optimization of the binding capability of the cement monolith.

4.2.2 Site Controls

Where needed, site controls will be installed that restrict public access to the site where remedial work will be performed. The western perimeter consists of a 13 to 20-foot retaining wall with the overhead platform tied in to the top of the retaining wall. Along the north, east and south, beneath the platform, there exists chain-link fencing. In addition, the physical features, namely, the rail road corridor along the east side of the property will restrict access. To restrict access during remedial activities, warning tape will be used to cordon off the SRA. For the duration of the SRA jet grouting activities, a sign-in/sign-out sheet will be maintained for the site. Access to the SRA will be through the east side of the platform area and all on-site personnel and site visitors will be required to sign in upon entering the site and sign out upon leaving. Implementation of safe work practices will provide for additional site security during remediation. Safe work practices that will contribute to overall site security include the following:

- Maintaining temporary construction fencing around all potentially dangerous areas;
- Parking heavy equipment in a designated area each night and removing keys;
- Maintaining an organized work area, including proper storage of all tools and equipment; and
- Conducting a daily security review.

Work and staging areas will be maintained on site. No off-site storage of contaminated materials will be allowed. The selected contractor may be required to coordinate with the BCP area contractor with regard to site layout and traffic control.

4.2.3 Erosion and Sediment Control

Specific erosion and sedimentation control measures for the remedial activities will be implemented in accordance with NYS requirements and approved site permits. Additionally, certain operational and management practices will be implemented throughout the project to provide an additional measure of erosion and sedimentation control; these practices will be coordinated with the BCP area contractor to avoid any conflicts. These operational measures may include wetting any on-site access roads; use of gravel roads; installing truck wash pads, and vehicle entrances. A sediment and erosion control plan will be developed in coordination with the sediment and erosion control plan for the BCP area. Typical control measures that may be included in this plan are geotextile fencing and hay bales along the edge of the roads and areas to be disturbed. The erosion and sedimentation control measures and procedures will be maintained for the duration of the project until such time that site restoration activities have provided a final or temporary surface cover (as appropriate). For the duration of the project, the erosion and sedimentation control measures will be inspected each workday and maintained. Given that the expected disturbance area will not be greater than 1 acre, a SPDES and NOI permit will not need to be filed.

4.2.4 Air and Dust Control

During all SRA jet grouting activities air and dust emissions will be monitored and controlled to protect the surrounding environment from exposure to airborne contaminants. Outside of the SRA, perimeter monitoring will be conducted to verify compliance as specified in the CAMP. Within the work zone, vapor and dust will be monitored for worker protection. A site-specific HASP will be developed and implemented. The HASP will address worker protection by setting the monitoring criteria, action levels and protective equipment. Potential air and dust hazards to workers are volatile and semi-volatile organic vapors, carbon monoxide, dust, and methane.

4.2.5 Quality Assurance/Quality Control

A quality assurance/quality control (QA/QC) program will be implemented to ensure that the RAOs are met. The QA/QC program will verify that the jet grout columns have fully encapsulated, solidified, and stabilized the contaminants in the soil.

In order to be certain that the jet grouting process is forming a single, solid grout monolith, it is important that the texture of the grout mixture remain consistent throughout the program. The following field tests will be performed to verify the consistency of the grout batching operations (i.e., grout mixture remains consistent) at least every fifth batch of similar grout:

- Flow (ASTM C 939-94a);
- Density (ASTM D 4380); and
- Set time (ASTM C 403).

To confirm that the jet grouting process has formed a solid grout monolith of the entire area, a PQ-sized core shall be collected of the grouted monolith to a depth not to exceed 14 ft bgs a minimum of four days after completion of that area of in situ solidification as follows:

- Obtain one core for every 750 square ft area (a total of four cores) to confirm that the jet grouting process has achieved the continuous zone of grout monolith.

The percent recovery of core shall be a minimum of 95 percent, and the percent recovery of core greater than 6-inches long shall be a minimum of 50 percent. All of the cores will be logged and photodocumented. This documentation will provide sufficient evidence that the jet grout process formed a solid grout monolith. All coreholes will be sealed with a cement-bentonite grout immediately after removing the final core.

One portion of each core will be selected for laboratory analysis. The core samples will be allowed to cure (28 days from initial placement) and then extracted TCLP samples will be analyzed for SVOCs and VOCs. These results will verify that the in situ leachable concentrations of the contaminants are comparable to the bench scale stabilization study results.

4.2.6 Protection of Adjacent Structures

During implementation of the proposed remedial action, structures located on the site and adjacent properties will be monitored by the contractor through the use of inclinometers, vertical and lateral reference points (fixed-mounted targets that permit remote measurements), and threshold-type seismographs for excessive settlement and vibration. The remedial construction activity may be modified as necessary to protect the structures. The following performance criteria shall be utilized in assessing the impact of remedial construction on settlement and vibration of adjacent structures:

- Settlement threshold: Proceed with caution if settlement of 0.01 foot is measured. Stop and implement action if two consecutive positive readings are noted.
- Vibration threshold: Proceed with caution when readings of 0.5 inches per second peak particle velocity are recorded. Stop and implement corrective measures when velocity exceeds 1.0 inch per second.

4.2.7 Removal and Control of Returned Material

It is anticipated that as the grout is injected into the soil matrix that there will be some return of the grout mixture (approximately 10 to 30 percent) to the top of the hole. The contractor will be required to install sleeve casings or some other method of controlling the grout spoil expelled from the borehole. The returned spoil will be diverted directly from the borehole to a temporary containment structure. All temporarily contained grout spoil material will be removed from the work area daily so not to interfere with ongoing grouting operations. The grout spoil, once set, may be handled with heavy equipment (i.e, front end loader) and loaded for proper off-site disposal.

4.2.8 Final Site Grading

The ground surface beneath the existing platform has a gentle slope toward the south, with slight eastward component. The ground surface at the SRA, located beneath the southwest corner of the platform, is usually moist to wet, with some standing water shortly after significant storm events. Observations of the ground surface beneath the platform area suggests that some of the storm water lines are plugged and there is surface water flow across portions of the area during significant storm events.

After completing the in situ solidification process, additional clean fill material will be placed in the SRA to raise the grade to an elevation higher than the areas immediately to the north and east. The final surface of the SRA will be graded toward the east with a 4 percent slope. This will divert surface water from the north or east away from the SRA, and any surface water on the SRA will run off to the east. This final grading will minimize any recharge into the soils overlying the grout monolith.

5.0 SUMMARY AND CONCLUSIONS

Shaw Environmental & Infrastructure, Inc. (Shaw) has been retained by the New York City School Construction Authority (SCA) to prepare a Supplemental Remedial Area (SRA) Work Plan for the area located immediately north of the former Metro North property (Mott Haven Site) located at 672 Concourse Village West, Bronx, New York. The Mott Haven Site is currently being addressed under the Brownfield Cleanup Program (BCP) Agreement between the New York State Department of Environmental Conservation (NYSDEC) and SCA. This Work Plan describes the proposed remedial action for the area located immediately north of the Mott Haven Site and is hereafter referred to as the Supplemental Remedial Area (SRA). The SRA consists of an approximately 60 feet by 50 feet area north of the BCP area on the Mott Haven Site.

Shaw completed site investigation activities at the Mott Haven Site, and the subject SRA, between March and September 2005. These investigative activities were completed as two separate phases. The Remedial Investigation (RI) activities, completed pursuant to the NYSDEC approved Remedial Investigation Work Plan (RIWP) (July 2005), were performed between March and August 2005. A Supplemental Investigation (SI) was performed to the north and west of the Mott Haven Site under the existing platform between August and September 2005, to identify off-site contamination which may be impacting the Mott Haven Site. These SI activities were based on a Scope of Work (SOW) presented to NYSDEC and New York State Department of Health (NYSDOH) on July 14, 2005.

The findings of the site investigations identified a small pocket of soil and groundwater contamination in the SRA at concentrations above NYSDEC Recommended Soil Cleanup Objectives (RSCOs) and groundwater quality standards, specifically associated with volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). The most elevated VOC and SVOC compounds detected include benzene, toluene, ethylbenzene, and xylenes (BTEX), and polynuclear aromatic hydrocarbons or PAHs (e.g. naphthalene, chrysene, benzo(a)anthracene, benzo(a)pyrene, phenanthrene). The organic contaminant with the highest detected concentration was naphthalene. The highest levels of contamination identified were generally confined to a small pocket of contamination in the center of the SRA, at a depth corresponding to the top of the zone of saturation (water table).

Remedial Action Objectives (RAOs) have been established to ensure that the proposed SRA remedy is protective of human health and the environment. The RAOs proposed for the SRA are:

- Ensure that on-site contaminant concentrations in soil and groundwater will not result in exposure to school occupants; and
- Maintain existing groundwater quality at the downgradient property line.

To achieve the above remedial action objectives, the small pocket of contaminated soil, an area approximately 60 feet by 50 feet, and to a depth of approximately 15 feet (the SRA), will be stabilized and isolated using an in situ solidification technology.

An evaluation of the proposed remedy demonstrates that it will be protective of human health and the environment. The proposed remedy utilizes solidification to physically and chemically bind the contaminants in the stabilized mass. Further, the use of cement and other additives to create the solid mass also significantly reduces the hydraulic conductivity of the stabilized mass, thereby isolating the mass from the upgradient groundwater flow.

Following implementation, the effectiveness of the remedy will be confirmed through a Bench Scale Stabilization Study, the collection of cores drilled through the solidified mass, Toxicity Characteristic Leaching Procedure (TCLP) analysis on selected cores samples for SVOCs and VOCs, and one year of groundwater monitoring downgradient of the area.

6.0 SIGNATURES OF ENVIRONMENTAL PROFESSIONALS

Shaw has prepared this Work Plan for the Supplemental Remedial Area, immediately north of the Former Metro North property (Mott Haven Site) located at 672 Concourse Village West, Bronx, New York.

Shaw Environmental & Infrastructure, Inc.

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7.0 REFERENCES

Shaw Environmental & Infrastructure, Inc. (Shaw), Draft Remedial Action Work Plan for Former Metro North Property (Mott Haven) at 672 Concourse Village West, Bronx, New York, November 15, 2005.

Shaw Environmental & Infrastructure, Inc. (Shaw), Draft Remedial Investigation Report of Former Metro North Property at 672 Concourse Village West, Bronx, New York, November 15, 2005.

URS Corporation, Phase I Environmental Site Investigation of the Former Metro North Property (Mott Haven) at 672 Concourse Village West, Bronx, NY 10451, July 20, 2001.

URS Corporation, Remedial Investigation Work Plan of the Former Metro North Property (Mott Haven) at 672 Concourse Village West, Bronx, NY 10451, July 2005.

TABLES

Table 1
New York City School Construction Authority
Metro-North/Mott Haven Site
Bronx, New York
Supplemental Remedial Area
Summary of Soil Sample Laboratory Analyses

Sample ID	Sample Depth (ft bgs)	TAL Metals	Cyanide	VOCs	SVOCs	Pesticides/PCBs	Herbicides
SOIL BORING SAMPLES							
SB47	2-4	X	X	X	X	X	X
SB47	6-7	X	X	X	X	X	X
SB47	14-15	X	X	X	X	X	X
SB48	2-4	X	X	X	X	X	X
SB48	8-9	X	X	X	X	X	X
SB48	14-15	X	X	X	X	X	X
PSB1	2-3	X		X	X		X
PSB1	6-7	X		X	X		X
PSB1	14-15	X		X	X		X
PSB2	4-5	X		X	X		X
PSB2	7-8	X		X	X		X
PSB2	14-15	X		X	X		X
PSB3	4-5	X		X	X		X
PSB3	7-8	X		X	X		X
PSB3	14-15	X		X	X		X
PBSB1	2-3	X		X	X		X
PBSB1	6-7	X		X	X		X
PBSB1	13-14	X		X	X		X
PBSB2	3-4	X		X	X		X
PBSB2	5-7	X		X	X		X
PBSB2	14-15	X		X	X		X

Notes:

ID: Indentification
ft bgs: feet below ground surface
TAL: Target Analyte List
VOCs: Volatile Organic Compounds
SVOCs: Semi-volatile Organic Compounds
PCBs: Polychlorinated Biphenyls

Table 2
New York City School Construction Authority
Metro-North/Mott Haven Site
Bronx, New York
Supplemental Remedial Area
Summary of Organic Compounds in Soil

Compound	TAGM 4046 Recc. Soil Cleanup Objective*							
	Sample ID:	SB47	SB47	SB47	SB48	SB48	SB48	PSB1
	Sample Depth (ft.):	2-4	7-8	13-15	2-4	8-9	14-15	2-3
	Sample Date:	04/28/05	04/28/05	04/28/05	04/28/05	04/28/05	04/28/05	08/17/05
	Sample Classification:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Volatile Organic Compounds (ug/kg)								
Acetone	200	540 U	550 U	**31 J**	**21 J**	550 U	**45**	4.7 U
Carbon Disulfide	2700	63 U	65 U	0.47 U	0.44 U	65 U	0.53 U	0.52 U
Methylene Chloride	100	100 U	100 U	2.3 U	**2.9 J**	**180 JB**	**2.8 J**	**2.9 JB**
2-Butanone	300	460 U	470 U	3.6 U	3.3 U	470 U	4.1 U	4.0 U
1,1-Dichloropropene	^	120 U	130 U	0.41 U	0.38 U	130 U	0.47 U	0.35 U
cis-1,2-Dichloroethene	^	61 U	62 U	0.5 U	0.47 U	62 U	0.57 U	0.46 U
Benzene	60	**91 J**	**830 J**	0.51 U	0.47 U	**730 J**	0.58 U	0.56 U
Trichloroethene	700	110 U	110 U	0.39 U	0.36 U	110 U	0.45 U	0.43 U
Toluene	1500	**370 J**	**310 J**	0.51 U	0.48 U	64 U	0.59 U	0.57 U
Tetrachloroethene	1400	54 U	55 U	0.92 U	0.86 U	55 U	1.1 U	1.0 U
Ethylbenzene	5500	**1300**	**9200**	0.45 U	0.42 U	**7100**	0.51 U	0.50 U
m/p-Xylenes	1200	**3900**	**6800**	1.1 U	**2.2 J**	**2600**	1.3 U	1.2 U
o-Xylenes	1200	**2300**	**3900**	0.49 U	**4.4 J**	**1800**	0.56 U	0.54 U
Isopropylbenzene	^	**280 J**	**1600**	0.53 U	**22**	**960**	0.60 U	0.58 U
n-Propylbenzene	^	**360 J**	**1500**	0.68 U	**8.4**	**1300**	0.78 U	0.75 U
1, 3, 5-Trimenthylbenzene	^	**1800**	**3300**	0.63 U	**11**	**2100**	0.72 U	0.69 U
1,2,4-Trimethylbenzene	^	**4000**	**10000**	**1.4 J**	**35**	**8300**	0.55 U	0.53 U
Sec-butylbenzene	^	69 U	71 U	0.53 U	0.49 U	71 U	0.61 U	0.59 U
p-Isopropyltoluene	^	**540 J**	**1800**	0.54 U	**17**	**770 J**	0.62 U	0.60 U
n-Butylbenzene	^	76 U	**580 J**	0.43 U	0.40 U	**380 J**	0.49 U	0.48 U
Naphthalene	13000	**31000**	**180000 D**	**9.2**	**59**	**120000 D**	0.85 U	0.82 U
Semi-Volatile Organic Compounds (ug/kg)								
Naphthalene	13,000	**13000**	**150000 D**	**130 J**	**2400**	**9400 D**	81 U	79 U
2-Methylnaphthalene	36,400	**9200**	**66000**	**84 J**	**710 J**	**3400**	80 U	78 U
Acenaphthylene	41,000	**600 J**	**6500 J**	67 U	**320 J**	**240 J**	77 U	75 U
Acenaphthene	50,000	**1800**	**25000**	74 U	**420 J**	**870**	85 U	83 U
Fluorene	50,000	**3400**	**31000**	70 U	**610 J**	**1400**	80 U	78 U
Phenanthrene	50,000	**19000 D**	**150000 D**	**190 J**	**2700**	**6800 D**	76 U	**130 J**
Anthracene	50,000	**1900**	**26000**	62 U	**600 J**	**680**	72 U	70 U
Fluoranthene	50,000	**8600**	**45000**	**68 J**	**2500**	**1900**	71 U	**310 J**
Pyrene	50,000	**13000**	**69000**	**100 J**	**3600**	**2600**	84 U	**260 J**
Benzo(a)anthracene	224 or MDL	**4500**	**26000**	58 U	**1400**	**910**	67 U	**170 J**
Chrysene	400	**4600**	**24000**	74 U	**1400**	**940**	85 U	**180 J**
bis(2-Ethylhexyl)phthalate	50,000	330 U	1700 U	79 U	150 U	84 U	91 U	**160 J**
Benzo(b) fluoranthene	1,100	**4700**	**22000**	45 U	**1800**	**810**	52 U	**270 J**
Benzo(k)fluoranthene	1,100	**1700 J**	**9300**	91 U	**700 J**	**320 J**	100 U	**160 J**
Benzo(a)pyrene	61 or MDL	**4100**	**27000**	66 U	**1700**	**1000**	76 U	**180 J**
Indeno (1,2,3-cd)pyrene	3,200	**540 J**	**2200 J**	52 U	**200 J**	**130 J**	60 U	59 U
Benzo(g,h,i)perylene	50,000	**2000**	**8200 J**	68 U	**760 J**	**380 J**	79 U	**80 J**

Table 2
New York City School Construction Authority
Metro-North/Mott Haven Site
Bronx, New York
Supplemental Remedial Area
Summary of Organic Compounds in Soil

Compound	TAGM 4046 Recc. Soil Cleanup Objective*							
	Sample ID:	PSB1	PSB1	PSB2	PSB2	PSB2	PSB3	PSB3
	Sample Depth (ft.):	6-7	14-15	4-5	7-8	14-15	4-5	7-8
	Sample Date:	08/17/05	08/17/05	08/17/05	08/17/05	08/17/05	08/17/05	08/17/05
	Sample Classification:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Volatile Organic Compounds (ug/kg)								
Acetone	200	**1100 J**	**48**	**120**	450 U	4.1 U	600 U	110 U
Carbon Disulfide	2700	49 U	2.4 J	0.45 U	49 U	0.45 U	71 U	12 U
Methylene Chloride	100	**2000 B**	**2.3 JB**	2.3 U	240 U	2.2 U	110 U	**96 JB**
2-Butanone	300	370 U	**7.1 J**	**25 J**	370 U	3.4 U	510 U	90 U
1,1-Dichloropropene	^	0.52 U	0.98 U	0.49 U	52 U	0.48 U	60 U	13 U
cis-1,2-Dichloroethene	^	0.43 U	0.40 U	0.40 U	43 U	0.40 U	140 U	10 U
Benzene	60	**1100**	0.49 U	**4.2 J**	**1000**	0.49 U	**100 J**	**170**
Trichloroethene	700	41 U	0.38 U	0.38 U	41 U	0.38 U	120 U	9.8 U
Toluene	1500	53 U	0.49 U	0.50 U	**400 J**	0.49 U	70 U	13 U
Tetrachloroethene	1400	96 U	0.89 U	0.90 U	97 U	0.89 U	60 U	23 U
Ethylbenzene	5500	47 U	0.43 U	0.44 U	**3800**	0.43 U	74 U	**470**
m/p-Xylenes	1200	**150 J**	1.1 U	**1.3 J**	**9200**	1.1 U	170 U	**880**
o-Xylenes	1200	51 U	0.47 U	**2.0 J**	**1900**	0.47 U	66 U	**66 J**
Isopropylbenzene	^	**130 J**	0.51 U	0.51 U	**14000**	0.51 U	**670 J**	**89 J**
n-Propylbenzene	^	**180 J**	0.65 U	0.66 U	**20000**	0.65 U	**610 J**	**140 J**
1, 3, 5-Trimenthylbenzene	^	65 U	0.60 U	0.61 U	**460 J**	0.60 U	67 U	16 U
1,2,4-Trimethylbenzene	^	**290 J**	0.46 U	**1.9 J**	**850**	0.46 U	**220 J**	**510**
Sec-butylbenzene	^	55 U	0.51 U	0.52 U	**2400**	0.51 U	77 U	13 U
p-Isopropyltoluene	^	56 U	0.52 U	0.52 U	**290 J**	0.52 U	66 U	14 U
n-Butylbenzene	^	45 U	0.41 U	0.42 U	**2500**	0.41 U	85 U	11 U
Naphthalene	13000	**2400**	0.71 U	0.72 U	**800**	0.71 U	**4700**	**160 J**
Semi-Volatile Organic Compounds (ug/kg)								
Naphthalene	13,000	71 U	68 U	69 U	**370 J**	69 U	**1900**	70 U
2-Methylnaphthalene	36,400	70 U	67 U	68 U	74 U	67 U	80 U	69 U
Acenaphthylene	41,000	68 U	65 U	66 U	72 U	65 U	77 U	67 U
Acenaphthene	50,000	74 U	71 U	72 U	79 U	72 U	85 U	73 U
Fluorene	50,000	70 U	68 U	69 U	75 U	68 U	80 U	69 U
Phenanthrene	50,000	66 U	64 U	65 U	**92 J**	64 U	76 U	66 U
Anthracene	50,000	63 U	60 U	61 U	67 U	61 U	72 U	62 U
Fluoranthene	50,000	62 U	60 U	**79 J**	**250 J**	60 U	**91 J**	61 U
Pyrene	50,000	74 U	71 U	72 U	**210 J**	71 U	84 U	73 U
Benzo(a)anthracene	224 or MDL	58 U	56 U	57 U	**120 J**	56 U	67 U	58 U
Chrysene	400	75 U	72 U	73 U	**150 J**	72 U	86 U	74 U
bis(2-Ethylhexyl)phthalate	50,000	**100 J**	77 U	78 U	**130 J**	77 U	91 U	**100 J**
Benzo(b) fluoranthene	1,100	46 U	44 U	45 U	**230 J**	44 U	52 U	45 U
Benzo(k)fluoranthene	1,100	92 U	88 U	90 U	**140 J**	89 U	100 U	91 U
Benzo(a)pyrene	61 or MDL	67 U	64 U	65 U	**160 J**	64 U	76 U	66 U
Indeno (1,2,3-cd)pyrene	3,200	53 U	51 U	52 U	56 U	51 U	60 U	52 U
Benzo(g,h,i)perylene	50,000	69 U	66 U	67 U	74 U	67 U	79 U	68 U

Table 2
New York City School Construction Authority
Metro-North/Mott Haven Site
Bronx, New York
Supplemental Remedial Area
Summary of Organic Compounds in Soil

Compound	TAGM 4046 Recc. Soil Cleanup Objective*								
	Sample ID:	PSB3	PBSB1	PBSB1	PBSB1	PBSB2	PBSB2	PBSB2D	PBSB2
	Sample Depth (ft.):	14-15	2-3	6-7	13-14	3-4	5-7	5-7	14-15
	Sample Date:	08/17/05	08/16/05	08/16/05	08/16/05	8/15/2005	8/15/2005	08/15/05	08/15/05
	Sample Classification:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Volatile Organic Compounds (ug/kg)									
Acetone	200	**25 J**	4.1 U	4.0 U	100 U	4.2 U	4.3 U	**13 J**	**11 J**
Carbon Disulfide	2700	0.43 U	0.45 U	0.44 U	**36 J**	0.46 U	0.47 U	0.47 U	0.44 U
Methylene Chloride	100	**5.0 JB**	2.2 U	**6.4 B**	**72 J**	2.3 U	2.3 U	2.3 U	2.2 U
2-Butanone	300	3.3 U	3.5 U	3.4 U	86 U	3.5 U	3.6 U	3.6 U	3.4 U
1,1-Dichloropropene	^	0.46 U	0.48 U	0.47 U	12 U	0.50 U	0.50 U	0.50 U	0.47 U
cis-1,2-Dichloroethene	^	0.38 U	0.40 U	0.39 U	9.9 U	0.41 U	0.42 U	0.42 U	0.39 U
Benzene	60	**3.2 J**	0.49 U	**4500 D**	**390**	**2.5 J**	**0.77 J**	**1.6 J**	0.48 U
Trichloroethene	700	0.36 U	0.38 U	0.37 U	9.4 U	0.38 U	0.39 U	0.39 U	0.37 U
Toluene	1500	**7.5**	0.50 U	**14**	12 U	0.51 U	**1.6 J**	**3.4 J**	0.49 U
Tetrachloroethene	1400	0.86 U	0.90 U	0.88 U	22 U	0.91 U	0.94 U	0.94 U	0.88 U
Ethylbenzene	5500	**55**	0.43 U	**2700 D**	**250**	0.44 U	**19**	**6.9**	**6.1**
m/p-Xylenes	1200	**160**	1.1 U	**64**	**65 J**	1.1 U	**41**	**24**	**27**
o-Xylenes	1200	**110**	0.47 U	**110**	**35 J**	0.48 U	**26**	**11**	**12**
Isopropylbenzene	^	**15**	0.51 U	**15**	13 U	**14**	**4.9 J**	**1.9 J**	**0.83 J**
n-Propylbenzene	^	**27**	0.66 U	**13**	16 U	**36**	**11**	**5.1 J**	**1.4 J**
1, 3, 5-Trimenthylbenzene	^	**18**	0.61 U	**21**	15 U	**1.5 J**	**4.5 J**	**5.0 J**	**3.4 J**
1,2,4-Trimethylbenzene	^	**87**	0.47 U	**76**	**94 J**	**0.85 J**	**53**	**13**	**13**
Sec-butylbenzene	^	**1.8 J**	0.51 U	0.50 U	13 U	**3.8 J**	**1.4 J**	0.54 U	0.50 U
p-Isopropyltoluene	^	**1.9 J**	0.52 U	**6.0 J**	13 U	**0.65 J**	0.54 U	0.54 U	0.51 U
n-Butylbenzene	^	**4.9 J**	0.41 U	0.41 U	10 U	**4.8 J**	0.43 U	0.43 U	0.41 U
Naphthalene	13000	**38**	0.72 U	**2900 D**	**5800**	0.73 U	**11**	**6.1 J**	**5.1 J**
Semi-Volatile Organic Compounds (ug/kg)									
Naphthalene	13,000	66 U	**1100 J**	**1300**	**410**	**72 J**	72 U	72 U	**91 J**
2-Methylnaphthalene	36,400	65 U	670 U	**130 J**	**68 J**	69 U	70 U	71 U	66 U
Acenaphthylene	41,000	63 U	**1100 J**	65 U	66 U	67 U	68 U	69 U	64 U
Acenaphthene	50,000	69 U	720 U	71 U	72 U	**180 J**	75 U	75 U	71 U
Fluorene	50,000	65 U	680 U	67 U	68 U	70 U	71 U	71 U	67 U
Phenanthrene	50,000	62 U	**2600 J**	**190 J**	**78 J**	66 U	67 U	67 U	63 U
Anthracene	50,000	59 U	**1000 J**	60 U	61 U	62 U	64 U	64 U	60 U
Fluoranthene	50,000	58 U	**5300**	**96 J**	**70 J**	**270 J**	63 U	63 U	59 U
Pyrene	50,000	69 U	**11000**	**210 J**	**89 J**	**1000**	75 U	75 U	70 U
Benzo(a)anthracene	224 or MDL	54 U	**4000 J**	63 J	57 U	**200 J**	59 U	59 U	56 U
Chrysene	400	70 U	**5100**	71 U	73 U	**260 J**	76 U	76 U	71 U
bis(2-Ethylhexyl)phthalate	50,000	75 U	770 U	**120 J**	**81 J**	79 U	81 U	81 U	76 U
Benzo(b) fluoranthene	1,100	43 U	**5100**	54 J	45 U	**510**	46 U	47 U	44 U
Benzo(k)fluoranthene	1,100	85 U	**1600 J**	88 U	89 U	**140 J**	93 U	93 U	87 U
Benzo(a)pyrene	61 or MDL	62 U	**6600**	**77 J**	65 U	**760**	67 U	68 U	63 U
Indeno (1,2,3-cd)pyrene	3,200	49 U	**4000**	51 U	52 U	**650**	54 U	54 U	50 U
Benzo(g,h,i)perylene	50,000	64 U	**4900**	66 U	67 U	**850**	70 U	70 U	66 U

Table 2
New York City School Construciton Authority
Metro North/Mott Haven Site
Bronx, New York
Supplemental Remedial Area
Summary of Organic Compounds in Soil

Notes:

General Comments
All results are in µg/kg (microgram per kilogram or parts per billion (ppb)).
Only those parameters detected in at least one sample are reported on this table.
Bold face indicates that analyte was detected above laboratory limit.
Bold face and shaded values indicate an exceedance of TAGM value.
No pesticides, herbicides, or PCBs were detected in any of the soil samples collected from SB47 or SB48 (in the Supplemental Remedial Area).

Standards
* = NYSDEC TAGM Memorandum No. 4046, revised January 24, 1994
^ = No standard or guidance value is available for this compound.
MDL = Method Detection Limit

Laboratory Qualifers - Organic
U - Indicates the compound was analyzed for but was not detected.
J - Indicates an estimated value. This flag is used:
(1) When estimating, a concentration for a tentatively identified compound
(2) When the mass specral data indicated the indentification, however the result was less than the specified detection limit, but greater than zero.
B - Indicates the analyte was found in the blank as well as the sample.
D - This flag identifies all compounds identigied in an analysis at a secondary dilution factor.

Table 3
New York City School Construction Authority
Metro-North/Mott Haven Site
Bronx, New York
Supplemental Remedial Area
Summary of Inorganics in Soil

Compound	TAGM 4046 Recc. Soil Cleanup Objective	TAGM Eastern USA Background	NYSDEC Region 3 Background Soil Heavy Metals Conc.						
			Sample ID:	SB47	SB47	SB47	SB48	SB48	SB48
			Sample Depth (ft.):	2-4	7-8	13-15	2-4	8-9	14-15
			Sample Date:	04/28/05	04/28/05	04/28/05	04/28/05	04/28/05	04/28/05
			Sample Classification:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
TAL Metals (mg/kg)									
Aluminum	SB	33000	N/A	**9360**	**6930**	**6720**	**7320**	**5880**	**5480**
Antimony	SB	N/A	N/A	**3.410 J**	0.435 U	0.415 U	**4.300 J**	0.432 U	0.469 U
Arsenic	7.5 or SB	3-12	2.2-23.1	**4.330**	**1.020 J**	**3.040**	**3.880**	0.517 U	**9.880**
Barium	300 or SB	15-600	38.5-187	**115**	**26.5 J**	**25.2 J**	**479**	**25.6 J**	**30.1**
Beryllium	0.16 or SB	0-1.75	0.24-2.2	**0.375 J**	**0.227 J**	**0.309 J**	**0.348 J**	**0.217 J**	**0.283 J**
Cadmium	1 or SB	0.1-1	0.04U-1.2	0.042 U	0.044 U	0.042 U	**0.093 J**	0.044 U	0.047 U
Calcium	SB	130-35,000	N/A	**36900**	**3260**	**2190**	**20700**	**946**	**4110**
Chromium	10 or SB	1.5-40	11.2-51.2	**14.9**	**12.6**	**11.9**	**31.9**	**10.5**	**10.6**
Cobalt	30 or SB	2.5-60	N/A	**3.850 J**	**5.140 J**	**7.350**	**5.610**	**4.350 J**	**5.530 J**
Copper	25 or SB	1-50	5.8-64.8	**34.4**	**14.0**	**16.4**	**58.0**	**9.240**	**15.2**
Iron	2,000 or SB	2,000-550,000	N/A	**11500**	**10300**	**12900**	**14200**	**8900**	**14700**
Lead	SB	200-500	6.9-303	**163**	**36.6**	**4.510**	**649**	**5.890**	**3.470**
Magnesium	SB	100-5,000	N/A	**12300**	**3410**	**3960**	**7360**	**2650**	**4260**
Manganese	SB	50-5,000	N/A	**439**	**165**	**106**	**263**	**97.1**	**165**
Mercury	0.1	0.001-0.2	0.04-0.92	**0.249**	**0.025**	**0.010 J**	**0.870 D**	0.008 U	**0.011 J**
Nickel	13 or SB	0.5-25	8.7-54.5	**12.7**	**10.6**	**15.1**	**11.5**	**10.4**	**11.6**
Potassium	SB	8,500-43,000	N/A	**2260**	**714**	**708**	**1080**	**644 J**	**547 J**
Selenium	2 or SB	0.1-3.9	0.20-2.9	0.438 U	0.452 U	0.432 U	0.406 U	0.450 U	0.487 U
Silver	SB	N/A	N/A	0.102 UN*	**0.489 JN***	0.100 UN	**1.100 JN***	**0.476 JN***	0.113 UN*
Sodium	SB	6,000-8,000	N/A	**1180**	**150 J**	**65.2 J**	**307 J**	**131 J**	**70.9 J**
Thallium	SB	N/A	N/A	0.678 U	0.699 U	0.667 U	0.627 U	0.695 U	0.753 U
Vanadium	150 or SB	1-300	N/A	**21.1**	**13.1**	**15.6**	**24.9**	**11.5**	**21.7**
Zinc	20 or SB	9-50	35.7-225	**180**	**38.9**	**46.5**	**159**	**31.0**	**42.8**

Table 3
New York City School Construction Authority
Metro-North/Mott Haven Site
Bronx, New York
Supplemental Remedial Area
Summary of Inorganics in Soil

Compound	TAGM 4046 Recc. Soil Cleanup Objective	TAGM Eastern USA Background	NYSDEC Region 3 Background Soil Heavy Metals Conc.						
			Sample ID:	PSB1	PSB1	PSB1	PSB2	PSB2	PSB2
			Sample Depth (ft.):	2-3	6-7	14-15	4-5	7-8	14-15
			Sample Date:	08/17/05	08/17/05	08/17/05	08/17/05	08/17/05	08/17/05
			Sample Classification:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
TAL Metals (mg/kg)									
Aluminum	SB	33000	N/A	**9170**	**9500**	**5790**	**7680**	**6660**	**5330**
Antimony	SB	N/A	N/A	**1.6 J**	0.41 U	0.40 U	**1.7 J**	**5.7 J**	0.40 U
Arsenic	7.5 or SB	3-12	2.2-23.1	**1.6**	0.49 U	0.48 U	**3.0**	**11.4**	0.48 U
Barium	300 or SB	15-600	38.5-187	**48.3**	**39.8**	**22.7**	**56.9**	**93.7**	**27.6**
Beryllium	0.16 or SB	0-1.75	0.24-2.2	0.01 U	0.01 U	0.01 U	**0.06 J**	**0.11 J**	0.01 U
Cadmium	1 or SB	0.1-1	0.04U-1.2	0.05 U	0.04 U	0.04 U	0.04 U	**1.0**	0.04 U
Calcium	SB	130-35,000	N/A	**1820**	**1180**	**1580**	**6370**	**2910**	**1270**
Chromium	10 or SB	1.5-40	11.2-51.2	**11.8**	**12.2**	**9.5**	**15.1**	**29.6**	**9.3**
Cobalt	30 or SB	2.5-60	N/A	**4.9 J**	**3.8 J**	**5.5 J**	**6.1 J**	**6.7 J**	**3.7 J**
Copper	25 or SB	1-50	5.8-64.8	**25.5**	**8.3**	**13.3**	**84.6**	**319**	**10.5**
Iron	2,000 or SB	2,000-550,000	N/A	**13100**	**11800**	**11100**	**18600**	**28000**	**9680**
Lead	SB	200-500	6.9-303	**63.9**	**8.8**	**7.2**	**209**	**411**	**6.6**
Magnesium	SB	100-5,000	N/A	**3150**	**3250**	**3200**	**3130**	**2310**	**2790**
Manganese	SB	50-5,000	N/A	**104**	**107**	**92.3**	**238**	**227**	**90.0**
Mercury	0.1	0.001-0.2	0.04-0.92	**0.244**	**0.015**	0.007 U	**0.226**	**0.701**	**0.010 J**
Nickel	13 or SB	0.5-25	8.7-54.5	**12.6**	**11.8**	**11.9**	**14.9**	**17.5**	**9.5**
Potassium	SB	8,500-43,000	N/A	**814**	**941**	**864**	**815**	**578 J**	**783**
Selenium	2 or SB	0.1-3.9	0.20-2.9	0.48 U	0.42 U	0.42 U	0.42 U	0.46 U	0.42 U
Silver	SB	N/A	N/A	0.11 U	0.10 U	0.10 U	0.10 U	0.11 U	0.10 U
Sodium	SB	6,000-8,000	N/A	**274 J**	**170 J**	**133 J**	**237 J**	**373 J**	**172 J**
Thallium	SB	N/A	N/A	**1.4**	0.65 U	0.65 U	0.65 U	0.71 U	0.64 U
Vanadium	150 or SB	1-300	N/A	**14.5**	**10.2**	**11.7**	**19.2**	**32.8**	**10.2**
Zinc	20 or SB	9-50	35.7-225	**56.1**	**38.9**	**87.2**	**123**	**245**	**34.3**

Table 3
New York City School Construction Authority
Metro-North/Mott Haven Site
Bronx, New York
Supplemental Remedial Area
Summary of Inorganics in Soil

Compound	TAGM 4046 Recc. Soil Cleanup Objective	TAGM Eastern USA Background	NYSDEC Region 3 Background Soil Heavy Metals Conc.						
			Sample ID:	PSB3	PSB3	PSB3	PBSB1	PBSB1	PBSB1
			Sample Depth (ft.):	4-5	7-8	14-15	2-3	6-7	13-14
			Sample Date:	08/17/05	08/17/05	08/17/05	08/16/05	08/16/05	08/16/05
			Sample Classification:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
TAL Metals (mg/kg)									
Aluminum	SB	33000	N/A	**7450**	**6140**	**5470**	**6700**	**5690**	**5510**
Antimony	SB	N/A	N/A	0.47 U	**0.51 J**	0.39 U	**22.3 N**	**2.420 JN**	**2.180 JN**
Arsenic	7.5 or SB	3-12	2.2-23.1	**0.79 J**	**0.91 J**	**1.4**	**18.3**	0.473 U	0.477 U
Barium	300 or SB	15-600	38.5-187	**77.4**	**27.7**	**23.6**	**112**	**34.7**	**26.1**
Beryllium	0.16 or SB	0-1.75	0.24-2.2	0.01 U	0.01 U	0.01 U	**0.371 J**	**0.214 J**	**0.189 J**
Cadmium	1 or SB	0.1-1	0.04U-1.2	0.05 U	0.04 U	0.04 U	**5.320**	**0.317 J**	**0.371 J**
Calcium	SB	130-35,000	N/A	**2850**	**789**	**1170**	**13000**	**978**	**1030**
Chromium	10 or SB	1.5-40	11.2-51.2	**11.8**	**10.6**	**9.6**	**56.9**	**10.1**	**11.4**
Cobalt	30 or SB	2.5-60	N/A	**2.1 J**	**3.6 J**	**4.2 J**	**11.3**	**4.070 J**	**4.320 J**
Copper	25 or SB	1-50	5.8-64.8	**9.7**	**8.9**	**9.9**	**248**	**8.760**	**10.5**
Iron	2,000 or SB	2,000-550,000	N/A	**10100**	**12400**	**11600**	**51500**	**8400**	**8710**
Lead	SB	200-500	6.9-303	**35.7**	**6.6**	**6.3**	**902**	**8.100**	**6.250**
Magnesium	SB	100-5,000	N/A	**1670**	**2290**	**2690**	**6470**	**2260**	**2420**
Manganese	SB	50-5,000	N/A	**174**	**106**	**105**	**394**	**78.6**	**90.2**
Mercury	0.1	0.001-0.2	0.04-0.92	**0.259**	0.007 U	**0.011 J**	**0.426**	**0.012 J**	**0.010 J**
Nickel	13 or SB	0.5-25	8.7-54.5	**5.8**	**8.7**	**10.1**	**53.6**	**11.6**	**11.3**
Potassium	SB	8,500-43,000	N/A	**531 J**	**697**	**902**	**1570**	**623**	**667**
Selenium	2 or SB	0.1-3.9	0.20-2.9	0.49 U	0.43 U	0.40 U	**2.800**	**0.649 J**	**0.527 J**
Silver	SB	N/A	N/A	0.11 U	0.10 U	0.09 U	**3.600**	**0.364 J**	**0.515 J**
Sodium	SB	6,000-8,000	N/A	**340 J**	**239 J**	**134 J**	**499 J**	**147 J**	**176 J**
Thallium	SB	N/A	N/A	0.76 U	0.66 U	0.62 U	0.646 U	0.636 U	0.642 U
Vanadium	150 or SB	1-300	N/A	**12.8**	**12.8**	**11.1**	**27.0**	**10.7**	**12.2**
Zinc	20 or SB	9-50	35.7-225	**43.8**	**30.2**	**33.8**	**259**	**28.8**	**33.2**

Table 3
New York City School Construction Authority
Metro-North/Mott Haven Site
Bronx, New York
Supplemental Remedial Area
Summary of Inorganics in Soil

Compound	TAGM 4046 Recc. Soil Cleanup Objective	TAGM Eastern USA Background	NYSDEC Region 3 Background Soil Heavy Metals Conc.				
			Sample ID:	PBSB2	PBSB2	PBSB2D	PBSB2
			Sample Depth (ft.):	3-4	5-7	5-7	14-15
			Sample Date:	08/15/05	08/15/05	08/15/05	08/15/05
			Sample Classification:	SOIL	SOIL	SOIL	SOIL
TAL Metals (mg/kg)							
Aluminum	SB	33000	N/A	**6930 N**	**7220 N**	**6850 N**	**5650 N**
Antimony	SB	N/A	N/A	**3.220 JN**	**7.310 JN**	**4.590 JN**	**3.250 JN**
Arsenic	7.5 or SB	3-12	2.2-23.1	**2.460**	**2.770**	**2.180**	0.470 U
Barium	300 or SB	15-600	38.5-187	**28.9**	**34.8**	**28.5**	**29.1**
Beryllium	0.16 or SB	0-1.75	0.24-2.2	**0.539 J**	**0.556 J**	**0.486 J**	**0.466 J**
Cadmium	1 or SB	0.1-1	0.04U-1.2	**1.790**	**2.430 N**	**1.930 N**	**1.520 N**
Calcium	SB	130-35,000	N/A	**1270**	**931**	**1190**	**1210**
Chromium	10 or SB	1.5-40	11.2-51.2	**11.7**	**15.8**	**12.8**	**12.6**
Cobalt	30 or SB	2.5-60	N/A	**5.480 J**	**7.130**	**4.990 J**	**5.410 J**
Copper	25 or SB	1-50	5.8-64.8	**14.2**	**14.5**	**10.2**	**12.2**
Iron	2,000 or SB	2,000-550,000	N/A	**10800**	**15900**	**13300**	**9210**
Lead	SB	200-500	6.9-303	**31.7**	**15.8**	**26.3**	**6.460**
Magnesium	SB	100-5,000	N/A	**2420**	**2540 N**	**2220 N**	**2890 N**
Manganese	SB	50-5,000	N/A	**103**	**138**	**104**	**95.2**
Mercury	0.1	0.001-0.2	0.04-0.92	**0.320**	**0.048**	**0.048**	**0.011 J**
Nickel	13 or SB	0.5-25	8.7-54.5	**11.7**	**11.7**	**10.3**	**13.3**
Potassium	SB	8,500-43,000	N/A	**658**	**668**	**611 J**	**823**
Selenium	2 or SB	0.1-3.9	0.20-2.9	0.426 U	**0.439 J**	**0.675 J**	0.409 U
Silver	SB	N/A	N/A	**1.300**	**1.570 N**	**1.470 N**	**1.200 N**
Sodium	SB	6,000-8,000	N/A	**343 J**	**325 J**	**332 J**	**208 J**
Thallium	SB	N/A	N/A	0.659 U	0.674 U	0.677 U	0.632 U
Vanadium	150 or SB	1-300	N/A	**14.0**	**18.7**	**17.6**	**14.1**
Zinc	20 or SB	9-50	35.7-225	**53.6**	**39.6**	**38.0**	**39.1**

Table 3
New York City School Construciton Authority
Metro North/Mott Haven Site
Bronx, New York
Supplemental Remedial Area
Summary of Inorganics in Soil

Notes:

General Comments

All results are in mg/kg (milogram per kilogram or parts per million (ppm)).
Only those parameters detected in at least one sample are reported on this table.
Bold face indicates that analyte was detected above laboratory limit.
Bold face and shaded values indicate an exceedance of TAGM value.
NR - Not reported or not analyzed
Cyanide was not detected in any of the samples collected from SB47 or SB48
(in the Supplemental Remedial Area).

Standards

SB - Site Background
N/A - Not Available

Laboratory Qualifers - Organic

U - Indicates the compound was analyzed for but was not detected.
J - If the reported value was obtained from a reading that was less than the Contract Required
Detection Limit (CRDL), but the greater than or equal to the Instrument Detection Limit (IDL).
N - Spiked sample recovery not within control limits.
* - Duplicate analysis not within control limits.

Table 4
New York City School Construction Authority
Metro North/Motthaven Site
Bronx, New York
Supplemental Remedial Area
Summary of Organic Groundwater Analytical Data

Compound	NYSDEC Class GA Groundwater Standard	MW14-GW 5/19/2005	MW15-GW 5/19/2005
Volatile Organic Compounds (μg/L)			
Acetone	50*	**29**	2.3 U
cis-1,2-Dichloroethene	5	**4.4 J**	**8.0**
Naphthalene	10*	**950 D**	**1600 D**
Benzene	1	**470 D**	**1400 D**
Toluene	5	**230 D**	**39**
Ethylbenzene	5	**280 D**	**470 D**
m,p-Xylene	5	**450 D**	**200**
o-Xylene	5	**240 D**	**140**
Isopropylbenzene	5	**46**	**64**
N-propylbenzene	5	**50**	**77**
1,3,5-Trimethylbenzene	5	**61**	**84**
1,2,4-Trimethylbenzene	5	**150 D**	**120**
sec-butylbenzene	5	**4.3 J**	0.44 U
p-Isoproylbenzne	5	**9.7**	**7.2**
n-butylbenzene	5	**3.8 J**	**3.2 J**
Base Neutral Compounds (μg/L)			
Phenol	1	**8.0 J**	1.3 U
3+4-Methylphenols	^	**5.4 J**	1.4 U
2,4-Dimethylphenol	1	**2.4 J**	1.2 U
Naphthalene	10	**310 D**	**750 D**
2-Methylnaphthalene	^	**60**	**78 JD**
Acenaphthene	20*	**19**	**8.6 J**
Fluorene	50*	**6.3 J**	**7.4 J**
Phenanthrene	50*	**10 J**	**16**
Pesticides/Herbicides/PCBs (μg/L)			
2,4-D	50	**0.97 P**	**0.60 P**

Notes:

General Comments
All results are in micrograms per liter (μg/L)
Only those parameters detected in at least one sample are reported on this table.
Bold face indicates that analyte was detected above laboratory limit.
Bold face and shaded values indicate an exceedence of the Class GA Groundwater Standard.

Standards
^ = No standard or guidance value available.
* = No standard available; value listed is a guidance value.

Laboratory Qualifiers - Organic
U - Indicates the compound was analyzed for but was not detected.
J - If the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).
D - The reported value is from a secondary analysis with a dilution factor. The original analysis exceeded the calibration range.
P - Three is a >25% difference for detected concentrations between the two GC columns. The lower of the two values is reported.

Table 5
New York City School Construction Authority
Metro North/Motthaven Site
Bronx, New York
Supplemental Remedial Area
Summary of Inorganic Groundwater Analytical Data

Compound	NYSDEC Class GA Groundwater Standard	MW14-GW 5/19/2005	MW15-GW 5/19/2005
TAL Metals ($\mu g/L$)			
Aluminum	^	**242**	**365**
Arsenic	25	**7.640 J**	**4.880 J**
Barium	1,000	**140 J**	**227**
Calcium	^	**129000**	**140000**
Copper	200	**10.8 J**	3.640 U
Iron	300	**11200**	**15000**
Lead	25	**4.760 J**	2.180 U
Magnesium	35000*	**32400**	**35600**
Manganese	300	**2220**	**4500**
Mercury	0.7	**0.0900 J**	**0.0900 J**
Nickel	100	**3.380 J**	1.560 U
Potassium	^	**34300 N**	**16200 N**
Selenium	10	3.040 U	**6.130 J**
Sodium	20000	**227000**	**166000**
Vanadium	^	**5.960 J**	0.701 U
Zinc	2000*	**19.6 J**	**9.180 J**
Wet Chemistry ($\mu g/L$)			
Cyanide	200	**0.015**	0.010 U

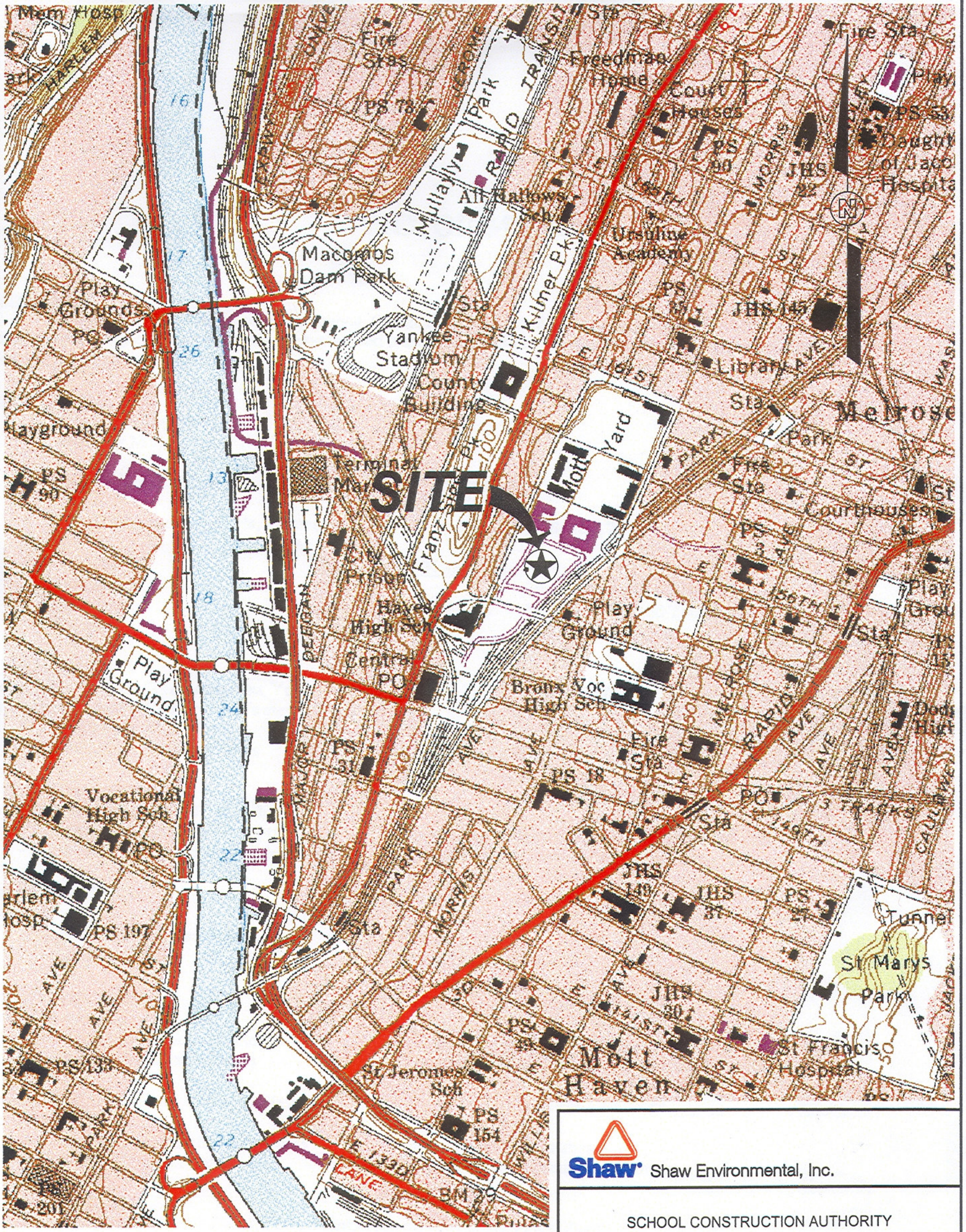
Notes:

General Comments
All results are in micrograms per liter (μg/L)
Only those parameters detected in at least one sample are reported on this table.
Bold face indicates that analyte was detected above laboratory limit.
Bold face and shaded values indicate an exceedence of the Class GA Groundwater Standard.

Standards
^ = No standard or guidance value available.
* = No standard available; value listed is a guidance value.

Laboratory Qualifiers - Inorganic
U - Indicates the compound was analyzed for but was not detected.
J - If the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but the greater than or equal to the Instrument Detection Limit (IDL).
N = Presumptive evidence of a compound.

FIGURES



NOT TO SCALE

REFERENCE:

BASE MAP SOURCR: www.nysgis.state.ny.us

Shaw Shaw Environmental, Inc.

SCHOOL CONSTRUCTION AUTHORITY

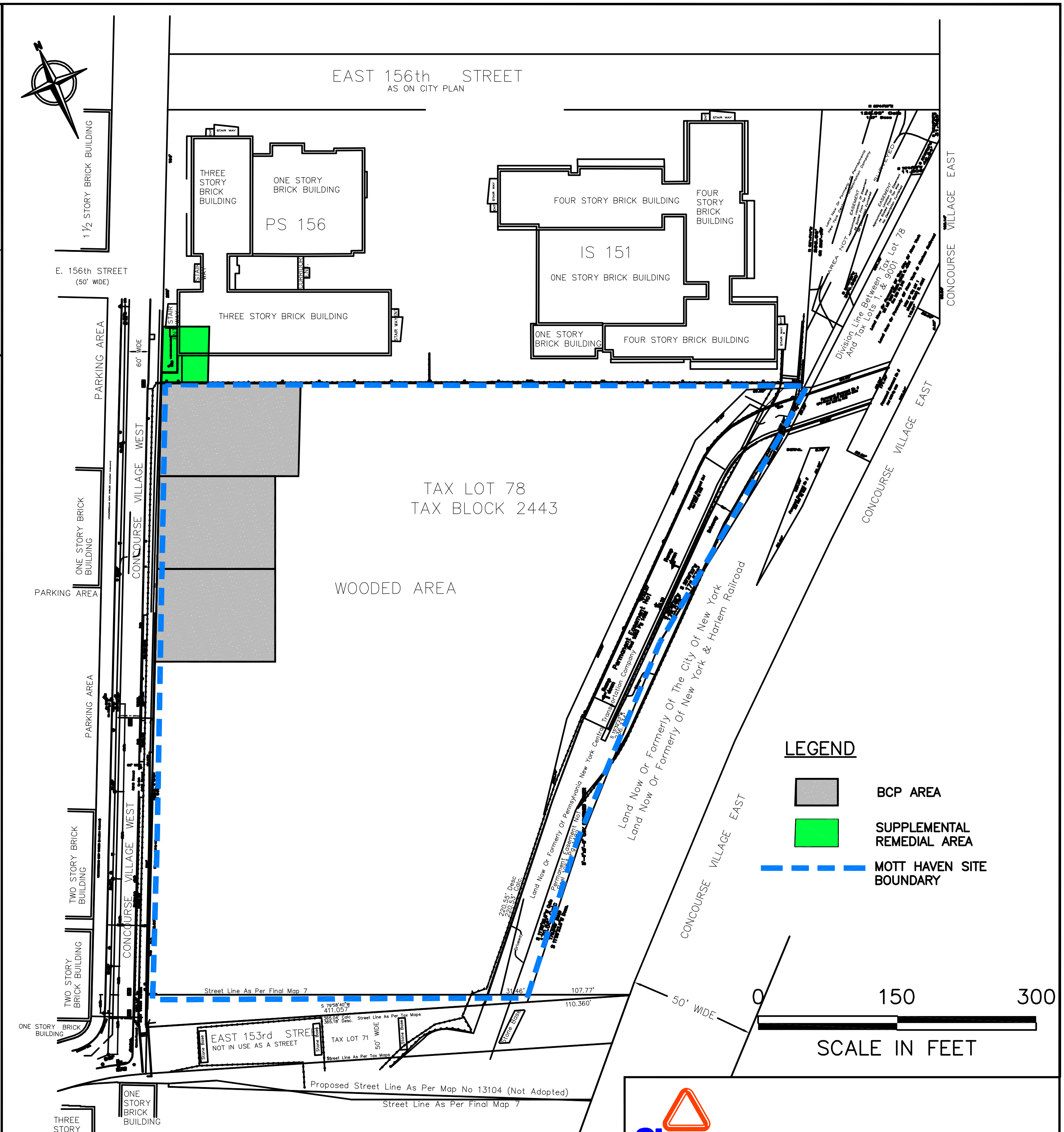
FIGURE 1
SITE VICINITY MAP

FORMER METRO NORTH PROPERTY
672 CONCOURSE VILLAGE WEST, BRONX, NY

OFFICE	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
ALBANY, NY	10/13/05	H. FARIELLO	S. SHKOLNIK			114926A3

L:\project\114926\114926A3.dwg Xref: .
Plot Date/Time: 10/13/05 11:57am Image: O40073G8
Plotted by: Samuil.Shkolnik

OFFICE New York, NY | DRAWING NUMBER 114926



NOTES:

1. HORIZONTAL DATUM: COORDINATE SYSTEM BASED UPON PUBLISHED COORDINATES OF EXISTING WELLS AND MH AT CP 802

2. VERTICAL DATUM: QUEENS BOROUGH PRESIDENT'S DATUM WHICH IS 2.725 FT ABOVE U.S. COAST AND GEODETIC SURVEY DATUM, SANDY HOOK, NJ (NGVD 29)

Shaw Environmental, Inc.

DESIGNED BY: CK	NEW YORK CITY SCHOOL CONSTRUCTION AUTHORITY
DRAWN BY: DBT	SUPPLEMENTAL REMEDIAL AREA (SRA)
CHECKED BY:	FORMER METRO NORTH PROPERTY 672 CONCOURSE VILLAGE WEST, BRONX, NY

APPROVED BY:	DATE:	SCALE:	DRAWING NO.	FIGURE
	2/24/06	AS SHOWN		2

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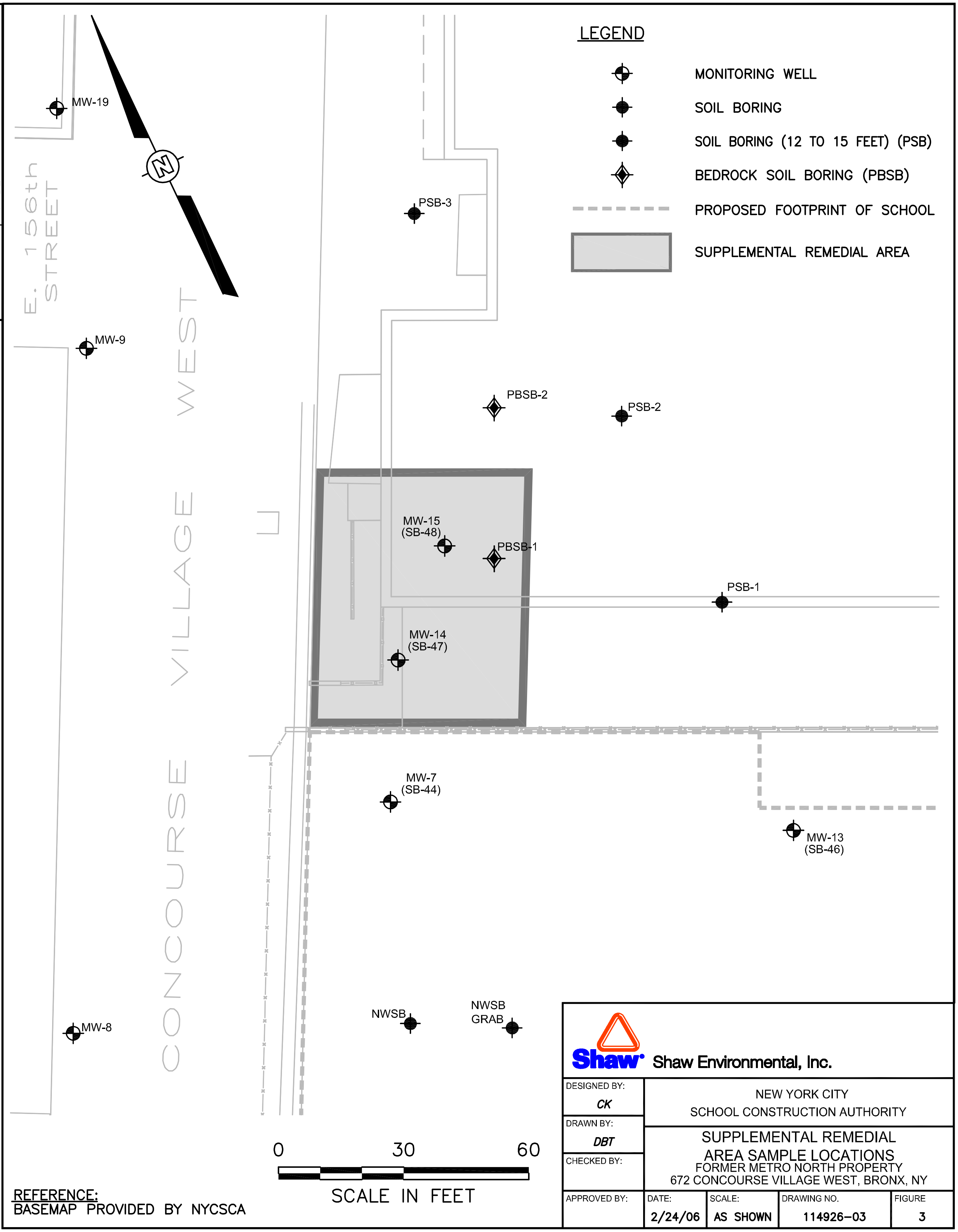

OFFICE: New York, NY
DRAWING NUMBER: 114926-03

Shaw Environmental, Inc.

DESIGNED BY: CK	NEW YORK CITY SCHOOL CONSTRUCTION AUTHORITY
DRAWN BY: DBT	SUPPLEMENTAL REMEDIAL AREA SAMPLE LOCATIONS FORMER METRO NORTH PROPERTY 672 CONCOURSE VILLAGE WEST, BRONX, NY
CHECKED BY:	

APPROVED BY:	DATE:	SCALE:	DRAWING NO.	FIGURE
	2/24/06	AS SHOWN	114926-03	3

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VERIFY SCALE 0 1"

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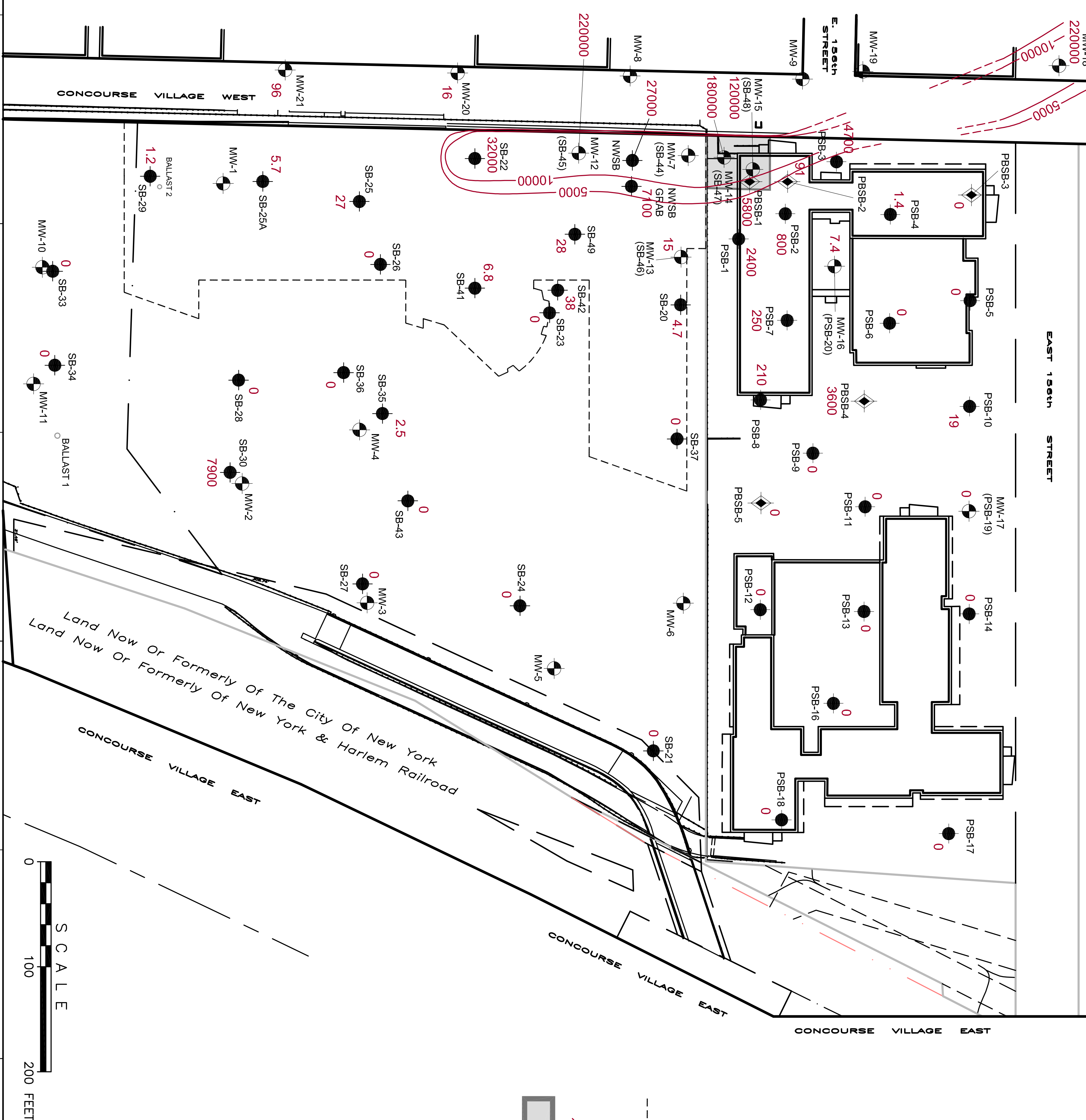
OFFICE	DRAWING NUMBER	114926-04
ALBANY, NY		

REFERENCE:
BASEMAP PROVIDED BY NYCSCA. SG AND MW LOCATIONS LOCATIONS SURVEYED BY GEOD IN MARCH AND MAY 2005. SB, TP, AND BALLAST LOCATIONS SURVEYED/MEASURED BY SHAW IN MAY 2005.



LEGEND
MONITORING WELL
SOIL BORING
SOIL BORING (12 TO 15 FEET) (PSB)
BEDROCK SOIL BORING (PBSB)
TEST PIT/BALLAST PILE
PROPOSED FOOTPRINT OF SCHOOL
250 NAPHTHALENE CONCENTRATION
NAPHTHALENE CONTOUR (ppb) (DASHED WERE INFERRED)
SUPPLEMENTAL REMEDIAL AREA

Shaw Shaw Environmental, Inc.

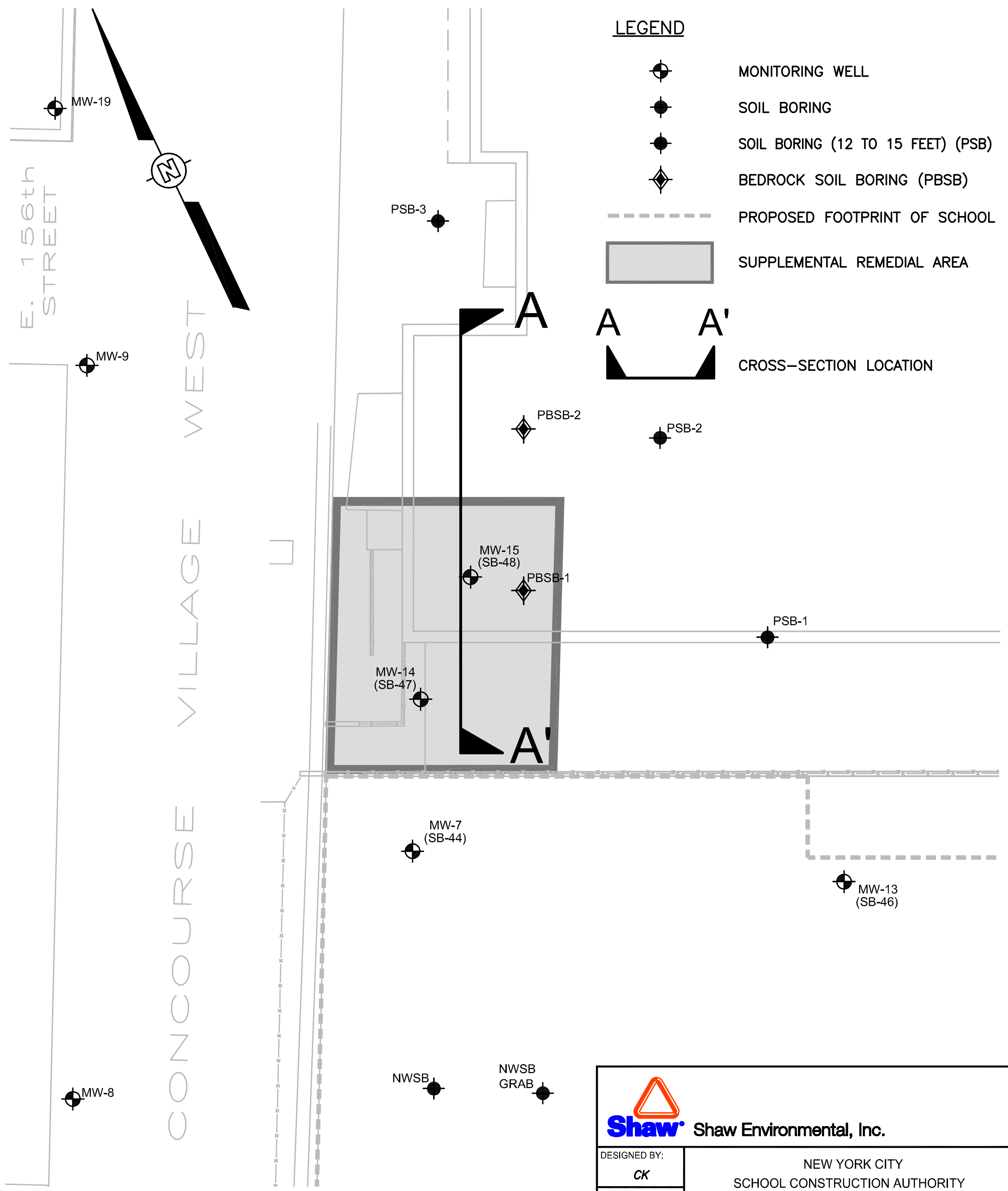
SCHOOL CONSTRUCTION AUTHORITY

NAPHTHALENE IN SOIL

FORMER METRO NORTH PROPERTY
672 CONCOURSE VILLAGE WEST, BRONX, NY

DESIGNED BY:	CK
DRAWN BY:	dbt
CHECKED BY:	
APPROVED BY:	
DATE:	2/24/06
SCALE:	AS SHOWN
DRAWING NO.	114926-04
FIGURE	4

REV	DESCRIPTION / ISSUE	DATE	APPROVED



0 30 60

SCALE IN FEET

REFERENCE:
BASEMAP PROVIDED BY NYCSCA

Shaw Environmental, Inc.

DESIGNED BY: CK	NEW YORK CITY SCHOOL CONSTRUCTION AUTHORITY			
DRAWN BY: DBT	CROSS SECTION LOCATION PLAN			
CHECKED BY:	FORMER METRO NORTH PROPERTY 672 CONCOURSE VILLAGE WEST, BRONX, NY			
APPROVED BY:	DATE: 2/24/06	SCALE: AS SHOWN	DRAWING NO. 114926–05	FIGURE 5

OFFICE New York, NY | DRAWING NUMBER 114926–05

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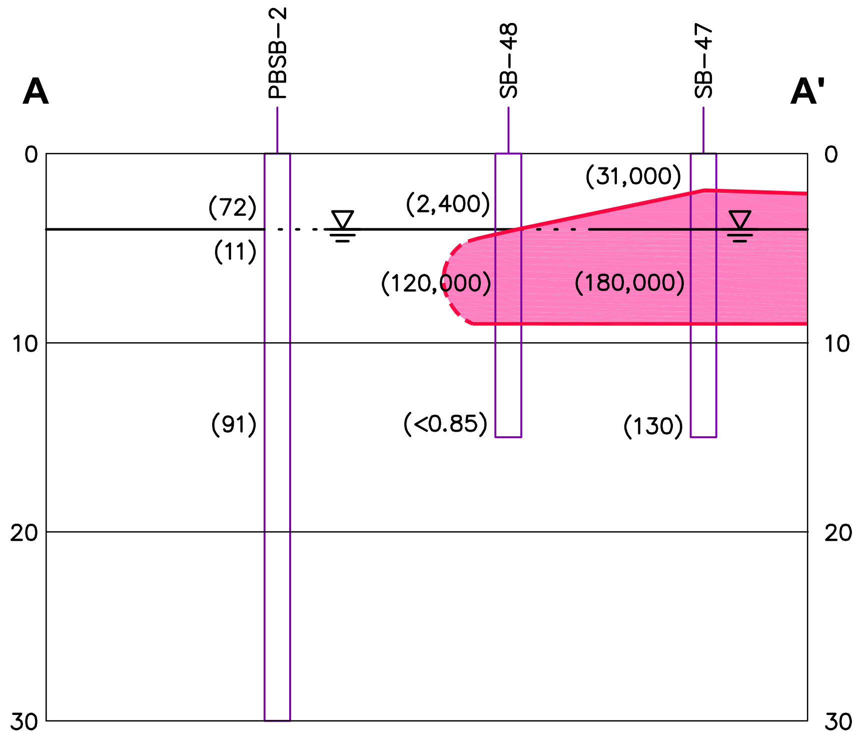
File: N:\Cad\Projects\NYCSCA – SRAWP\Project Drawings\HANYSD–13.dwg Layout: PDF User: Dave.Tice Mar 02, 2006 – 2:05pm

OFFICE: New York, NY | DRAWING NUMBER: 114926–06



LEGEND:

(32000) NAPHTHALENE CONCENTRATION ppb

WATER TABLE

NAPHTHALENE CONCENTRATION ABOVE RECOMMENDED SOIL CLEANUP OBJECTIVE

0 25 50
HORIZONTAL SCALE IN FEET

0 10 20
VERTICAL SCALE IN FEET

Shaw Environmental, Inc.

DESIGNED BY: CK
DRAWN BY: DBT
CHECKED BY:
APPROVED BY:

NEW YORK CITY
SCHOOL CONSTRUCTION AUTHORITY

NAPHTHALENE CONCENTRATIONS IN SOIL ALONG CROSS SECTION A-A'
FORMER METRO NORTH PROPERTY
672 CONCOURSE VILLAGE WEST, BRONX, NY

DATE:	SCALE:	DRAWING NO.	FIGURE
2/24/06	AS SHOWN	114926–06	6

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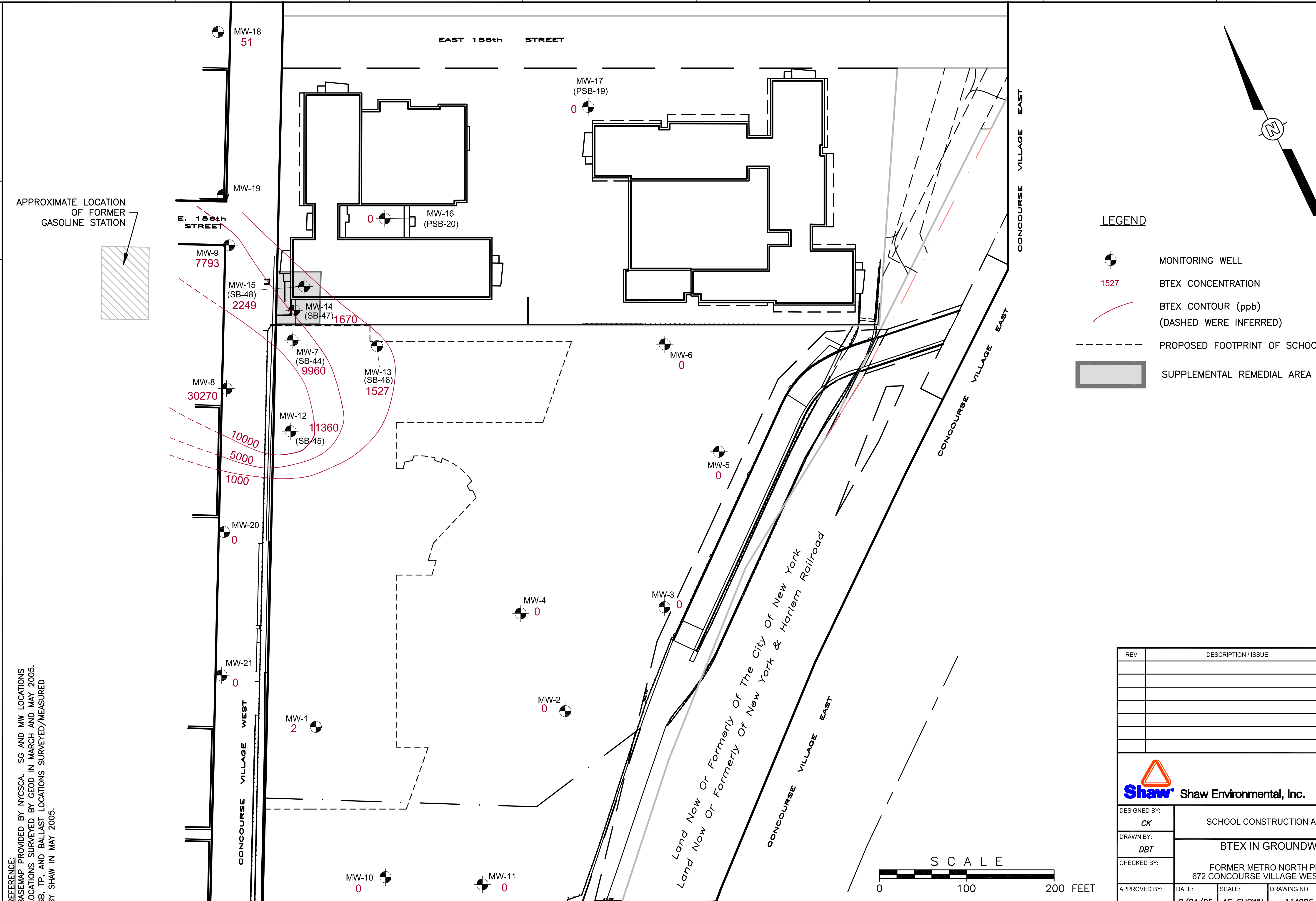
OFFICE	DRAWING NUMBER	114926-07
ALBANY, NY		

REFERENCE:
BASEMAP PROVIDED BY NYCSCA. SG AND MW LOCATIONS LOCATIONS SURVEYED BY GEOD IN MARCH AND MAY 2005. SB, TP, AND BALLAST LOCATIONS SURVEYED/MEASURED BY SHAW IN MAY 2005.



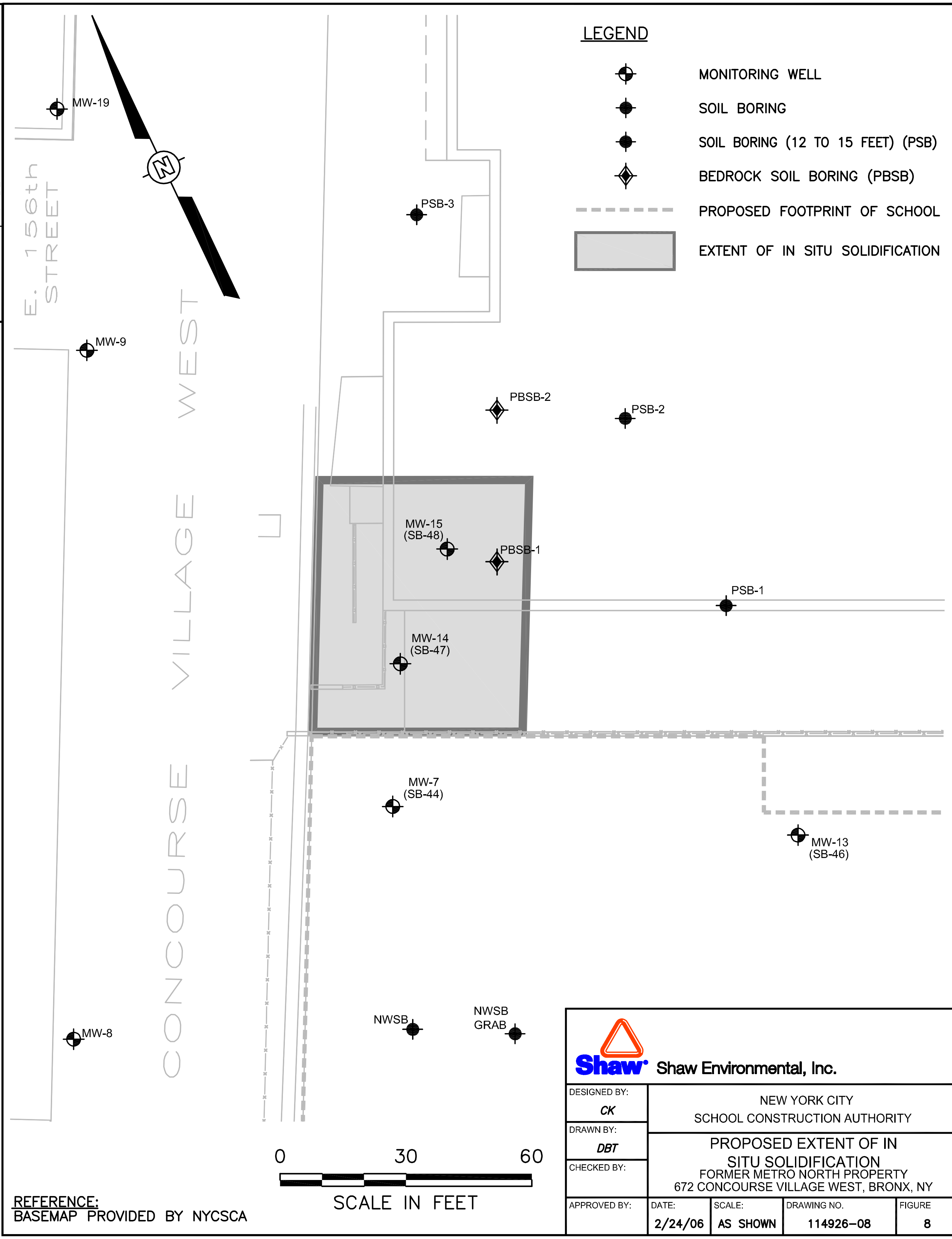
LEGEND

- MONITORING WELL
- 1527 BTEX CONCENTRATION
- BTEX CONTOUR (ppb) (DASHED WERE INFERRED)
- PROPOSED FOOTPRINT OF SCHOOL
- SUPPLEMENTAL REMEDIAL AREA

REV	DESCRIPTION / ISSUE	DATE	APPROVED

Shaw Environmental, Inc.

DESIGNED BY: CK	SCHOOL CONSTRUCTION AUTHORITY
DRAWN BY: DBT	BTEX IN GROUNDWATER
CHECKED BY:	FORMER METRO NORTH PROPERTY 672 CONCOURSE VILLAGE WEST, BRONX, NY
APPROVED BY:	DATE: 2/24/06 · SCALE: AS SHOWN · DRAWING NO. 114926–07 · FIGURE 7



REFERENCE:
BASEMAP PROVIDED BY NYCSCA

Shaw Environmental, Inc.

DESIGNED BY: CK	NEW YORK CITY SCHOOL CONSTRUCTION AUTHORITY			
DRAWN BY: DBT	PROPOSED EXTENT OF IN SITU SOLIDIFICATION FORMER METRO NORTH PROPERTY 672 CONCOURSE VILLAGE WEST, BRONX, NY			
CHECKED BY:				
APPROVED BY:	DATE: 2/24/06	SCALE: AS SHOWN	DRAWING NO. 114926-08	FIGURE 8

OFFICE New York, NY | DRAWING NUMBER 114926-08

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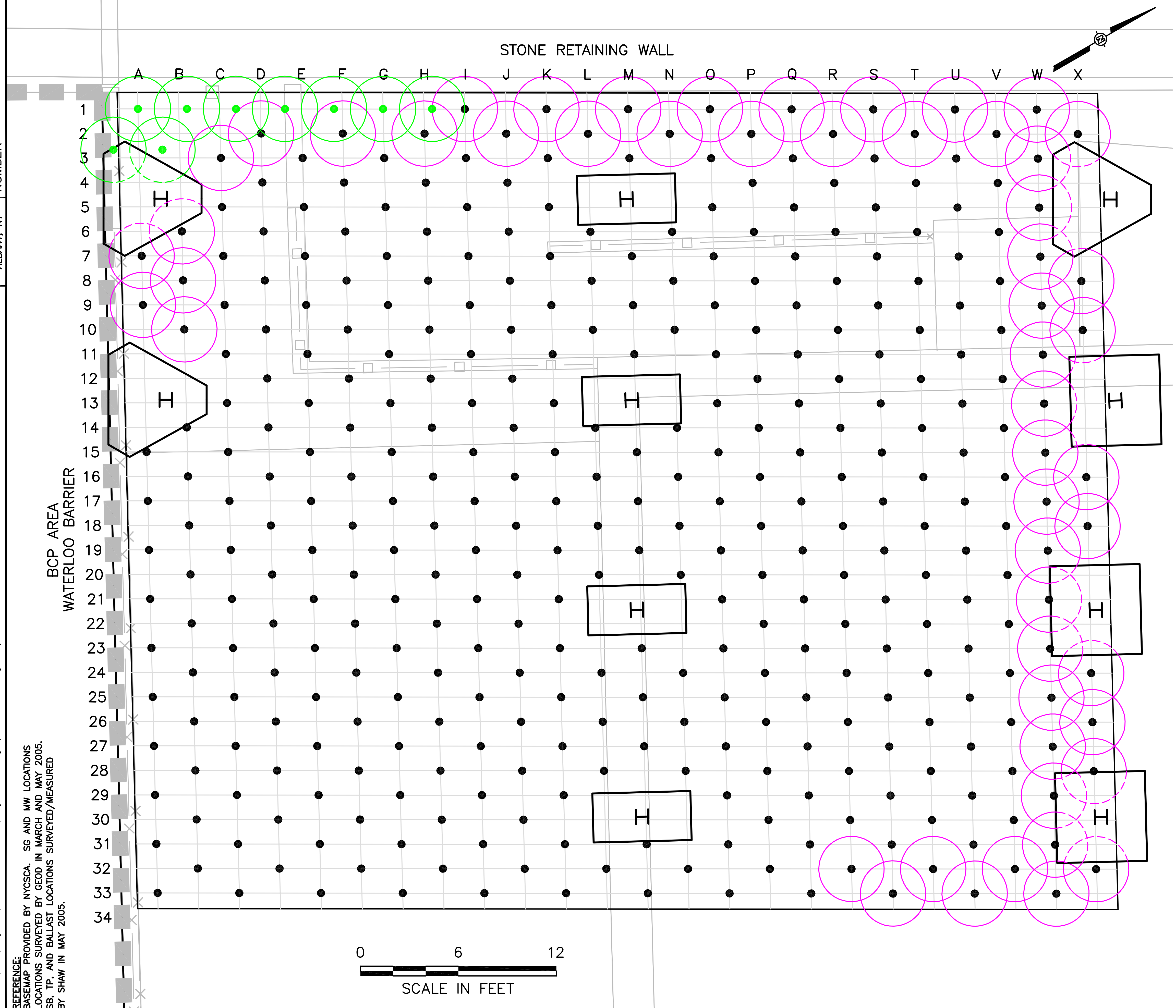

LEGEND

- CENTER OF HYDRAULIC BARRIER JET GROUT COLUMN
- CENTER OF SRA JET GROUT COLUMN
- OUTLINE OF 4' DIAMETER HYDRAULIC BARRIER JET GROUT COLUMN
- OUTLINE OF 4' DIAMETER SRA JET GROUT COLUMN
- DASHED OUTLINE INFERS THAT JET GROUT COLUMN IS BENEATH PILE CAP
- PILE CAP PC2
- PILE CAP PC3
- PILE CAP PC4

NOTE:
THIS FIGURE IS NOT FOR DESIGN. ALL LOCATIONS SHOWN ON FIGURE ARE APPROXIMATE.

REFERENCE:
BASEMAP PROVIDED BY NYCSCA. SG AND MW LOCATIONS LOCATIONS SURVEYED BY GEOD IN MARCH AND MAY 2005. SB, TP, AND BALLAST LOCATIONS SURVEYED/MEASURED BY SHAW IN MAY 2005.

VERIFY SCALE 0 1"

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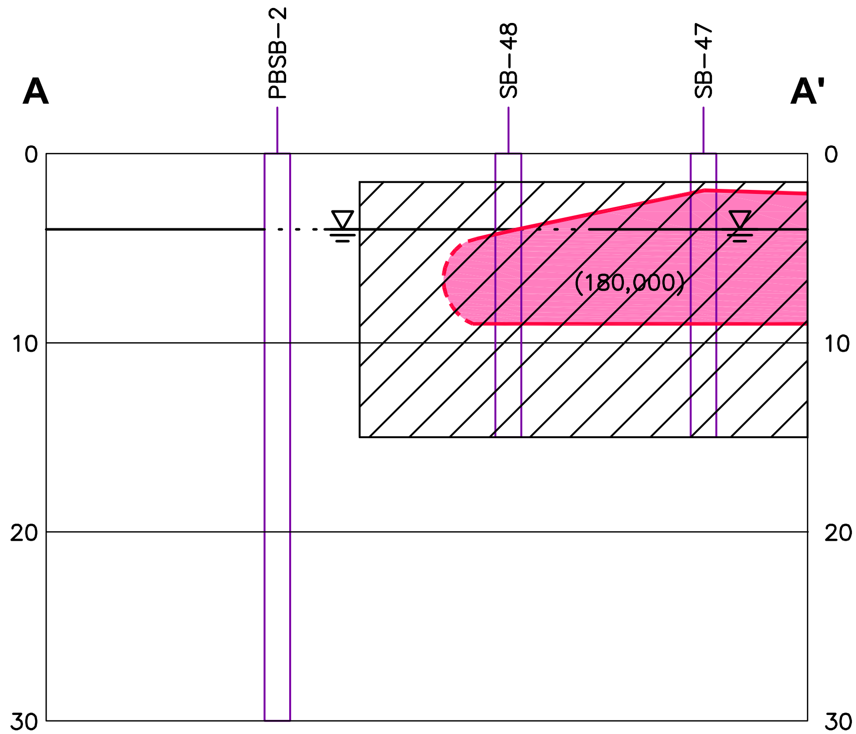
OFFICE ALBANY, NY | DRAWING NUMBER 114926-07

REV	DESCRIPTION / ISSUE	DATE	APPROVED

Shaw Environmental, Inc.

DESIGNED BY: CK	SCHOOL CONSTRUCTION AUTHORITY
DRAWN BY: DBT	PROPOSED LAYOUT OF JET GROUT COLUMNS FORMER METRO NORTH PROPERTY 672 CONCOURSE VILLAGE WEST, BRONX, NY
CHECKED BY:	
APPROVED BY:	DATE: 2/24/06 · SCALE: AS SHOWN · DRAWING NO. 114926-09 · FIGURE 9

OFFICE: New York, NY | DRAWING NUMBER: 114926–06



LEGEND:

- WATER TABLE
- NAPHTHALENE CONCENTRATION ABOVE RECOMMENDED SOIL CLEANUP OBJECTIVE
- IN SITU SOLIDIFIED MASS

0 25 50
HORIZONTAL SCALE IN FEET

0 10 20
VERTICAL SCALE IN FEET

Shaw Environmental, Inc.

DESIGNED BY: CK	NEW YORK CITY SCHOOL CONSTRUCTION AUTHORITY
DRAWN BY: DBT	IN SITU SOLIDIFIED MASS THROUGH CROSS SECTION A-A' FORMER METRO NORTH PROPERTY 672 CONCOURSE VILLAGE WEST, BRONX, NY
CHECKED BY:	
APPROVED BY:	DATE: 2/24/06 · SCALE: AS SHOWN · DRAWING NO. 114926–10 · FIGURE 10