



Report

BOSTON REDEVELOPMENT AUTHORITY

**Phase I Initial Investigation/
Tier Classification**

**PARCEL P-3 Tremont/Whittier St
RTN 3-15009 Roxbury**

April 1998

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1.0 EXECUTIVE SUMMARY AND RECOMMENDATIONS

1.1 Executive Summary

Weston & Sampson Engineers, Inc. (WSE) was contracted by the Boston Redevelopment Authority (BRA) to perform a Phase I Initial Site Investigation (Phase I) at Parcel P-3 located at the intersection of Whittier and Tremont Streets in Roxbury, Massachusetts. The purpose of this investigation was to determine whether there are, or have been, releases of oil and/or hazardous materials (OHM) and to evaluate the hydrogeological conditions at Parcel P-3. This investigation was performed in accordance with the Oil and Hazardous Material Release Prevention and Response Act, Massachusetts General Law Chapter 21E (MGL c. 21E) and the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000.

The Phase I included a site inspection, a review of city records, a subsurface investigation program including test pits, soil borings and groundwater monitoring wells, analysis of soil and groundwater and a preliminary risk characterization. In addition, two geotechnical borings were advanced on the property. WSE excavated 7 test pits, advanced 14 soil borings and installed 12 groundwater monitoring wells at the property. WSE submitted soil and groundwater samples to AMRO Environmental Laboratories Corporation for an analysis of Total Petroleum Hydrocarbons (TPH), Volatile Organic Compounds (VOCs), Polynuclear Aromatic Hydrocarbons (PAHs) and RCRA 8 metals.

TPH, certain PAHs and lead were detected in soil samples at concentrations in excess of applicable reportable concentrations (RCs); however, contaminants detected in groundwater were all below RCs. In accordance with 310 CMR 40.0315, this exceedence required release notification to Department of Environmental Protection (DEP). Consequently, BRA submitted a Release Notification Form (RNF) to DEP on April 14, 1997. DEP issued release tracking number (RTN) 3-15009 to this release.

Following the initial field work, WSE performed an additional soil boring program to further characterize the extent of contamination in fill in the northern portion of the property. WSE advanced 17 borings on a grid pattern and analyzed soil samples at three-foot intervals.

TPH, certain PAHs and lead concentrations exceeding applicable Method 1 cleanup standards were detected in soil samples from the topographically elevated area of fill in the northern portion of the property. In addition, certain PAHs exceeded Method 1 cleanup standards in fill below pavement in the area of Parcel P-3 southwest of the Whittier Street Health center (the northeast corner of Vernon and Hampshire Streets). Lead concentrations, analyzed using the Toxicity Characterization Leaching Procedure (TCLP), were all below the RCRA action level of 5 milligrams per liter (mg/l).

WSE tier classified the site in accordance with 310 CMR 40.1500. The site was classified as a Tier II site.

1.2 Recommendations

Based on the data collected during the Phase I, WSE recommends the following:

- 1) Preparation of a Method 3 Risk Assessment to assess the potential impact to human-health and the environment from residual soil contamination. If a condition of no significant risk exists a Response Action Outcome (RAO) can be prepared for the site. However, if significant risk exists, excavation of contaminated soils may be required.
- 2) The northern area of Parcel P-3 is currently proposed for development which is likely to include excavation of soils. Remediation efforts should be coordinated with construction activities. It is possible that following development of Parcel P-3, residual contaminated soils will either have been removed from the site or will be immobilized below pavement eliminating exposure to soils.

2.0 GENERAL PROPERTY INFORMATION

2.1 Property Location and Description

2.1.1 Geographic Location

Parcel P-3 (the property) is an approximately 341,819 square foot (7.85 acres) lot located in the Campus High School Urban Renewal Area in Roxbury, Massachusetts (see Figure 1, Locus Map). Parcel P-3 is bounded by Tremont Street to the north, Whittier Street to the east, Downing Street to the south and the Madison Park High School and Linden Park Street to the west.

The geographical location for the property is described as follows:

UTM Coordinates:	N	4,688,700 m
	E	327,800 m

Latitude/Longitude:	42°20'03" N
	71°05'21" W

2.1.2 Site Description

The BRA owns Parcel P-3, which currently contains two structures, Connolly's Tavern and the Whittier Street Health Center, located on the northern and northeastern portion of the parcel, respectively. The central and southern portions of the parcel are overgrown and undeveloped and crossed by former streets (Hampshire and Vernon). The southwestern portion of the parcel is occupied by a large asphalt-paved parking area used by the adjacent Madison Park High School. The BRA subdivided Parcel P-3 into Parcels P-3X, P-3Y and P-3Z. A plan showing these subdivisions and a second plan showing existing utilities across the property are included in Appendix A.

Connolly's Tavern is a single story structure with a basement. It is connected to municipal water and sewer and is currently heated by natural gas. Connolly's Tavern is currently vacant and is scheduled for demolition in April 1998. The Whittier Street Health Center is a four story building, with basement. It is also connected to municipal water and sewer and is heated by oil. A vaulted underground storage tank (UST) is located in the basement of the health center. Two fill and vent

pipes were observed adjacent to the exterior wall of the health center; however, no information about a potential second tank was available during the site visit. The northwest portion of the site is a vacant area containing approximately 6-feet of artificial fill. In general, the site topography is flat, with the exception of the filled area behind Connolly's Tavern. With the exception of the filled area and landscaping, the rest of the parcel is paved. At the start of our investigation, this area of the site was partially fenced; however, access was available from Whittier Street. This fence separated the Madison Park High School parking lot from the rest of Parcel P-3 (see Figure 2, Site Plan). Since beginning the Phase I, the BRA has enclosed Parcel P-3 (with the exception of the portion used by the High School as a parking lot) with a 6-foot high security fence to restrict access. The fenced area includes the areas of contamination identified in the Phase I.

The number of workers on the property appears to be limited to the employees of the Whittier Street Health Center, estimated to be approximately 25 employees in total. In addition, the southern and southwestern portion of the property is utilized as a parking lot for the abutting high school. However, the areas of contamination are all in undeveloped portions of Parcel P-3. The disposal site is therefore defined as the topographically elevated area in the northern portion of the property bounded by Tremont, Vernon, Hampshire and Whittier Streets and Connolly's Tavern, plus the paved area bounded by Vernon, Downing and Hampshire Streets and the wall behind (southwest) of the Whittier Street Health Center. Consequently, there are no on-site workers at the disposal site.

Solid waste debris (mainly construction and demolition debris) was observed in the paved area of the site behind the Whittier Street Health Center. In addition, approximately 300 cubic yards of fill and an abandoned vehicle were dumped in this paved area. The additional fill was dumped in this area between January and March 1997.

No surface water or drainage swales were observed on the property. The Stony Brook Culvert (which is completely enclosed) borders the site and runs below Downing Street and Whittier Street (formerly Culvert Street). The Stony Brook Culvert ultimately discharges to the Muddy River, approximately ½-mile north-northwest of the property, which in turn discharges to the Charles River.

2.2 Land Uses and Potential Receptors

2.2.1 Regional Environmental Assessment

2.2.1.1 Abutting and Surrounding Properties

The P-3 parcel is abutted by: 1) Tremont Street to the northwest, with a new Police Station located northwest of Tremont, 2) Whittier Street to the northeast with residences northeast of Whittier Street, 3) Downing Street east of the Whittier Street Health Center, and 4) Madison Park High School to the southwest and southeast. The Stony Brook Culvert (identified on historical atlases) abuts the site below Downing and Whittier Streets. Properties located within ¼-mile are predominantly residential, institutions (Health Center and High School), a police station and a railroad.

The site is located in a residential area of Roxbury; therefore, WSE estimates the residential population within ½-mile at greater than 1,000 people. One institution, the Whittier Street Health Center, is currently located on the property. The property is also abutted by the Madison Park High School to the southwest and southeast.

2.2.1.2 City Records

According to the City of Boston Assessor's office, Parcel P-3 is listed as Ward 9 Parcel 2980-10, Sheet #9021B. The property owner is listed as the Boston Redevelopment Authority.

The Boston Engineering office also had an aerial photograph of the property and the Office of Community Development had planimetric maps, older Assessor's plans showing previous parcels and Sanborn maps showing historical site use (see Section 3.1). According to the Flood Insurance Rate Map (FIRM), Community Panel No. 250286 0010C, dated April 1982, the site is not located in a zone designated as a flood zone.

On November 20, 1996, WSE requested information regarding USTs at the property, from the Boston Fire Department. The Fire Department provided a number of permits for fuel storage at former properties and one for the Whittier Street Health Center. A summary of the permits is provided below.

<u>Property Address</u>	<u>Name of Registrant</u>	<u>Type of Fuel/Quantity</u>	<u>Date</u>
20 Whittier Street	City of Boston Health Unit	3,000 Gallons Fuel Oil	exp 06/30/96
1176 Tremont St.	Estate of William B Rice	1,500 Gallons Gasoline	12/24/19
1176 Tremont St.	Henry D. Mac Ritchie	Acetylene and Oxygen	10/9/33
			Revoked 12/15/58
1178-1180 Tremont	Greenlow Motor Parts	550 Gallons Fuel	10/23/61
1184 Tremont St.	Connolly's Cafe	Cert. Of Occupancy	1/4/83 & 12/12/84
1186 Tremont St.	Paul George Realty	550 Gallons Fuel	No date
1186 Tremont St.	Hub Refrigeration Co.	550 Gallons Fuel	3/16/65

2.2.1.3 State Records - DEP Northeast Region

Prior to this Phase I Initial Site Investigation, no environmental studies had been conducted on Parcel P-3.

WSE reviewed the 1993 DEP Bureau of Waste Site Cleanup (BWSC) list of "Confirmed Disposal Sites and Locations To Be Investigated (LTBI)", its addendum (April 1994), and the Release Tracking List dated May 31, 1997. The following listed facilities are located within ¼-mile of the property:

<u>Name</u>	<u>Identification</u>	<u>Address</u>	<u>Status</u>
Parcel 22	Site #3-3429	1177-1229 Tremont St.	Transition Site
No Location Aid	RTN 3-11181	1170 Tremont Street	72-Hr Notification
Boston Housing Auth.	RTN 3-12401	10 Whittier Street	2-Hr Notification/ RAO Submitted

Three environmental assessments have been conducted by Rizzo Associates (1989, 1989 and 1991) for Parcel 22 (located across Tremont Street). Parcel 22 is the site of the new Police Headquarters Building. Rizzo indicated that groundwater at Parcel P-22 is flat and generally hydraulically upgradient of Parcel P-3. Rizzo identified a number of potential upgradient sources of OHM on Parcel 22 including a former gasoline station (at the northern end of Parcel 22), a former auto repair garage at 1207 Tremont Street, numerous former underground storage tanks (USTs), located in the central portion of Parcel 22 and a former auto repair garage at 1279 Tremont Street (southern portion of Parcel 22). Rizzo detected petroleum contamination in test pit soils, attributed to former USTs and evidence of

petroleum contamination in groundwater at Parcel P-22. In addition, Rizzo identified four possible USTs at the Former Old South Oil located across from Connolly's Tavern at the corner of Whittier and Tremont Streets.

No additional information on the other two releases was available; however, the release at the Boston Housing Authority property, located northeast of Whittier Street to the site has received an RAO. The Tremont Street release is located further up Tremont Street to the north.

2.2.2 Drinking Water Supplies

The two structures on Parcel P-3 and the surrounding area are served by municipal water. No public water supply wells are located within a mile of the property. No private water supplies are located within 500 feet of the property.

2.2.3 Potential Environmental Receptors

Parcel P-3 is bordered by a residential neighborhood and a public school. In addition a health care facility (Whittier Street Health Center) is located within the property boundary. Other sensitive receptors near the property are shown on the area receptors map (Figure 3), prepared by the Massachusetts Geographic Information Systems (GIS). This figure also includes the 500-foot and ½-mile radii from the center of the property. The site is located in the Charles River Basin; however, Figure 3 does not identify any surface water bodies, wetlands or any potential productive aquifers within ½-mile of the site. The Stony Brook Culvert (currently underground) borders the site and is located below Whittier and Downing Streets. The nearest regulated open spaces are within 500-feet of the site, located northwest of Tremont Street and some additional small patches adjacent to Whittier Street. No public water supplies or other environmental receptors are shown within ½-mile of the property.

3.0 PROPERTY HISTORY

3.1 Owner/Operator and Operations History

According to the City of Boston Assessor's office, Parcel P-3 is listed as Ward 9 Parcel 2980-10, Sheet #9021B. The property owner is listed as the Boston Redevelopment Authority. The Assessor's map shows the Boston Edison substation abutting the western portion of Parcel P-3. However, Parcel P-3 formerly comprised of over 50 smaller lots and has been an urbanized area for over 100 years. A planimetric map dated 1996, shows the Whittier Street Health Center (called the George Robert White Fund Health Unit) and two small parcels located in the northeastern corner of the parcel at the present location of Connolly's Tavern. A 1977 aerial photograph shows the Whittier Street Housing Project and Health Center, the park behind the Health Center, Connolly's Tavern and the Boston Edison substation. Madison Park High School was partially built but not to the extent it is today. The rest of Parcel P-3 was leveled and undeveloped.

A 1962 planimetric map shows over 50 lots within the area of Parcel P-3 including St. John's Church and the Roxbury Crossing Station (containing a United States Postal Office) located on Tremont Street. The 1962 map also shows the Health Center building. Other historical publications reviewed included a 1931 Atlas of the City of Boston (G.W. Bromley & Co.), which identified numerous small lots on the present Parcel P-3. This atlas also identified a garage located on Whittier Street at the present location of the housing development, plus a Gulf station northeast of Tremont at the present location of Parcel 22 (the new Boston Police Headquarters). A Sanborn Atlas dated 1890, identified numerous lots including the Tremont Iron Foundry (located at the present location of the Whittier Street Health Center), an Electric Cable Manufacturer and the Roxbury Carpet Company all located within Parcel P-3.

3.2 Release History

Prior to this Phase I Initial Site Investigation, no environmental studies had been conducted of Parcel P-3, which formerly comprised of more than 50 smaller lots/parcels.

3.3 Oil and Hazardous Materials Use and Storage History

OHM use and storage includes the storage of fuel oil in the vaulted UST at the Whittier Street Health Center. Numerous potential sources of OHM have historically existed on parcel P-3 which has been developed since before 1890.

3.4 Waste Management History

Parcel P-3 is not used for regulated disposal of solid waste; however, Parcel P-3 has been the site of unauthorized dumping of solid waste including fill, construction and demolition debris, and an abandoned car.

3.5 Environmental Permits and Compliance History

3.5.1 Environmental and OHM Storage Permits

The only permits for the site which were available for review were the fuel storage permits described in Section 2.2.1.2.

3.5.2 Massachusetts General Law (MGL) Chapter 21E Response Action Permits

Prior to this investigation, no releases were reported at the site. During this investigation contaminant concentrations exceeding reportable concentrations were encountered. Consequently, the BRA submitted an RNF to DEP on April 14, 1997. Subsequently the DEP issued RTN 3-15009, and a Notice and Responsibility dated May 28, 1997, to this release (Appendix B).

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4.0 HYDROGEOLOGICAL CHARACTERISTICS

4.1 Subsurface Explorations

4.1.1 General

WSE performed the following field activities at Parcel P-3:

- Test Pit Excavation;
- Soil borings and groundwater monitoring well installation;
- Groundwater elevation survey; and
- Soil and groundwater sample collection and analysis.

All field methods during well and/or boring installation were performed in accordance with suggested procedures in Massachusetts DEP Publication #WSC-310-910 Standard References for Monitoring Wells. Field methods and procedures followed during this investigation are outlined in the following sections. The results of the field investigation are summarized in Section 5.0.

4.1.2 Test Pits

On November 27, 1996, seven test pits (TP-1, TP-2, TP-3, TP-4, TP-5, TP-6 and TP-7) were excavated in the filled northern portion of Parcel P-3 under the oversight of a WSE geologist. Test pits were excavated by Cyn Environmental, Inc. (Cyn) of South Boston, Massachusetts. The test pits were excavated to an approximate depth of eighteen feet below ground surface. Concrete blocks, boulders, tires and other large debris encountered within the test pits were backfilled to one side of the pits, so that subsequent soil borings advanced through the test pit locations would not encounter debris. Test pits locations are shown in Figure 2 and are described in the field notes in Appendix C.

4.1.3 Soil Borings

On December 3, 4, and 5, 1996, fourteen soil borings (WS-1 through WS-12, B-1 and B-2) were advanced into overburden by Zoinio-Hebert Inc., of Raynham, Massachusetts. The borings were advanced at the locations shown in Figure 2 under the oversight of a WSE geologist. Soil borings were advanced using hollow-stem auger (HSA) and drive and wash drilling techniques.

Soil boring WS-8, WS-9, WS-10, WS-12, B-1, and B-2 were advanced at the locations of TP-5, TP-4, TP-7, TP-1, TP-3, and TP-2, respectively. Soil borings WS-2 through WS-12 were advanced to depths of between 17 and 25 feet below ground surface. In order to provide geotechnical information for a potential future development, soil borings B-1, B-2, and WS-1 were advanced to depths of 61 feet, 61 feet, and 60 feet respectively. WS-1 was advanced in the parking lot of Connolly's Tavern near the eastern corner of the building. WS-2 was advanced near the northern corner of the Whittier Street Health Center. WS-3 and WS-4 were advanced in the vacant lot southwest of the Whittier Street Health Center. WS-5, WS-6, WS-7 and WS-11 were advanced in the parking area of the Madison Park High School. WS-8, WS-9, WS-10, and WS-12 were advanced in the topographically elevated filled area of Parcel P-3, located southwest of Connolly's Tavern. Separate auger flights were used for each boring and equipment was steam cleaned between borings. No oil, grease or other petroleum products were used to lubricate augers or rods.

Following the discovery of contaminants in the fill in the northern portion of the property, WSE performed additional investigation of this area to assess the vertical and horizontal distribution of contaminants in the fill. Between March 24 and 26, 1997, seventeen soil borings (B-101 through B-117) were advanced into shallow overburden by Soil Exploration of Leominster, Massachusetts. Soil borings B-101 through B-115 were advanced in the filled area southwest of Connolly's Tavern each to an approximate depth of 9 feet below grade. Soil borings B-116 and B-117 were advanced in the paved area behind (southwest of) the Whittier Street Health Center to a depth of 3 feet below grade. Split spoon soil samples were collected from 3-foot intervals from each boring. All borings were advanced under the oversight of a WSE geologist. Field notes and soil boring logs detailing subsurface conditions are also provided in Appendix C.

4.1.4 Groundwater Monitoring Wells

Twelve, two-inch diameter monitoring wells (WS-1 through WS-12) were installed in their respective soil borings, as part of the Phase I Investigation (see Figure 2 for locations). Monitoring wells were not installed in soil borings B-1, B-2 or B-101 through B-117.

Monitoring wells were installed in shallow overburden between fifteen and twenty-three feet below grade, with screened intervals typically between seven and seventeen feet below grade. All wells

were screened across the water table. WS-1 (which was drilled to a depth of 60 feet) was backfilled, sealed and screened between three and eighteen feet. All wells were constructed of Schedule 40, 2-inch inner diameter (ID) PVC riser pipe, attached with threaded joints to Schedule 40, 2-inch ID, 0.010-inch slotted PVC well screen. Each of the wells was constructed in general accordance with DEP publication WSC-310-91 entitled Standard References for Monitoring Wells. Wells WS-1 and WS-2 were finished with flush mounted metal roadboxes and wells WS-3 through WS-12 were finished with locking protective steel standpipes set in concrete. Well construction details, including screen intervals are presented in Appendix D. Following installation, the 2-inch monitoring wells were developed by hand bailing at least 5 well-bore volumes of water. All wells were allowed to equilibrate for approximately one week prior to sampling.

4.1.5 Survey

On December 10, 1996 and January 2, 1997, WSE conducted a survey for elevations of the twelve groundwater monitoring wells. These elevations were measured relative to an on-site temporary benchmark of 100.00 feet established relative to an arbitrary datum. The benchmark is located on top of the fire hydrant on the former Vernon Street near Tremont Street. The locations of test pits, soil borings and groundwater monitoring wells were taped from existing features.

4.1.6 Soil Sampling and Analysis

During advancement of soil borings, soil samples were collected using a 2-foot split-spoon sampler at five-foot intervals. Soils were classified on-site by a WSE field geologist using the Burnister Soil Classification System. Soil samples collected from the test pits and borings were screened in the field using a Photovac Microtip model HI-2000, fitted with a 10.6 electron volt (eV) lamp. The PID screening does not identify or quantify individual compounds, but provides an indication of relative levels of total volatile organic compounds (TVOCs) present in a sample (referenced to a standard of isobutylene in air). TVOC concentrations were measured using the headspace test described in the DEP Waste Site Cleanup Policy #WSC-94-400 - Interim Remediation Waste Management Policy for Petroleum Contaminated Soils.

Selected soil grab samples from test pits TP-1, TP-4, TP-5, and TP-7 were submitted for laboratory analysis. These test pits corresponded to soil borings WS-12, WS-9, WS-8, and WS-10,

respectively. Soil samples were also analyzed from soil borings WS-1, WS-2, WS-3, WS-4, WS-5, WS-6, WS-7 and WS-11 and B-101 through B-117.

December 1996 Sampling and Analysis

Twelve soil samples collected from test pits and soil borings (WS-1, WS-2, WS-3, WS-4, WS-5, WS-6, WS-7, TP-5/WS-8, TP-4/WS-9, TP-7/WS-10, WS-11 and TP-1/WS-12) were submitted to a state-certified laboratory for the analysis of VOCs by EPA Method 8260 and TPH-GC/FID petroleum scan by modified EPA Method 8100. Six soil samples were analyzed for PAHs by EPA Method 8100 and RCRA 8 metals. Samples were chosen based on visual and olfactory evidence of contamination, field screening data and the location of the soil borings relative to observed and/or historical contamination sources. The PID screening results are discussed in Section 5.1 of this report, the laboratory data are presented in Appendix E and the results are discussed in Section 5.2.1 of this report.

March 1997 Sampling and Analysis

The additional borings (B-101 through B-115) were advanced to a depth of 9 feet below grade with soil samples collected from 3-foot intervals. In addition, one sample was collected from the 1-3 foot interval from B-116 and B-117 (both of which were advanced to a depth of 3 feet below grade). All samples were submitted to a state-certified laboratory for the analysis of TPH (by GC/FID), PAHs and RCRA 5 metals (arsenic, cadmium, chromium, lead and mercury). Six samples (from two borings) were also analyzed for polychlorinated biphenyls (PCBs). In cases where total metal concentrations exceeded twenty times their respective TCLP regulatory level (e.g. lead concentrations exceeded 100 milligrams per kilogram (mg/kg)), soils were analyzed for metals by TCLP. The laboratory data are presented in Appendix E and the results are discussed in Section 5.2.1 of this report.

4.1.7 Groundwater Sampling and Analysis

On December 12, 1996, WSE collected groundwater samples from the twelve newly installed monitoring wells (WS-1 through WS-12). Prior to sampling, the standing volume of water in each well was calculated using the depth to water and total well depth measurements. Five times the standing volume of water was purged from each monitoring well prior to sampling. Samples were

collected from monitoring wells using dedicated polyethylene disposable bailers. Temperature, pH, specific conductivity and dissolved oxygen of each sample were measured in the field prior to the collection of each sample.

Groundwater samples from each monitoring well were collected and analyzed for VOCs by EPA Method 8260 and TPH-GC/FID petroleum scan by modified EPA Method 8100. Selected groundwater samples (six total) were collected and analyzed for PAHs by EPA Method 8100 and dissolved RCRA 8 metals. A VOC trip blank, and a VOC and TPH duplicate were collected and analyzed as part of quality assurance/quality control (QA/QC) procedures. Laboratory analyses were performed by AMRO Environmental Laboratory Corporation, a Massachusetts-certified laboratory located in Merrimack, New Hampshire. All samples were stored on ice after collection and during transportation to the laboratory. Samples were handled and relinquished using standard quality assurance and chain-of-custody procedures. The laboratory results are provided in Appendix E and are discussed in Section 5.2.2 of this report.

4.2 Regional Geology and Hydrogeology

4.2.1 Regional Geology

According to the USGS Bedrock Geologic Map of Massachusetts (Zen *et al.*, 1983) Parcel P-3 is underlain by Roxbury Conglomerate. This unit is typically a conglomerate, sandstone, siltstone, argillite and melaphyre, consisting of the Brookline, Dorchester and Squantum members. In general, overburden in the Boston area consists of the following units (Woodhouse *et al.*, 1991):

- Urban Fill - consisting of a wide range of materials;
- Shallow Marine and Marsh Deposits - consisting of sand and peat deposits;
- Deep Marine Deposits - consisting of silt and clay deposits.

4.2.2 Regional Hydrogeology

Regionally, groundwater is assumed to follow topography and flow to the northwest, towards the Muddy River. It is possible that locally groundwater flow direction may be influenced by Stony Brook Culvert.

4.3 Site Geology and Hydrogeology

4.3.1 Site Geology

The geological units encountered during this investigation encountered most overburden units described in Section 4.2.1. Bedrock was not encountered in any borings. The following units were encountered in overburden and include, in stratigraphic succession from youngest to oldest:

- Urban Fill - heterogenous and in certain areas included construction and demolition debris, bricks, concrete, boulders and tires;
- Organic Deposits - consisting of peat and organic silt; and
- Sand - consisting of fine to coarse sand, and trace gravel.

The fill unit varied from 12 feet to 19 feet thick across the site. The underlying organic deposits were approximately 10 feet thick and the sand unit was detected in all deep borings from below the organic layer to the bottom of borings (approximately 60 feet below grade). The soil boring logs are included in Appendix C.

4.3.2 Groundwater Flow

All wells were gauged on December 5, 6 and 12, 1996. Well gauging and groundwater elevation data are presented in Table 1. The groundwater gradient across the site is very flat with groundwater elevations varying by up to 2.87 feet across the site. On December 5, 1996, groundwater elevations ranged from a maximum of 86.62 in WS-12 to a minimum of 83.75 in WS-2. Groundwater elevations were consistently highest in WS-12 and were lowest in either WS-2 or WS-5 during the well gauging events. These data were used to create the groundwater contours in Figure 4.

The horizontal gradient across Parcel P-3 is least in the southwestern portion of the property (parking lot of Madison Park High School) and the fill area and central part of the property (Figure 4), with the hydraulic gradient (I) estimated to be 0.0028 in the southwestern portion of the site and 0.02 in the northern portion of the site, behind Connolly's Tavern.

Using conservative tabulated hydraulic conductivity (K) value of 0.2834 feet/day (Freeze and Cherry, 1979), an average porosity value of 0.2 (Driscoll, 1989) and the I range shown above, the

estimated groundwater velocity across the property varies from approximately 12 feet/year to 100 feet/year. This is below the 200 feet/year threshold for substantial release migration as defined in 310 CMR 40.0413 (2). All calculations are presented in Appendix F.

4.3.3 Property Characterization

4.3.3.1 Groundwater

Parcel P-3 does not meet any of the RCGW-1 reporting criteria as defined in 310 CMR 40.0362. Therefore, groundwater must be compared to reporting category RCGW-2 standards for notification of a release.

Parcel P-3 does not meet any of the GW-1 criteria as defined in 310 CMR 40.0932 (4). Depth to groundwater over most of Parcel P-3 is less than 15 feet except for the elevated filled area behind Connolly's Tavern (and at WS-11), where depth to groundwater is greater than 15 feet below grade. The disposal site area, which includes the area of fill in the northern portion of the property and the paved area southeast of Hampshire Street, behind the Whittier Street Health Center are all greater than 30 feet from the two buildings at the property. Consequently portions of Parcel P-3 (where groundwater is less than 15 feet and which are within 30 feet of the Whittier Street Health Center or Connolly's Tavern) meet the GW-2 criteria as defined in 310 CMR 40.0932 (6). Groundwater across the rest of Parcel P-3 and specifically at the disposal site is classified as GW-3 in accordance with 310 CMR 40.0932 (3).

4.3.3.2 Soils

Parcel P-3 is within 500 feet of residential dwellings (located on Whittier Street); therefore, it meets the RCS-1 reporting criteria as defined in 310 CMR 40.0361. Therefore, soils at the property must be compared to reporting category RCS-1 standards for notification of a release.

Under current conditions at the disposal site (discounting the parts of Parcel P-3 which are beyond the limits of contamination), the soils are classified as S-3 for both surficial soils and for soils greater than 3 feet deep, as defined in 310 CMR 40.0933 (7). This is because: 1)

children are considered not present because access to Parcel P-3 has been restricted by a fence surrounding the property, 2) adult frequency of use is considered low because access to the disposal site is restricted and is in a portion of the property which is not in use, 3) the intensity of site use is considered low, and 4) the soils are considered accessible, as some areas of contamination are unpaved with contaminants detected in the top three feet.

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5.0 NATURE AND EXTENT OF CONTAMINATION

5.1 Evidence of OHM Releases to the Environment

No surficial soil staining was observed at the property. Despite obvious signs of dumped soil, construction and demolition debris, tires and an abandoned car, there was no evidence of releases of OHM observed at the parcel. The area of Parcel P-3 which received most of the dumped materials was the paved area southeast of Hampshire Street, behind the Whittier Street Health Center.

The fill at the site was heterogeneous, containing concrete construction debris, bricks, wood, metal debris, asphalt and tires. Evidence of OHM was limited in test pits and soil borings, based on visual, olfactory evidence and PID screening data. Evidence of OHM was observed in TP-1 (WS-12) where a dark gray discoloration and slight petroleum odor was encountered at the bottom of the sandy fill/top of peat layer (depth 11.5 to 12.5 feet below grade). Soil field screening results from the soil boring program are summarized in Table 2. Maximum headspace readings were 34.0 parts per million (ppm) in the sample described above from TP-1 (11.5-12.5 feet). Background air PID readings did not exceed 0.2 ppm, indicating that VOCs were not present in the atmosphere.

5.2 Environmental Sampling and Analysis

5.2.1 Soil Analysis Results

TPH, PAHs and lead concentrations exceeding applicable reportable concentrations (RCs) were detected in WS-8, WS-9, WS-10 and WS-12 (see Table 3). All these soil borings are located in the area of fill southwest of Connolly's Tavern (see Figure 1 for boring locations). VOCs were detected in only one soil sample at concentrations below reportable concentrations. Of the contaminants detected exceeding RCs, certain PAHs (in TP-5/WS-8 and TP-1/WS-12), TPH (in TP-1/WS-12) and lead (in TP-4/WS-9) also exceeded their respective Method 1 cleanup standards (see Table 3).

The subsequent field program to assess soil contamination in the fill southwest of Connolly's Tavern also detected PAHs, TPH and lead in selected samples at concentrations which exceeded Method 1 cleanup standards. PAHs were detected in most samples with the following contaminants detected at concentrations exceeding Method 1 cleanup standards: benzo (a) anthracene, benzo (b)

fluoranthene, benzo (a) pyrene, dibenzo (a,h) anthracene and indeno (1,2,3-cd) pyrene. TPH exceeded Method 1 cleanup standards in three samples and lead exceeded Method 1 cleanup standards in seven samples. However, the TCLP analysis for lead (which was conducted on all samples where total lead concentrations exceeded 100 mg/kg) did not fail the RCRA action level of 5 milligrams per liter (mg/l) (Table 4). Analytical data are summarized in Tables 3 and 4 and are presented in the laboratory reports included in Appendix E.

Since contaminant concentrations in soil exceeded RCs the DEP was notified of the conditions encountered at the site. The BRA submitted an RNF to DEP's Northeast Regional Office on April 14, 1997. Consequently DEP issued an NOR to the BRA on May 28, 1997 (see Appendix B).

5.2.2 Groundwater Analysis Results

Contaminants detected in groundwater were below reportable concentrations. The only contaminants detected were three VOCs and barium, which were detected in several wells (Table 5). Analytical data are presented in the laboratory reports included in Appendix E. The sample results and applicable RCs are shown in Table 5.

Field parameter data (Table 5) show fairly consistent pH across the site ranging from 6.1 in WS-11 to 7.0 in WS-3. Elevated specific conductance readings ($> 1,000 \mu\text{S}/\text{cm}$) were detected in groundwater in WS-2, WS-5, WS-8, WS-9 and WS-12. It is likely that the nature of the urban fill and possible infiltration of road runoff may have contributed to elevated specific conductance. Dissolved oxygen concentrations varied from 1.4 mg/l in WS-9 to 4.4 mg/l in WS-6 and WS-7.

5.3 Extent of Contamination

The results of the Phase I Initial Investigation indicate that contamination at the site appears to be limited to PAHs, TPH and lead detected in urban fill at the site. The data show that an area of fill located in the northern portion of the site contains these contaminants at concentrations which exceeding Method 1 cleanup standards. In addition, certain PAHs (benzo (a) anthracene and benzo (a) pyrene) have been detected in fill located below pavement in the area behind the Whittier Street Health Center (B-116 and B-117) at concentrations exceeding Method 1 cleanup standards. Groundwater does not appear to be impacted by a release of OHM at the site, with the contaminants

in groundwater all detected at concentrations below Method 1 cleanup standards. Based on the results of the Phase I, there is no need for an Immediate Response Action at Parcel P-3.

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6.0 MIGRATION PATHWAYS AND EXPOSURE POTENTIAL

6.1 Air

Background PID readings did not exceed 0.2 ppm, indicating that organic vapors have not affected the atmosphere. In addition volatile contaminants detected in groundwater were at concentrations below RCs and Method 1 GW-2 cleanup standards (the applicable standard for indoor air quality). It is therefore unlikely that VOCs have affected indoor air quality in the two structures at the property (Whittier Health Center and Connolly's Tavern).

6.2 Soil

Contaminants have been detected in both surficial (top three feet) and subsurface soils at the disposal site, with contaminants detected in the urban fill at Parcel P-3. Large portions of Parcel P-3 are paved, which limits access to contaminated soils. In addition, a chain link fence has been erected to prevent access to the parcel (specifically all areas where contaminants were detected exceeding applicable cleanup standards), which will also prevent exposure to soil in unpaved areas.

6.3 Groundwater

Contaminants detected in groundwater were at concentrations below RCs and Method 1 cleanup standards.

6.4 Surface Water

There are no surface water bodies at the parcel. The Stony Brook Culvert borders the parcel below Whittier and Downing Streets.

6.5 Known and Potential Human Exposures

Potential human receptors include workers and visitors at the Whittier Street Health Center and Connolly's Tavern, students parking in the parking lot for Madison Park High School, plus local residents and trespassers. However, contamination appears to be limited to soil and urban fill located in the area south and southwest of Connolly's Tavern which is currently undeveloped, and an area below pavement at B-116 and B-117. Consequently, potential human receptors in this portion of the site are limited to trespassers. However, access to this portion of Parcel P-3 is restricted by a

chain link fence. Contaminant concentrations of VOCs in groundwater are low enough such that vapor migration from groundwater to the two buildings on Parcel P-3 is unlikely.

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7.0 NUMERICAL RANKING SCORE AND TIER CLASSIFICATION

In accordance with 310 CMR 40.1500, WSE completed a Numerical Ranking System Scoresheet (NRS) and Tier Classification based on the data collected during the Phase I investigation. The release site did not meet any of the Tier I inclusionary criteria identified in 310 CMR 40.0520 (2) and based on the NRS score of 143, the site was classified as a Tier II site. The completed NRS, with original signatures, is included in Appendix G.

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8.0 REFERENCES

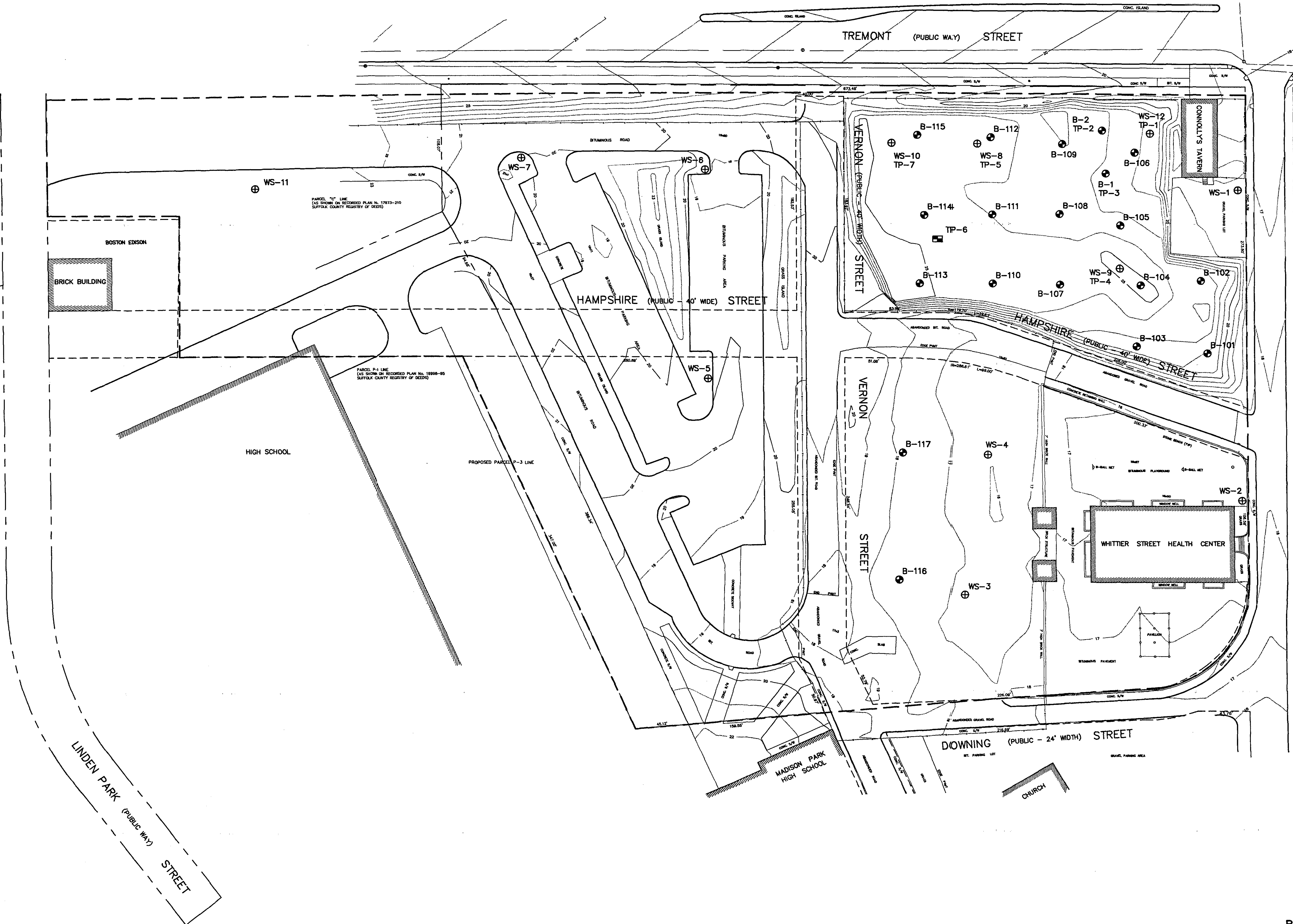
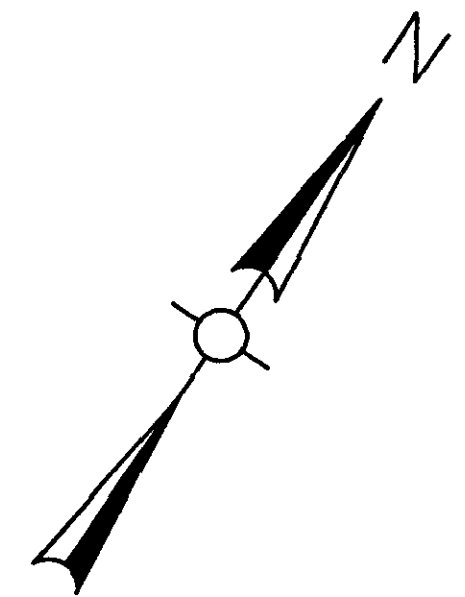
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9.0 LIMITATIONS

Should additional information become available concerning Parcel P-3 or neighboring properties in the future, that information should be made available to Weston & Sampson Engineers, Inc. for review so that the conclusions presented in this report may be modified as necessary. The information collected has not been used to assess if contaminants from this property have migrated to other nearby properties, or if contaminants from potential off-site sources have impacted Parcel P-3. This report was prepared on behalf of and for the exclusive use of the Boston Redevelopment Authority for use in evaluating the environmental conditions at the property.

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LEGEND:

- B-1 BORING
- ⊕ WS-1 MONITORING WELL
- TP-6 TEST PIT
- P-3 PARCEL BOUNDARY
- - - CHAIN LINK FENCE

FIG 2
ROXBURY, MASSACHUSETTS
BRA/EDIC PARCEL P-3

SITE PLAN

FEBRUARY, 1998 SCALE: 1" = 40'

- SOURCES:**
1. PLAN OF LAND IN BOSTON PARCELS P-3X, P-3Y, P-3Z, NOV. 1996 GREEN INTERNATIONAL AFFILIATES, INC.
 2. BRA/EDIC RUGGLES PLAZA PLAN

WESTON & SAMPSON
ENGINEERS, INC.

Assessing On-Line

Map

Parcel ID:	0500819010
Address:	TREMONT ST, Boston, MA, 02116
Property Type:	Exempt
Lot Size (sqft):	10047
Owner As of January 1, 2007:	BOSTON REDEVELOPMENT AUTH
Residential Exemption:	No
Current Owner's Address:	TREMONT ST BOSTON MA 02116

Value/Tax	Current Owner(s)	Value History
-----------	---------------------	------------------

Assessment as of January 1, 2006, statutory lien date.

Building value:	\$0.00
Land Value:	\$905,800.00
FY2007 Total Assessed Value:	\$905,800.00

FY2007 Tax Rates (per thousand):

- Residential:	\$10.99
- Commercial:	\$26.87

FY2007 Gross Tax:

- Residential Exemption :	\$0.00
- Personal Exemption :	\$0.00

FY2007 Net Tax : \$0.00

FY2008 Preliminary Tax (first half)*: \$0.00

* Estimated

View the **FY2008 Tax Bill and Payment Information** for this parcel.

For CURRENT fiscal year tax bill Questions, contact the Taxpayer Referral & Assistance Center.

For questions concerning PRIOR fiscal year tax payments, interest charges & fees, etc. contact the Collector's office at 617-635-4131.

B

Assessing On-Line

Map

Parcel ID:	0500819000
Address:	549 TREMONT ST, Boston, MA, 02116
Property Type:	Exempt
Lot Size (sqft):	12500
Owner As of January 1, 2007:	BOSTON REDEVELPMNT AUTH
Residential Exemption:	No
Current Owner's Address:	549 TREMONT BOSTON MA 02116

Value/Tax	Current Owner(s)	Value History
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Assessment as of January 1, 2006, statutory lien date.

Building value:	\$2,988,500.00
Land Value:	\$1,370,000.00
FY2007 Total Assessed Value:	\$4,358,500.00
FY2007 Tax Rates (per thousand):	
- Residential:	\$10.99
- Commercial:	\$26.87
FY2007 Gross Tax:	
- Residential Exemption :	\$0.00
- Personal Exemption :	\$0.00
FY2007 Net Tax :	\$0.00
FY2008 Preliminary Tax (first half)*:	\$0.00

* Estimated

View the **FY2008 Tax Bill and Payment Information** for this parcel.

For CURRENT fiscal year tax bill Questions, contact the Taxpayer Referral & Assistance Center.

For questions concerning PRIOR fiscal year tax payments, interest charges & fees, etc. contact the Collector's office at 617-635-4131.

Assessing On-Line

Map

Parcel ID:	0500818000
Address:	537 TREMONT ST, Boston, MA, 02116
Property Type:	Exempt
Lot Size (sqft):	29412
Owner As of January 1, 2007:	BOSTON CTR ARTS INC LESSEE
Residential Exemption:	No
Current Owner's Address:	539 TREMONT ST BOSTON MA 02116

Value/Tax	Current Owner(s)	Value History
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Assessment as of January 1, 2006, statutory lien date.

Building value:	\$598,900.00
Land Value:	\$2,639,100.00
FY2007 Total Assessed Value:	\$3,238,000.00

FY2007 Tax Rates (per thousand):

- Residential:	\$10.99
- Commercial:	\$26.87

FY2007 Gross Tax:	\$0.00
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- Residential Exemption :	\$0.00
- Personal Exemption :	\$0.00

FY2007 Net Tax :	\$0.00
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FY2008 Preliminary Tax (first half)*:	\$0.00
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* Estimated

View the **FY2008 Tax Bill and Payment Information** for this parcel.

For CURRENT fiscal year tax bill Questions, contact the Taxpayer Referral & Assistance Center.

For questions concerning PRIOR fiscal year tax payments, interest charges & fees, etc. contact the Collector's office at 617-635-4131.

Assessing On-Line

Map

Parcel ID:	0500478001
Address:	TREMONT ST, Boston, MA, 02116
Property Type:	Exempt
Lot Size (sqft):	7845
Owner As of January 1, 2007:	BOSTON REDVLPMT AUTHOR
Residential Exemption:	No
Current Owner's Address:	TREMONT BOSTON MA 02118

Value/Tax	Current Owner(s)	Value History
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Assessment as of January 1, 2006, statutory lien date.

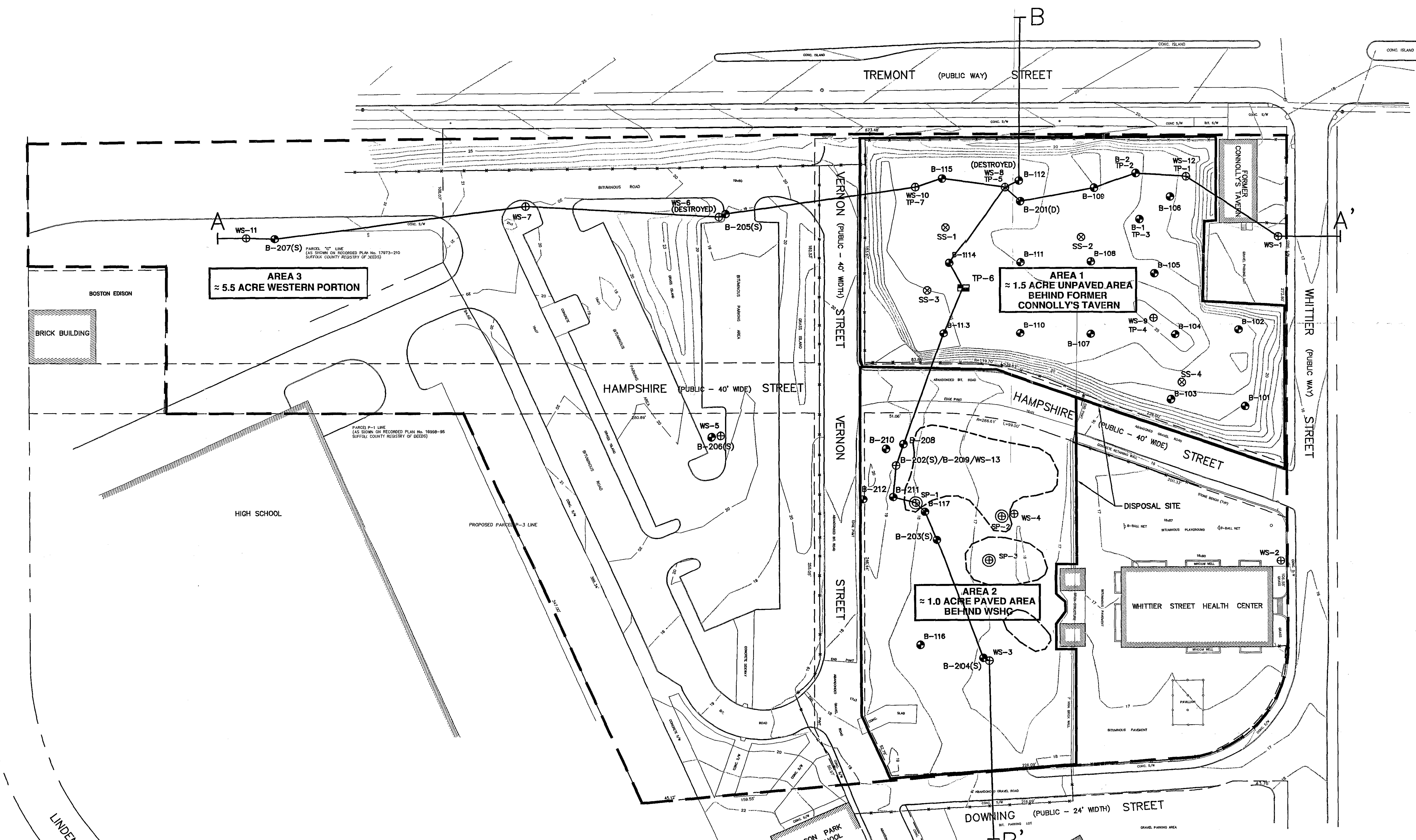
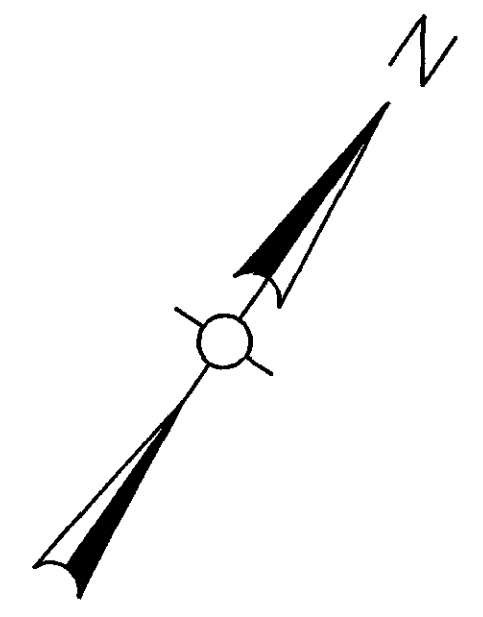
Building value:	\$0.00
Land Value:	\$745,300.00
FY2007 Total Assessed Value:	\$745,300.00
FY2007 Tax Rates (per thousand):	
- Residential:	\$10.99
- Commercial:	\$26.87
FY2007 Gross Tax:	
- Residential Exemption :	\$0.00
- Personal Exemption :	\$0.00
FY2007 Net Tax :	\$0.00
FY2008 Preliminary Tax (first half)*:	\$0.00

* Estimated

View the **FY2008 Tax Bill and Payment Information** for this parcel.

For CURRENT fiscal year tax bill Questions, contact the Taxpayer Referral & Assistance Center.

For questions concerning PRIOR fiscal year tax payments, interest charges & fees, etc. contact the Collector's office at 617-635-4131.



- LEGEND:**
- ⊕ B-1 SOIL BORING
 - ⊕ WS-1 GROUNDWATER MONITORING WELL
 - ⊗ SS-1 SURFICIAL SOIL SAMPLING LOCATION
 - ⊗ SP-1 STOCKPILE SOIL SAMPLE
 - ⊕ B-201(D) DEEP SOIL BORING
 - ⊕ B-203(S) SHALLOW SOIL BORING
 - ⊕ TP-6 TEST PIT
 - A—A' GEOLOGIC CROSS-SECTION
 - P-3 PARCEL BOUNDARY
 - CHAIN LINK FENCE
 - DISPOSAL SITE BOUNDARY
 - - - APPROXIMATE LIMITS OF SURFICIAL SOIL STOCKPILE

FIG 2
ROXBURY, MASSACHUSETTS
BRA PARCEL P-3
SITE PLAN

SOURCES:

- PLAN OF LAND IN BOSTON PARCELS P-3X, P-3Y, P-3Z, NOV. 1996 GREEN INTERNATIONAL AFFILIATES, INC.
- BRA RUGGLES PLAZA PLAN

MARCH, 2002 SCALE: 1"=40'

WESTON & SAMPSON
ENGINEERS, INC.

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