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FINAL
REMEDIAL INVESTIGATION REPORT
Hexagon Laboratories
Site No. 2-03-003

VOLUME I

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HEXAGON LABORATORIES REMEDIAL INVESTIGATION

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EXECUTIVE SUMMARY

A Remedial Investigation (RI) of the Hexagon Laboratories Site, located in the Eastchester Section of Bronx County, New York, was performed for the New York State Department of Environmental Conservation (NYSDEC) by TAMS Consultants, Inc. Hexagon Laboratories operated under several different owners as a manufacturer of various medicinals, pharmaceuticals, and industrial organic chemicals from 1946 until the plant closed in May 1988.

NYSDEC and the New York City Department of Environmental Protection (NYCDEP) inspected this site several times as early as the 1980s as a result of complaints about dumping by Hexagon Laboratories. A site inspection report prepared in 1988 included a "NFRAP" (no further remedial action planned) recommendation. The hazard ranking system (HRS) scoring for the site was 3.48; a score of 28.5 is the minimum for a site to be listed on the federal National Priorities List (*i.e.*, as a Superfund site).

In 1990, the New York City Police Department Bomb Squad removed a number of explosives and reactives from the site, and in 1992, the United States Environmental Protection Agency (USEPA) initiated an emergency removal action which included removal of hazardous wastes and substances from drums and tanks and obvious waste piles on the floors of buildings. The emergency removal action was completed in 1993.

In July 1997, an Interim Remedial Measure (IRM) was performed at the site as a precursor to the RI due to concerns over the structural stability of several buildings on site. The IRM consisted of demolition of four of the seven buildings on site (Old Plant, New Plant, Hydrotherm No. 2, and Cylinder House), asbestos abatement of these structures and the yard areas, removal of 47 above ground storage tanks/reactor vessels, and removal of 31 underground storage tanks (USTs). This work was completed in January 1998.

RI field activities were initiated in November 1997 and were completed in April 1998. Additional surface and subsurface soil samples were collected in the East Yard in October 1998 as part of the Phase II RI to supplement the earlier sampling effort. Observed contamination at the Hexagon Laboratories Site consists primarily of benzene, toluene, ethylbenzene, and xylenes (BTEX compounds), chlorinated volatile organics, phenolic compounds, polycyclic aromatic hydrocarbons (PAHs), and PCBs. Elevated concentrations of some metals including antimony, arsenic, cadmium, chromium, copper, mercury, nickel, selenium, thallium, and zinc were also observed. Cyanide was also detected at an elevated concentration in groundwater samples collected from one monitoring well. No samples were determined to be hazardous by characteristic using the Toxicity Characteristic Leaching Procedure (TCLP). The distribution of this contamination is described below.

Significant VOC and SVOC contamination, excluding PAHs, was detected in only one shallow subsurface soil sample collected immediately adjacent to the South Yard UST excavation. PAHs were detected at concentrations in excess of NYSDEC Recommended Soil Cleanup Objectives (RSCOs) in 10 of the 16 surface and shallow subsurface soils across the site. The pervasive presence of the PAH contamination across the site is expected due to the proximity of the site to three major highways (US Route 1, Interstate 95, and the New York State Thruway). Pesticides were detected sporadically; these detections are considered suspect due to significant matrix interference. PCBs were detected in one surface soil sample from the South Yard and one shallow subsurface soil sample from the East Yard at concentrations greater than the NYSDEC RSCO. The most metals exceedances (antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, mercury, nickel, thallium, and zinc) were reported for a surface soil sample collected within the footprint of the former New Plant and for a shallow subsurface soil sample collected in the central portion of the East Yard. The fewest exceedances were observed in a sample collected from beneath the floor slab of Hydrotherm No. 1.

High levels of VOC contamination, in particular BTEX compounds, chlorinated aliphatics, and chlorobenzene, were detected in subsurface boring samples collected beneath the floor slabs of the former Old Plant and New Plant as well as in samples collected from the sidewalls of the South Yard and New Plant UST excavations. PAHs were detected in samples collected from all parts of the site but at less frequency and generally lower concentrations than observed in the surface soils. Various other SVOCs, including phenolic compounds, were detected at concentrations greater than NYSDEC RSCOs in samples collected beneath the floor slabs of the former Old Plant and New Plant as well as in the East Yard and in sidewall samples collected from the South Yard and New Plant UST excavations. In general, relatively low concentrations of VOCs and SVOCs were detected in samples collected from the East Yard, South Yard (excluding the UST excavation), and North Yard. Pesticides were detected sporadically in the subsurface soil samples; these detections are considered suspect due to significant matrix interference. PCBs were detected in one sample, collected from beneath the floor slab of the former New Plant, at a concentration greater than the NYSDEC RSCO. Metals were detected across the site at concentrations in excess of the evaluation criteria. Frequent metals exceedances were reported for samples collected from beneath the floor slab of the former Old Plant and in the East Yard and North Yard.

VOCs, in particular BTEX compounds, chlorinated aliphatics, acetone, and chlorobenzene, were detected at concentrations greater than the NYSDEC Class GA groundwater standards in all six of the monitoring wells. However, highest concentrations were observed in monitoring well MW-3 (South Yard), monitoring well MW-4 (New Plant), and monitoring well MW-5 (Old Plant). Concentrations of VOCs detected in deep monitoring well MW-2 (East Yard) are generally either greater than or comparable to VOC concentrations detected in the co-located shallow monitoring well MW-1. Relatively low concentrations of VOCs were detected in presumed upgradient monitoring well MW-6 (Boston Post Road). As with VOCs, the highest concentrations of SVOC contamination (primarily phenolic compounds, 1,2-dichlorobenzene, and phthalates) were observed in monitoring wells MW-3, MW-4, and MW-5. Relatively low levels of SVOCs were detected in monitoring wells MW-1, MW-2, and MW-6. Pesticides were detected sporadically; these detections are considered suspect due to significant matrix interference. PCBs were detected in both samples collected from New Plant monitoring well MW-4 at concentrations well above the NYSDEC Class GA groundwater standard. Metals were detected in the total metals samples from each monitoring well at concentrations in excess of NYSDEC Class GA groundwater standards. Cyanide was detected at concentrations greater than the NYSDEC Class GA groundwater standard in two unfiltered samples collected at monitoring well MW-4 (New Plant). However, in the dissolved metals samples, only antimony (MW-5), chromium (MW-4 and MW-5), and zinc (MW-1) were detected at concentrations greater than the NYSDEC Class GA groundwater standards. Cyanide was not analyzed in the filtered samples.

The future behavior of contaminants at the site is difficult to predict, since there are no historic data with which to compare (and evaluate trends). However, based on knowledge of site conditions and site history, current conditions, and the physical properties of the contaminants at the site, a few general observations can be made.

1. Overland transport for the most part is not expected to be a significant contaminant transport route. The data indicate that the concentrations of VOCs in surface soils are relatively low; probably due to the fact that VOCs have, in the years since closure of Hexagon Laboratories, volatilized or leached to deeper soils or groundwater. Therefore, neither runoff nor entrained sediments (soils) leaving the site are expected to be significantly contaminated with VOCs. SVOCs are still present at relatively high concentrations in the surface soils and may be subject to some transport with entrained sediments during rainfall. Transport of surface water is to the combined sewers (storm and sanitary) along Boston Post Road and Hollers Avenue. The limited amount of contaminated sediment transported to the sewer system during normal rainfall is unlikely to be a problem for the treatment plant. However, during significant storms (*i.e.*, when the treatment plant is allowed to let some of the combined flow bypass treatment), the sediments (along with untreated wastes from other sources) would be discharged directly to the Hutchinson River.

2. Groundwater transport is likely to be the most significant pathway for off-site migration of contamination from the Hexagon Laboratories Site. Although no off-site wells were installed, the detection of significant concentrations (hundreds of μg/L) of aromatic VOCs in both the shallow (overburden) and deep (top of screen about 25 feet below top of bedrock, with a total well depth of about 50 feet below ground surface) wells in a downgradient location on site (southeastern corner of the East Yard) suggest that BTEX contamination has already permeated the groundwater in the area; there is nothing preventing this contamination from migrating ultimately to the Hutchinson River. Contamination migrating by this pathway is expected to be primarily VOCs. VOCs in subsurface soils are expected to continue to leach into groundwater, creating an on-going source for continued groundwater contamination. Leaching of SVOCs and PCBs is likely to be much less significant.

3. Volatilization is no longer expected to be a significant route of contaminant transport under current conditions, although it is likely that volatilization may have played a significant role in the past in reducing the concentrations of VOCs in the surface soils. Volatilization could become more significant in the future if site activities (*e.g.*, excavation) expose VOC-contaminated subsurface soils to the ambient air.

The limited human health risk assessment for the Hexagon Laboratories Site examined current and future exposure scenarios to determine if contaminants present in the surface soil at the site pose unacceptable carcinogenic or noncarcinogenic risks to potentially exposed populations. Ingestion of and dermal exposure to the two identified compounds of concern (lead and benzo(a)pyrene) were examined. Three populations (trespassers, site workers, and construction workers) were considered to have complete exposure pathways. Trespassers were evaluated for current- and future-use exposure while site workers and construction workers were evaluated for future-use exposure only.

Carcinogenic risks were determined to exceed target risk levels for the high end, future-use exposure scenarios examined for site workers due to the presence of benzo(a)pyrene in the surface soil. Noncarcinogenic risks were not calculated due to the lack of quantitative toxicity values for the contaminants of concern. However, for nonresidential lead risks, the USEPA-recommended methodology relating soil lead uptake to blood lead concentrations in women of chilbearing age to derive risk-based remediation goals (RBRG) was used. The 95% upper confidence level concentration of lead in the surface soil exceeded the RBRG for construction workers. The average concentration of lead in the soil also exceeded the RBRG for construction workers. Unidentified SVOCs (*i.e.*, TICs) may also contribute to human health risks, but were not quantitatively evaluated due to the lack of quantitative toxicity values for TICs.

The primary objective of the ecological assessment was to evaluate the adverse ecological impacts of contaminants at the Hexagon Laboratories Site on site biota. Because of the highly developed nature of the site, and as a result, the negligible amounts of vegetation present at the site, there does not appear to be an impact on site vegetation by contamination present at the site. In addition, since the Hexagon Laboratories Site itself is essentially devoid of vegetation, and it does not feature wetlands or open water, there is insufficient natural habitat available to support any threatened or endangered species. Thus, the impact of site contamination on threatened or endangered species on site is considered to be negligible.

No environmental samples were collected off site as part of the remedial investigation and, therefore, the presence of site-related contamination off-site and an assessment such site-related contamination on off-site biota would be inconclusive. However, it is important to note the highly developed, industrial nature of the Hexagon Laboratories Site and its immediate vicinity and the corresponding lack of significant vegetation.

The sampling program was targeted towards presumed source areas both within the buildings and in the yard areas. It is believed that, for the most part, these areas have been sufficiently characterized for conduct of the focused feasibility study. However, in order provide a more comprehensive evaluation of contamination at the Hexagon Laboratories Site, the following recommendations for future work are provided:

1. Install one shallow well upgradient of the site to better characterize groundwater quality flowing onto the site. Groundwater elevation data will be used to refine horizontal flow directions and gradients.

2. Install one deep monitoring well (approximately 150 feet deep or to next major fracture zone) in a downgradient location (co-located with monitoring wells MW-1 and MW-2) to better assess the vertical extent of the groundwater contamination; contaminant concentrations in deep well MW-2 were generally comparable to concentrations in the co-located shallow monitoring well MW-1, indicating no attenuation of contamination with depth.

3. Install a new shallow monitoring well between monitoring wells MW-5 and MW-6 to better characterize the groundwater flow pattern at the northern end of the site.

4. Install downgradient off-site monitoring wells to define the extent of horizontal migration of site-related contamination from the site.

5. Perform a comprehensive human health risk assessment which includes evaluation of exposure (ingestion, inhalation, and dermal contact) to subsurface soil and groundwater. This would supplement the limited human health risk assessment of surface soil exposure (ingestion and dermal contact) performed as part of this RI, and would allow for better assessment of the human health risk associated with existing levels of contamination at the site.

In addition to the above-listed recommendations, a detailed delineation of areas of contamination may be required during Remedial Design, depending on the final remedial action objectives developed for the site.

Significant levels of site-related contamination were detected in surface soil, subsurface soil, and groundwater at the Hexagon Laboratories Site. It is possible that contamination levels detected in the soil and groundwater represent unacceptable risks should exposure pathways to these media be complete. Therefore, in developing remedial action objectives (RAOs), the following should be considered:

1. RAOs should prevent exposures to surface and subsurface soil which exceed risk-based levels.

2. RAOs should prevent exposures to groundwater which exceed risk-based levels.

3. RAOs should take into consideration potential future uses of the site (*e.g.*, redevelopment of the property for commercial or industrial use).

4. RAOs should address mitigation of actual or potential off-site migration of contaminants which result in unacceptable risks or environmental degradation.

1.0 INTRODUCTION

TAMS Consultants, Inc. (TAMS) performed a remedial investigation (RI) at the Hexagon Laboratories Site located in the Eastchester Section of Bronx County, New York (Figure 1-1). This site is listed in the New York State Department of Environmental Conservation (NYSDEC) Registry of Inactive Hazardous Waste Sites, Site No. 2-03-003. The RI was conducted in accordance with the United States Environmental Protection Agency (USEPA) Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, October 1988) which is in agreement with the NYSDEC Guidelines for Remedial Investigations/Feasibility Studies, Technical and Administrative Guidance Memorandum (TAGM) #4025 (March 31, 1989) and Selection of Remedial Activities at Inactive Hazardous Waste Sites, TAGM #4030 (September 11, 1989, Revised May 15, 1990). The work was performed under the TAMS/NYSDEC Superfund Standby Contract Work Assignment No. D003060-13.2.

The objectives of the RI were to determine the physical characteristics of the site, to evaluate the nature and extent of contamination, to evaluate the fate and transport characteristics of the contamination, to characterize the potential human health risk associated with the site, and to perform a qualitative ecological assessment of the site. The information obtained as part of the RI will be used in the completion of a focused feasibility study (FFS) for the site. The FFS will identify and evaluate alternatives available for remediation of the site and will be used as the basis for final selection of the appropriate remedial response.

Other pertinent reports prepared by TAMS for the Hexagon Laboratories Site include:

- Final Hexagon Laboratories Project Management Plan, December 1996, Amended March 1997 and June 1997, Revised September 1997; Addendum No. 1 (September 1997), Addendum No. 2 (January 1998), Addendum No. 3 (April 1998), Addendum No. 4 (September 1998).

- Final Hexagon Laboratories Field Activities Plan, November 1996, Revised September 1997.

- Final Hexagon Laboratories Quality Assurance Plan, November 1996, Revised September 1997.

- Final Building Evaluation Report, March 1997.

The text of the RI Report and associated tables and figures are presented in Volume 1. The appendices referenced in the text are presented in Volume 2.

1.1 Site Description and Surroundings

The Hexagon Laboratories Site is an approximately 0.9-acre (1.1 acres including the previously leased property southeast of the site formerly referred to as the "Bergio Property" and now owned by Bilgrei) inactive chemical manufacturing facility located at 3536 Peartree Avenue in the Eastchester section of Bronx County, New York. The facility occupies (according to lot and block information obtained from Sanborn maps [Sanborn Mapping and Geographic Information Service]) Block 5283, Lots 1, 3, 4, 51, 48, 46, 45, and 44, and evidently leased Lots 42 and 40 at one time. Review of Bronx County deed records show different lot numbers; it appears that all the land owned by Hexagon Laboratories (including the East Yard) was consolidated as Lot 43, and the leased property was renumbered as Lot 37. A topographic base map prepared for the site following the interim remedial measure (IRM) performed at the site in late 1997 (see discussion in Section 1.4) is provided as Figure 1-2. Boundaries of the Hexagon Laboratories property and adjoining properties are also shown in Figure 1-2.

1.1.1 Facility Description

Prior to the IRM performed at the site, the Hexagon Laboratories facility consisted of three principal buildings (referred to as the Old Plant, New Plant, and Office/Warehouse [New Wing]), several smaller structures (referred to as the Hydrotherm No. 1, Hydrotherm No. 2, Cylinder House, and Cinder Block building), and three main open areas (referred to as the North Yard, South Yard, and East (Vapor Phase) Yard.

The site was almost entirely covered by structures or pavement; however, the extent of paving was difficult to verify due to the presence of large amounts of debris (largely consisting of tires and auto parts, but including construction debris and other miscellaneous wastes and trash) covering much of the open areas. The part of the site referred to as the "Bergio Property", previously used for storage by Hexagon Laboratories, was occupied by an unnamed construction equipment and materials storage yard.

1.1.2 Site Surroundings

The site is bounded on the northwest by Boston Road (also referred to as Boston Post Road; US Route 1); on the northeast by Tufo's Wholesale Dairy and parking area (these two properties being the former Bronx Auto Wrecking and Salvage) and Heathcote Avenue; on the southeast by Marbo Used Auto Parts and an unnamed construction equipment and materials storage yard (formerly referred to as the "Bergio Property"); and on the southwest by Peartree Avenue. The surrounding area is generally a densely populated urban area. The northern edge of Co-op City, a New York City housing project, is approximately 2,000 feet south of the site, and the New England Thruway (Interstate Route 95) is about 250 feet southeast of the site.

Pelham Bay Park is located less than one mile east of the site, on the east side of the Hutchinson River. Two tidal marsh areas are located in the Pelham Bay Park as is the Thomas Pell Wildlife Refuge and Sanctuary. At its nearest point, the Hutchinson River is less than 1,000 feet northeast of the site.

1.2 Site History

Information on site history prior to 1946 has been inferred from Sanborn maps obtained by TAMS for the site and its immediate vicinity (years 1897, 1918, and 1935). Site history information after 1946 was derived from NYSDEC or NYSDEC files, supplemented by information from the Sanborn maps (years 1950, 1981, 1991, and 1995).

In 1897, the area in the vicinity of the site (between the Hutchinson River, Boston Road, and Eastchester Landing Road (later apparently renamed Baychester Road) was largely undeveloped, having only one or two residences and no commercial development. In 1918, Peartree Avenue, Heathcote Avenue, and Hollers Avenue are shown on the Sanborn map but labeled "not open". The 1935 Sanborn map shows Peartree Avenue open as an unpaved road between Boston Road and Hollers Avenue; a filling station with four gasoline tanks occupies the corner of Boston Road and Peartree Avenue (Block 5283, Lot 1) in the area later occupied by the Hexagon Laboratories Office/Warehouse building. An auto repair shop is adjacent to the filling station (Lot 3) in land also later occupied by the Office/Warehouse. As of 1935, no other development is shown on Block 5283, which is the block bounded by Boston Road, Peartree Avenue, Hollers Avenue, and Heathcote Avenue.

The 1950 Sanborn map shows the existence of the Hexagon Laboratories Old Plant building as "Manufacturing Chemists" on Lot 48; adjacent storage structures on Lot 48 also appear to be part of the facility. It also seems likely that the one-story storage structure indicated on Lot 46 (adjacent to and immediately south of the Old Plant) is related to the facility. There is no other development on the southern half of Block 5283. The filling station and auto repair facility fronting on Boston Road are still present, and an iron works facility is present on Lot 4, which also later became part of the Office/Warehouse building. Lot 51, located on Peartree Avenue between the filling station and the Old Plant, is occupied by an auto junk yard. A coffee packaging facility and auto parts facility are located on Lots 6 and 7, respectively, on land now occupied by Tufo's Wholesale Dairy. Three filling stations are located slightly farther east along Boston Road (between Heathcote Avenue and Pinkney Avenue). Lot 11, immediately east of the Old Plant, is occupied by an auto wrecking facility, and welding, auto repair, and fuel oil tank truck repair facilities are present on the east side of Heathcote Avenue. Peartree Avenue appears to be paved as of 1950, and an 8-inch water line extends the length of Block 5283, branching from a 12-inch line on Boston Road and terminating at Hollers Avenue.

The next available Sanborn map for the site vicinity is from 1981. The east side of Peartree Avenue from Boston Road south to (and including) Lot 42 is occupied by "Hexagon Lab Inc. Mfg. Chemists" with approximately 300 feet of frontage on Peartree Avenue. The facility appears to be in its current configuration. The Office/Warehouse building is shown as 1969 new construction, and three aboveground acid tanks are shown in what is now referred to as the North Yard. However, Lot 15, directly behind the Hexagon Laboratories property and later occupied by the East (Vapor Phase) Yard is shown as unoccupied. No occupants are shown on Lots 40, 38, or 30, which are the three lots south of the Hexagon Laboratories property between Lot 42 and Hollers Avenue. The filling stations along Boston Road are no longer present and both sides of the corner of Heathcote Avenue and Boston Road are occupied by auto wrecking facilities. The auto wrecking facility on the west side of Heathcote Avenue, east of the Office/Warehouse and Old Plant is evidently Bronx Auto Wrecking and Salvage (BAWS), although it is not identified as such by name on the Sanborn map.

The 1991 Sanborn Map shows no change to the Hexagon Laboratories facility. The only significant change in its vicinity is the replacement of the BAWS with Tufo's Wholesale Dairy (not identified by name) on Lot 11. The only noticeable change on the 1995 Sanborn map is that Lots 40, 38 and 30 are occupied by an auto wrecking facility. Based on a 1992 site plan prepared by Engineering-Science for NYSDEC, it appears that Lots 40 and 42, fronting approximately 100 feet of Peartree Avenue immediately south of the Hexagon Laboratories property, comprise the "Bergio Property". It is not apparent why no structures or use are shown on any of the Sanborn maps for Lot 15, which was occupied by Hexagon Laboratories' East Yard.

The site operated under several different owners as a manufacturer of various medicinals, pharmaceuticals, and industrial organic chemicals from 1946 until the plant closed in May 1988. The site functioned primarily as a contractor facility, where the chemicals manufactured depended on client requests. However, pharmaceuticals and pharmaceutical intermediates appear to have been the primary focus of the Hexagon Laboratories manufacturing work. On-site manufacturing processes included reaction, separation, and purification processes such as hydrogenation, chlorination, distillation, crystallization, centrifugation, grinding, and drying. Products were manufactured primarily in batch quantities, using batch reactors and distillation units.

The facility consisted of three main buildings and several smaller structures. The Old Plant was built in 1948; the New Plant was built in 1956; and the Office/Warehouse was built in 1970 (1969 according to Sanborn maps). The Old Plant, New Plant, and two smaller structures (Hydrotherm No. 2 and Cylinder House) were demolished as part of the IRM; the Office/Warehouse and Hydrotherm No. 1 still remain on site.

A wide variety of raw materials were used in manufacturing operations at the site, and a wide variety of finished products and wastes were generated by those operations. There were also

31 underground storage tanks (USTs) at the site. These tanks, which were removed in late 1997 as part of the IRM, ranged in capacity from 500 to 5,000 gallons. An inventory of underground and aboveground storage tanks located at the site was provided to NYSDEC by Hexagon Laboratories, Inc. in October 1987. This tank inventory is summarized in Table 1-1. According to information provided to NYSDEC by Hexagon Laboratories, UST integrity tests were performed in 1977. Seven of the tanks were determined to be leaking and were taken out of service. Subsequently, all the remaining tanks were emptied by USEPA in 1992.

The facility had a history of chemical spillage; as far back as the 1980s, there were complaints about dumping by Hexagon Laboratories. Complaints of strong odors and liquids seeping from the site along the Hexagon Laboratories property line were first made in 1980 to NYSDEC by BAWS, a commercial property adjacent to the site (now occupied by Tufo's Wholesale Dairy and parking area).

1.3 Previous Investigations

Based on information provided to TAMS by NYSDEC, two formal studies of the Hexagon Laboratories Site were conducted, although neither included site-specific sampling and analysis. These two studies include a site assessment (with a Hazard Ranking) conducted by NUS for USEPA in 1988, and a preliminary assessment, apparently consisting solely of a records search, conducted by Engineering-Science for NYSDEC which was completed in 1992. As discussed below, a number of limited investigations and site inspections have been conducted in addition to those previously cited.

In 1980, NYSDEC received complaints from BAWS; BAWS indicated that liquids seeped from the plant along the entire northeast wall of the facility. A follow-up inspection in March 1981 did not indicate any seepage, but a recently installed sump pump, apparently pumping seepage to the sewer system, was observed in the area where seepage had previously been noted.

A "foul-smelling" liquid was observed and sampled by a NYSDEC inspector in April 1981. A sample of this material was collected from the sump pump pit along the northeast wall of the Old Plant and analyzed for volatile organics by New York Testing Laboratories, Inc (now Nytest Environmental, Inc.). Detected analytes included benzene (755 ppb), chlorobenzene (653 ppb), methylene chloride (613 ppb), trichloroethylene (429 ppb), and ethylbenzene (171 ppb). Available data do not indicate if other fractions or non-target compounds were analyzed or reported.

A NYSDEC inspection in 1982 indicated the presence of seven deteriorating drums. In addition, a containment system for spill and drum storage area runoff consisting of two tanks with gravel-lined bottoms for percolation was noted.

High explosivity levels have been reported since 1966 in the Peartree Avenue public sewer line southwest of the site. New York City Department of Environmental Protection (NYCDEP) sewer department personnel took a water sample from a Peartree Avenue sewer in December 1987. This sample, which was attributed to infiltration of contaminated groundwater, was analyzed for volatile organic compounds (VOCs). VOCs detected in the sample included *trans*-1,2-dichloroethene (12.6 ppm), trichloroethene (3.6 ppm), toluene (8.4 ppm), and benzene (4.1 ppm). After the sewer system in this area collapsed in 1986, NYSDEC negotiated a plan for Hexagon Laboratories to install monitoring wells and conduct groundwater sampling; however, the plant apparently closed before the plan was implemented.

An inspection by NYCDEP in 1987 indicated the presence of spilled chemicals in the drum storage area and a lack of dikes in hazardous waste storage areas. Also in 1987, the presence of a 14.8 foot thick oil layer was reported (by Hexagon Laboratories employees) in a 6-inch diameter on-site bedrock production well. After removal of 29 gallons of oil from the well in August 1987, Hexagon Laboratories' consultant (Leggete, Brashears & Graham, Inc.) reported that the oil layer did not reappear.

The site inspection report prepared by NUS (1988) included a "NFRAP" (no further remedial action planned) recommendation. The hazard ranking system (HRS) scoring for the site was 3.48; a score of 28.5 is the minimum for a site to be listed on the federal National Priorities List (*i.e.*, as a Superfund site). NUS in their initial site inspection report (1987) had recommended collection of samples from the site, but, after a subsequent site visit and evaluation of site conditions and status, concluded that sampling was not necessary due to the low likelihood of human or environmental impacts related to site operations.

EP toxicity and total hydrocarbon analysis were conducted on three soil samples from the former BAWS site in July 1989. All regulated analytes were at concentrations substantially lower than the applicable regulatory limits. The total hydrocarbon analysis (for which there is no regulatory limit) indicated concentrations ranging from 4.5 ppm to 5.7 ppm in the three samples. A subsequent TCLP analysis of a single sample from BAWS conducted in 1990 indicated that VOCs, semivolatile organics (SVOCs), and PCBs were not detected. Metals were either not detected or were detected at concentrations at least two orders of magnitude less than the applicable regulatory limit.

A records search was conducted by NYSDEC in 1990 as part of a preliminary site assessment. No field data were obtained as part of this assessment. Also in 1990, the New York City Police Department Bomb Squad removed a number of explosives and reactives from the site.

An emergency removal action was initiated by USEPA in 1992. During excavation of a trench to access and shut off the water supply valve at the site, three workers were overcome by fumes and sent to a hospital. (This trench was in the center of Peartree Avenue across from the Old Plant. Analysis of soil and water samples collected from this trench reportedly indicated that toluene was the contaminant present in the highest concentration.) The removal action, completed in April 1993, included removal of hazardous wastes and substances from drums and tanks (including process vessels and fuel oil tanks), as well as smaller containers (pails and laboratory chemicals) and obvious waste piles on the floors of buildings. USEPA also attempted to pump out (drain) the sumps, but they were apparently being recharged and could not be emptied.

1.4 Interim Remedial Measure

As a preliminary step in the remedial investigation, TAMS conducted a structural evaluation of the on-site Hexagon Laboratories buildings. The results of this evaluation suggested that, for safety-related reasons, several of the buildings should be demolished prior to initiating the planned intrusive investigative activities in and around these buildings. The RI/FFS tasks were put on hold and an IRM consisting of demolition of four of the seven buildings on site (Old Plant, New Plant, Hydrotherm No. 2, and Cylinder House), asbestos abatement of these structures and the yard areas, removal of 47 above ground storage tanks/reactor vessels, and removal of 31 USTs was performed by Trade-Winds Environmental Restoration, Inc. (Trade-Winds). This IRM began in July 1997 and was completed in January 1998.

During UST removal activities, soil samples were collected by TAMS from excavations in which the tanks were located. The analytical data from these samples are included in this RI Report. Trade-Winds collected samples of soil excavated during the UST removal activities for waste-characterization/off-site disposal purposes. In addition, Trade-Winds collected floor slab samples as part of the IRM in order to assess the need for remediation (via scarification) of the floor slabs by Trade-Winds. These data are also included in this RI Report.

2.0 SITE INVESTIGATION

The components of the RI field activities are described below. Sampling of concrete floor slabs and excavated soil, performed by Trade-Winds as part of the IRM, is also described below. All tasks performed by TAMS were performed in accordance with the Field Activities Plan (FAP, revised September 1997) and the Quality Assurance Project Plan (QAPP, revised September 1997).

The principal components of the field investigation included:

- Surveying and Mapping
- Geophysical Survey
- Soil Borings
- Surface Soil Sampling
- Soil Sampling from Borings
- Soil Sampling From Underground Storage Tank (UST) Excavations
- Monitoring Well Installation and Development
- Groundwater Sampling
- Oily and Miscellaneous Waste Sampling
- Concrete Floor Slab Sampling
- Ecological Investigation

This work was performed as part of the Phase I RI field activities which began in November 1997 and were completed in October 1998. Most of the sampling activities were conducted in November and December 1997 concurrently with the latter stages of the IRM. Installation of monitoring well MW-6, first round sampling of MW-6, the second round of groundwater sampling, and the ecological investigation were performed after the completion of the IRM. Additional surface and subsurface soil samples were collected in the East Yard in October 1998 as part of the Phase II RI in order to supplement the Phase I RI sampling effort. Sampling locations are indicated in Figure 2-1.

2.1 Surface Features

A topographic survey of the site was performed from November 1997 to January 1998 to establish location and elevation of pertinent site features such as property boundaries, buildings, site fence lines, and remnant floor slabs. Location and elevation of soil borings and monitoring wells were also established. The survey was performed by YEC, Inc. (Valley Cottage, New York), a New York licensed land surveyor. A site topographic base map having a horizontal scale of 1-inch equals 20 feet and a contour interval of 1 foot was prepared. This base map also indicates a number of ancillary site features including the topography of adjacent roadways (Boston Road, Peartree Avenue, Heathcote Avenue, and Hollers Avenue) and locations of water and sewer lines. Soil boring and monitoring well locations were surveyed for location relative to the New York State Plane Coordinate

System. Elevations were referenced to the National Geodetic Vertical Datum (NGVD, 1929). Figure 1-2 provides the topographic contours along with site features and property boundary survey results. Sampling locations, which include the surveyed soil borings and monitoring wells, are indicated in Figure 2-1. Two permanent, mutually visible benchmarks, were installed on site for future reference. YEC, Inc. brought in control for these benchmarks from two off-site locations. Horizontal control was brought in from a NYSDOT control point located on Boston Road. Vertical control was brought in from a control point at the New York City Bus Garage located near the site.

2.2 Geophysical Survey

A geophysical survey was performed on November 25, 1997 by Hager-Richter Geoscience, Inc. as part of the IRM. The objective of this survey was to identify potential locations of USTs or subsurface structures (*e.g.*, vaults) which had not been removed or addressed as part of the IRM. The survey area included the North Yard, Old Plant, New Plant, and South Yard. Due to the ongoing demolition and tank removal activities, several areas were inaccessible to the geophysical survey crew. Two geophysical methods were utilized in the survey of the site: ground penetrating radar (GPR) and precision utility location (PUL). The GPR traverses were spaced no greater than 5 feet apart and oriented in two mutually perpendicular directions in the survey area. These two methods were capable of locating buried USTs larger than 500 gallons. Results of the survey are summarized in Section 3.6 and are provided in Volume II, Appendix A.

2.3 Geological Investigation

A geological investigation was performed utilizing exploratory soil borings and monitoring well installations. The locations of the borings and monitoring wells were selected to provide spatial representation of the site as well to provide information in areas of suspect contamination (*e.g.*, downgradient of UST locations and in building work areas). The exploratory boring and well boring locations are provided in Figure 2-1.

Drilling activities were performed from November 11, 1997 through December 8, 1997 and on January 16, 1998. A total of 15 soil borings designated B-1 through B-13, B-15 and B-16, were drilled on site to obtain subsurface geological information. B-1, B-2, and B-7 were advanced in the East Yard, B-3, B-8, and B-9 were advanced in the South Yard, B-4 and B-10 were advanced through the floor slab of the New Plant, B-5, B-11 and B-12 were advanced through the floor slab of the Old Plant, B-15 was advanced in the North Yard, B-13 was advanced through the floor slab of Hydrotherm No. 1, B-16 was advanced through the floor slab of the Office/Warehouse, and B-6 was advanced through the Boston Road sidewalk immediately north of the Office/Warehouse. B-1 through B-5 were advanced to the top of rock using 6¼-inch inside diameter hollow stem augers. Borings B-7 through B-12 and B-15 were advanced to the top of bedrock using 4¼-inch inside diameter hollow stem augers. A center rod, plug and pilot bit were used while advancing each boring. Boring B-6 was advanced using air rotary techniques. Split spoon samples were collected continuously to the top of bedrock and standard penetration tests (ASTM D-1586) were conducted at every 2-foot sampling interval. For borings B-13 and B-16, floor slab concrete was broken up with a jackhammer and split spoon samplers were manually advanced to the top of bedrock.

Three additional borings, BK-1, BK-2 and BK-3, were drilled off site to provide data on local soil quality. These off-site borings were drilled using 4¼-inch inside diameter hollow stem augers but were not continued to the top of bedrock. Samples were collected from the 2.5 to 4.5 feet below ground surface (bgs) split spoon sampler interval.

Split spoon sample collection was performed in accordance with ASTM D-1586 using 2-foot long, 2-inch outside diameter split spoons. The sampler was decontaminated prior to being used at any drill location and between individual sample collection activities. The split spoon sampler was driven by a 140-pound hammer having a 30-inch drop. To prevent cross-contamination within and between boreholes the drilling rig and tools were steam cleaned prior to the start of drilling operations at each borehole. The sampling tools were cleaned with a succession of soapy water, clean water, and distilled/deionized (analyte-free) water between uses.

Geotechnical samples were collected for grain size analysis from on-site borings B-5, B-6, B-7, and B-8 and from off-site boring BK-1. Soil samples were also collected at selected depths for chemical analysis as described below in Section 2.4.2. Boring logs, which are provided in Volume II, Appendix B, were maintained for each of the exploratory borings and, at a minimum, contain the following:

- Identification number for each boring;
- Description of the material encountered in the subsurface and the depth below the ground surface at which such material are encountered;
- Physical characteristics of each soil sample classified in the field and described based upon the Unified Soil Classification System (as described in ASTM D-2487);
- Field screening results (*e.g.*, organic vapor concentrations as measured using a photoionization detector);
- Identification of samples collected (both for chemical analysis and geological observation);
- Blow counts on the soil sampler; and
- Groundwater depths encountered during drilling, as measured from the ground surface.

Borings B-1 through B-6 were completed as monitoring wells (five shallow wells and one deep well) as described in Section 2.5. Rock cores were collected at five of the six monitoring well borings (MW-1 was completed in the overburden soils) and relevant lithologic, structural, and hydrogeological properties were noted in the corresponding boring logs. Rock cores were collected using a PQ core barrel. Separate logs were maintained for monitoring well construction details and include information such as depths to screen top and bottom and filter pack depth. The two monitoring wells placed in the East Yard, MW-1 and MW-2 (deep), were paired to provide information on vertical hydraulic gradients at the site and to provide information on groundwater quality at depth within the bedrock aquifer.

2.4 Soils Investigation

Surface and subsurface soil sampling was conducted to assist in determining the presence, nature and extent of soil contamination at the site. Surface soil samples were collected using manual sampling equipment. Subsurface soil samples were collected using manual sampling equipment as well as from soil borings during drilling. Grab samples were collected from the sidewalls of UST excavations and from stockpiles of soil excavated during UST removal.

2.4.1 Surface Soil Sampling

Surface soil samples were collected on December 18, 1997 to determine the nature and extent of contamination in shallow soil across the site. Five additional surface soil samples were collected in the East Yard on October 1 and 2, 1998 as part of the Phase II RI in order to supplement to the December sampling effort. As noted in Section 1.1.1, the Hexagon Laboratories Site is largely covered with asphalt pavement or concrete. Because of the extremely limited amount of surface soil present at the site, surface soil sampling locations were largely determined by those areas in which exposed surface soil was present. Samples were collected in the East Yard and the South Yard. Exposed surface soil, other than clean fill placed in the UST excavation during the IRM, was not present in the North Yard. Surface soil samples were also collected from the Old Plant and New Plant in areas where the concrete floor slab was either broken up or all together absent. Removal of an overlying layer of pavement (asphalt and/or concrete) was necessary to allow for collection of each of the five East Yard surface soil samples collected as part of the Phase II RI. Surface soil sampling locations are shown in Figure 2-1.

The five surface soil samples collected as part of the Phase I RI were collected in accordance with the sampling procedures outlined in the FAP. These samples were collected at a depth of approximately 0 to 6 inches below grade using decontaminated stainless steel sampling equipment including trowels and spoons. The five supplemental East Yard samples collected as part of the Phase II RI were collected in accordance with the sampling procedures outlined in the FAP and in the Project Management Plan (PMP), Addendum No. 4 (September 1998). All but one of these samples were collected at a depth of approximately 3 to 6 inches below grade (0 to 3 inches of soil beneath approximately 3 inches of asphalt) using decontaminated hand augers and stainless steel spoons; one sample (HX-SS9) was collected at a depth of 11 to 12 inches below grade (0 to 1 inch of soil beneath 11 inches of asphalt/concrete). In each case, the aliquot for volatile organics analysis was collected first as a discrete sample and placed directly in the sample container. The remainder of the sample was then placed on a clean piece of aluminum foil and homogenized by manually mixing the material with a spoon until a visually uniform appearance was obtained. The homogenized sample was then placed in appropriate sample containers.

Collection of surface soil background samples was not considered necessary due to the variety of surface contaminants expected to be endemic to the area and because of the extremely limited amount of surface soil present on the Hexagon Laboratories Site.

Surface soil samples were analyzed for the parameters shown in Table 2-1. Quality control (QC) samples for Phase I RI sampling effort included one duplicate sample (HX-SS51, duplicate of HX-SS1), one MS/MSD (HX-SS2MS/MSD), and one aqueous rinsate field blank (HX-FBSS1). Quality control (QC) samples for Phase II RI sampling effort included one duplicate sample (HX-SS9D, duplicate of HX-SS9), one MS/MSD (HX-SS10MS/MSD) and one aqueous rinsate field blank (HXFB1001). An aqueous sampling bottle blank (HXBB1001) was also collected during the Phase II sampling effort due to an odor detected in the cooler containing sampling bottles shipped from the laboratory.

2.4.2 Subsurface Soil Sampling

Subsurface soil samples were collected as part of the exploratory soil boring program in order to determine the nature and extent of subsurface overburden contamination. These samples were collected during the period of November 11, 1997 through December 8, 1997 and on January 16, 1998. As part of the Phase II RI, five additional subsurface soil samples were collected (using manual sampling methods) in the East Yard on October 1 and 2, 1998 to supplement to the data obtained from the exploratory soil boring program. (A total of six shallow subsurface soil samples, collected at a depth of less than two feet bgs, were used in characterization of contamination in site surface soils.) Subsurface soil sampling locations are shown in Figure 2-1.

Phase I RI Subsurface Soil Samples

As part of the exploratory soil boring program, a total of 15 soil borings were advanced on site as described in Section 2.3. While 16 on-site soil borings were proposed in the FAP, the excavation and subsequent backfill of much of the North Yard during the IRM tank removal activities encompassed the area proposed for B-14. This boring was deleted from the sampling program after consultation with the NYSDEC RI Project Manager.

Of the 15 on-site borings, six were completed as monitoring wells, five shallow wells and one deep bedrock well. These borings are designated as B-1/MW-1, B-2/MW-2 (deep well), B-3/MW-3, B-4/MW-4, B-5/MW-5, and B-6/MW-6.

Continuous split spoon samples were taken to the top of bedrock at all on-site boring locations except at deep monitoring well boring B-2/MW-2. While the FAP stipulated the collection of one or two subsurface soil samples at different depths from each of the boring locations, only one sample was collected for chemical analysis at most boring locations due to the shallow depth to bedrock (less than 5 feet bgs). Only at borings B-1/MW-1 and B-7 in the East Yard and B-9 in the South Yard was the overburden thickness sufficient for collection of two samples.

In addition to samples collected from on-site exploratory borings, three off-site background exploratory soil borings, designated as BK-1, BK-2, and BK-3, were advanced. Selection of appropriate locations for background samples in an urban, commercial/industrial area such as at the Hexagon Laboratories Site was problematic since contaminants (*e.g.*, lead and polycyclic aromatic hydrocarbons - PAHs) may be present as a result of the site's location in the industrialized New York metropolitan area. The presence of these contaminants may also be accentuated by the site's proximity to two major highways (US Route 1 [Boston Road] and the New England Thruway [Interstate 95]) and by the high number of auto salvage and repair facilities currently or formerly adjacent to the site. Factoring these considerations, three background sample locations were selected. These consisted of: (1) the vacant lot adjacent to Tufo's Wholesale Dairy; (2) the undeveloped land on the south side of Hollers Avenue; and (3) the western side of Peartree Avenue (across from the Hexagon Laboratories Site) between the street and the fence of the auto salvage yard. At each of the three background exploratory boring locations, a single overburden sample was collected from the 2.5 feet to 4.5 feet bgs split spoon interval. These borings were not continued to the top of bedrock.

Subsurface soil samples from borings were collected using standard split spoon sampling procedures. Specifically, each split spoon sampler was opened upon retrieval and screened for volatile organic compounds (VOCs). A sample for VOC analysis was then obtained and set aside. Subsequent to collection of the VOC aliquot, the sample characteristics (*e.g.*, soil type and recovery) were recorded. The split spoon sampler was then closed and set aside. This procedure was repeated for all the split spoons retrieved at a given borehole. Once the boring was advanced to the top of bedrock, the field team leader reviewed the VOC screening data and soil logs and made a determination of which split spoon sample(s) would be sent for laboratory analysis. VOC samples obtained from split spoons which were not selected for analysis were discarded.

Subsurface soil samples were analyzed for the parameters indicated in Table 2-2. Quality control (QC) samples included one duplicate sample (HXB54, duplicate of HXB4S2), two MS/MSD samples (HXB6S1MS/MSD and HXB16S1MS/MSD), and two aqueous rinsate field blanks (HXFBA1 and FBB-1).

Phase II RI Subsurface Soil Samples

A total of five supplemental subsurface soil samples were collected in the East Yard in accordance with the sampling procedures outlined in the FAP and in the PMP, Addendum No. 4. Three of these samples (HXB17, HXB20, and HXB21) were collected at a depth of approximately 2 to 2.5 feet below grade using decontaminated hand augers and stainless steel spoons. Due to auger refusal as a result of buried debris, the remaining two samples (HXB18 and HXB19) were collected at depths of less than 2 feet below grade. In each case, the aliquot for volatile organics analysis was collected first as a discrete sample and placed directly in the sample container. The remainder of the sample was then placed on a clean piece of aluminum foil and homogenized by manually mixing the material with a spoon until a visually uniform appearance was obtained. The homogenized sample was then placed in appropriate sample containers.

These subsurface soil samples were analyzed for the parameters shown in Table 2-1. Quality control (QC) samples were collected as part of the contemporaneous supplemental East Yard surface soil sampling effort. No subsurface soil-specific QC samples were collected.

2.4.3 Soil Sampling from UST Excavations

Soil samples were collected from the four UST excavations as part of the IRM. Three of these sampling locations, corresponding to the North Yard UST excavation, the South Yard UST excavation, and the East Yard UST excavation, were identified in the PMP-Amendment No. 2 (June 1997). A fourth sampling location was added during the IRM upon discovery of a fuel oil UST beneath the floor in the New Plant.

Upon removal of the USTs, the excavation sidewalls were inspected for visual signs of contamination. Soil samples were then collected from the excavated material and from the four sidewalls of the excavations where practical. Sidewall sampling was not possible in the East Yard UST excavation since the concrete vaults in which the four USTs were positioned remained intact during the tank removal. However, these UST vaults were found to have been backfilled with a sandy material during their installation. Instead, soil samples were collected from the soil surrounding each of the tanks. Similarly, sampling of only two of the four sidewalls was possible in the North Yard UST excavation since these tanks were encased in concrete and the concrete remained intact along the eastern and southern sides of the excavation during the tank removal activities. Because groundwater was present in all four excavations, no bottom samples were collected.

Sample locations were selected by the TAMS field supervisor. In order to avoid entering the excavations, soil samples were collected from the backhoe bucket. Soil was transferred from the backhoe bucket to laboratory supplied jars using a pre-cleaned, dedicated stainless steel spoon. The aliquot for VOC analysis was collected first as a discrete sample and placed directly in the sample container. The remainder of the sample was then homogenized by manually mixing the material with a spoon within the backhoe bucket until a visually uniform appearance was obtained. The homogenized sample was then placed in appropriate sample containers. Care was taken to avoid collecting soil that had come in contact with the backhoe bucket.

Subsurface UST soil samples were analyzed for the parameters indicated in Table 2-2. Quality control (QC) samples included one duplicate sample (SYTNX-1, duplicate of SYTN-1), one MS/MSD sample (SYTEX-1MS/MSD), and two aqueous rinsate field blanks.

In addition to samples collected by TAMS, several subsurface soil samples were collected by Trade-Winds for the purpose of characterizing the soil excavated during UST removal as necessary for disposal. These samples were collected using available on-site sampling equipment (*e.g.*, stainless steel spoons) and placed in appropriate laboratory-provided sample jars. These subsurface soil samples were analyzed for parameters indicated in Table 2-5. No QC samples were collected.

2.5 Hydrogeologic Investigations

Six monitoring wells were installed to determine groundwater elevations, flow direction and hydraulic gradients at the site. Five of these monitoring wells were shallow with the screened portion of the well straddling the groundwater table. One deep monitoring well (MW-2) was installed to determine groundwater quality in the deeper portion of the aquifer. This deep well was paired with a shallow monitoring well (MW-1) in order to assess the vertical component of flow at the site. Monitoring well locations are indicated in Figure 2-1.

2.5.1 Shallow Monitoring Well Installation

Soil borings B-1, B-3, B-4, B-5, and B-6 were advanced to the top of bedrock as described above in Section 2.3. Prior to installation of the shallow monitoring wells at these boring locations, the approximate depth to groundwater was determined by overdrilling boring B-3 to a depth of 23 feet bgs. A temporary well screen was placed in the borehole and water in the borehole was evacuated to establish recovery. The well was allowed to recover overnight and the resulting water level, 4.7 feet bgs, was used as a guidance in determining the water table elevation during construction of the remaining shallow wells. Following determination of the approximate groundwater table elevation, well sand was tremmied into the B-3 borehole to a depth of 15 feet bgs and sealed with 1-foot thick layer of bentonite pellets. Well installation then proceeded as discussed below.

The procedures used for shallow well installation are summarized as follows:

- The boreholes for MW-3 and MW-5 were advanced into bedrock using a 6-inch tricone bit and water rotary techniques to the desired depth. A 6-inch air hammer bit was used to advance the boreholes at MW-4 and MW-6 to the desired depth. MW-1 was completed in the overburden soils.

- Two-inch inside diameter, flush-threaded PVC casing and screen (0.010 or 0.020-inch factory slotted screen) were used for all shallow monitoring wells. The screened interval in each monitoring well is ten feet in length.

- A clean sand pack consisting of No. 1 or No. 2 sand was tremmied around the screen and extended approximately one to two feet above the top of the screened interval. Because of the very shallow water table and the proximity of the top of the screen to the ground surface, the minimum two foot thick sand pack above the top of the screen was only achieved in monitoring wells MW-1 and MW-6. In monitoring wells MW-3, MW-4, and MW-5, the sand pack extends 0.5 feet, 1 foot, and 1.5 feet, respectively, above the screened interval.

- The sand pack was sealed with a layer of bentonite pellets. Due to the shallow water table and the proximity of the top of the screen to the ground surface, a two-foot thick bentonite pellet seal was not achieved in most shallow wells. Instead, a one-foot thick pellet seal was placed on top of the filter sand pack.

- Cement grout was used to fill the annulus from the top of the bentonite pellet seal to the ground surface.

- A cemented gate box was installed over the PVC casing to complete each well at grade (*i.e.*, flush mount).

Monitoring well installation logs are provided in Volume II, Appendix B. It is important to note that the hydraulic gradient at the site had not been determined prior to implementation of the well installation activities. Based on observation of site topography, it was believed that monitoring well MW-6, located near the corner of Peartree Avenue and Boston Road, would serve as an upgradient well.

2.5.2 Deep Bedrock Monitoring Well Installation

Soil boring B-2 was advanced to the top of bedrock using 6¼-inch hollow stem augers as described in Section 2.3. Installation of the deep bedrock monitoring well (MW-2) proceeded as follows:

- The overburden borehole was reamed using 8¼-inch inside diameter hollow stem augers.

- A rock socket was drilled five feet into bedrock using a 7⅞-inch tricone roller bit inserted through the hollow stem augers.

- A 21-feet length of 6-inch inside diameter steel casing was installed in the borehole and sealed into the rock socket.

- The annulus between the 6-inch casing and the borehole was tremmie grouted in place using a cement/bentonite grout mixture. The hollow stem augers were lifted out incrementally as grouting proceeded.

- Continuous PQ bedrock cores were retrieved to the bottom of hole. At the discretion of the TAMS' field geologist, the boring was terminated at a depth of 51 feet bgs. A highly fractured zone was encountered from approximately 38 feet bgs to the bottom of the boring which appeared to be a water producing fracture zone.

- Upon examination of the core from the deep boring, the TAMS field geologist, in consultation with the NYSDEC RI Project Manager, determined that the bedrock was sufficiently fractured to require well screen and casing to maintain a functional well. The borehole was reamed using a 6-inch percussion air rotary bit to 53 feet bgs to allow for installation of the well screen and casing.

- Two-inch inside diameter screen (0.020-inch factory slotted PVC screen) and PVC riser were installed in the borehole. The screened interval for the deep monitoring well is ten feet in length.

- A clean sand pack consisting of No. 2 sand was tremmied around the screen and extended two feet above the top of the screened interval.

- The sand pack was sealed with a two-foot thick layer of bentonite pellets.

- A cement/bentonite grout mixture was used to fill the annulus from the top of the bentonite pellet seal to the ground surface.

- A cemented gate box was installed over the PVC casing to complete the deep well at grade (*i.e.*, flush mount).

The monitoring well installation log for the deep well is provided in Volume II, Appendix B.

2.5.3 Well Development

A minimum of 24 hours was allowed to elapse following completion of the well installation and initiation of well development. All wells had recovered within this time. Monitoring wells MW-1 through MW-5 were developed on December 15, 1997. MW-6 was developed on January 21, 1998.

All wells were developed using an electrical submersible Whale© pump. Purge rates ranged from approximately 0.5 to 2 gallons per minute (gpm). The objective of the monitoring well development was to flush remnant rock, sand and sediment from each of the wells so that the wells produced groundwater with a turbidity less than 50 Nephelometric Turbidity Units (NTU). Only one monitoring well, MW-6, met this turbidity criterion during development. Monitoring wells MW-1, MW-3 and MW-5 could not sustain low flow pumping without going dry. These wells were allowed to recover several times over several hours as development proceeded. Approximately 17 casing volumes were removed from MW-2 without achieving the 50 NTU criteria before development was terminated. Approximately 137 casing volumes were removed from MW-4 without achieving the 50 NTU criteria before development was terminated. Other parameters measured during development included pH, temperature, and specific conductance. Well development logs are provided in Volume II, Appendix B.

2.5.4 Groundwater Sampling

Two rounds of groundwater sampling were conducted as part of the remedial investigation. At the request of the NYSDEC RI Project Manager, the first round of groundwater sampling took place on January 2, 1998, prior to the installation of monitoring well MW-6. MW-6, which was installed on January 16, 1998, was first sampled on February 18, 1998. The second round of groundwater sampling occurred on March 5, 1998 and included all six monitoring wells. Groundwater sampling proceeded in accordance with the methodology outlined in the FAP and as described below.

Prior to purging each monitoring well, an oil/water interface probe was used to determine if a floating organic layer (light non-aqueous phase liquid - LNAPL) was present in the well. No floating organic layer was observed in any of the wells. However, an oily emulsion was observed in groundwater samples collected from monitoring well MW-4.

A minimum of three well volumes of water was pumped from the well using a centrifugal pump with dedicated black poly hose. Purging was performed to remove stagnant water which may have been in contact with the atmosphere from the well and to allow the well to recharge with water from the adjacent formation, enabling samples to be collected which were more representative of aquifer conditions at the time of sampling. Parameters monitored before, during, and after well purging included pH, temperature, turbidity, and specific conductivity. Purge water was discharged to the ground surface near the monitoring well from which it was removed. Purge water from MW-6 was transported to the former loading dock on-site and discharged to the ground surface.

Groundwater samples were collected using dedicated, disposable, Teflon bailers attached to dedicated polyethylene cords. Samples were then transferred to the appropriate sample containers. The aliquot designated for VOC analysis was obtained from the first bailerful of water removed from the well. Because the turbidity of most of the samples exceeded 50 NTU, field-filtered samples were collected for metals analysis in addition to the unfiltered (total metals) samples. The filtered samples were filtered using dedicated, disposable 0.45 micron filters and were filtered prior to adding sample preservative. All wells were sampled within a few hours of purging.

Groundwater samples were analyzed for the parameters indicated in Table 2-3. The field-filtered metals samples were kept preserved at the laboratory but not analyzed until results of the unfiltered (total metals) analyses had been evaluated. Because of the high turbidity of the unfiltered samples, and the fact that several metals concentrations in these samples exceeded NYSDEC Class GA groundwater criteria, the filtered samples from the first round of groundwater sampling were also analyzed; these data are reported as "dissolved metals." Note that, due to holding time considerations, no analysis for mercury was performed on these filtered samples.

During the second round of groundwater sampling, insufficient pre-preserved bottles for metals analysis were received from the laboratory. Therefore, the field-filtered samples collected during this sampling effort were not preserved immediately, although they were preserved within 24 hours of collection. The samples for total metals analysis were collected in pre-preserved bottles (*i.e.*, there was no lag between collection and preservation). As with the first round of groundwater sampling, due to high turbidity levels coupled with the exceedance of NYSDEC Class GA groundwater criteria by several metals in the unfiltered samples, the filtered samples were also analyzed; these data are reported as "dissolved metals".

QC samples collected during the first round of groundwater sampling included one duplicate sample (HXMW-53, duplicate of HXMW-3), one MS/MSD sample (HXMW-4MS/MSD), and one aqueous rinsate field blank. QC samples collected during the second round of groundwater sampling included one duplicate sample (HXMW-53, duplicate of HXMW-3) and one MS/MSD sample (HXMW-6MS/MSD). Due to bottle breakage, no field blank was analyzed for the second round of groundwater sampling.

While the FAP indicated that the existing on-site production well would be sampled as part of the groundwater sampling effort, the location of the production well could not be determined from previous records. Field inspections identified what appeared to be a 4-inch inside diameter steel well casing in the South Yard near Hydrotherm 2. However, this casing was blocked a few feet below grade and did not contain water. It is important to note that, due to its small size, it is unlikely that the four-inch casing corresponds to the production well. No other existing well was observed on site.

2.6 Waste Sampling (Oily Waste and Miscellaneous)

A deposit of viscous, oily, sludge-like material was observed on the first floor of Hydrotherm No. 1. The sample (OM-1) was collected on December 18, 1997 using a previously decontaminated stainless steel spoon. The aliquot for volatile organics analysis was collected first as a discrete sample and placed directly in the sample container. The remainder of the sample was then placed on a clean piece of aluminum foil and homogenized by manually mixing the material with a spoon until a visually uniform appearance was obtained. The homogenized sample was then placed in appropriate sample containers. This sample was analyzed for the parameters indicated in Table 2-4.

2.7 Concrete Floor Slab Sampling

Six discrete floor slab samples were collected by Trade-Winds, the demolition contractor, and analyzed as part of the IRM. These samples were collected in order to assess the need for remediation (via. scarification) of the floor slabs by Trade-Winds. These samples were collected using available on-site equipment including hammers and chisels. Pieces of the concrete were chipped from the surface of the floor slabs and placed in appropriate laboratory-provided sample containers. These samples were analyzed for the parameters listed in Table 2-5. No QC samples were collected as part of the floor slab sampling.

2.8 Ecological Investigation

An evaluation of the existing ecological conditions at the Hexagon Laboratories Site was conducted through review of available background information and a field reconnaissance. The following background information sources were consulted:

- National Wetlands Inventory (NWI) Map (Mount Vernon, NY quad);
- NYSDEC Tidal Wetlands Map (Map 598-526);
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate (FIRM) Map (Community Panel Number 360497 0007 B); and
- Data from the NYSDEC Significant Habitat Unit on threatened and endangered species and significant habitats (NYSDEC Wildlife Resources Center, receipt of letter dated February 27, 1998).

A field reconnaissance of the site was conducted by two TAMS ecologists on April 14, 1998.

3.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

This section provides a summary of the physical characteristics of the Hexagon Laboratories Site and surrounding area. Information provided in this section is based on data collected during the RI field investigation and on published literature. Figure 1-2 provides a topographic base map of the site. Sampling locations are indicated in Figure 2-1.

3.1 Surface Features

The Hexagon Laboratories Site is located in the northeast corner of Bronx County, New York approximately 700 feet southwest of the Hutchinson River. The eastern portion of Bronx County lies in the Atlantic Coastal Plain Physiographic province, which extends from Massachusetts to Florida. The western portion of Bronx County lies within the Appalachian Highlands Physiographic Province. The Hexagon Laboratories Site lies entirely within the Atlantic Coastal Plain Physiographic province.

The land surface in the immediate vicinity of the site generally slopes in a east-southeast direction towards the Hutchinson River. Based on site topography, the site can be divided into two major areas: the East Yard which fronts Heathcote Avenue; and the upper portion of the site (Office/Warehouse, North Yard, Old Plant, New Plant, and South Yard) which extends along Peartree Avenue. The East Yard is separated from the upper portion of the site by an approximately 4-feet high retaining wall which extends along its western edge. The East Yard generally slopes to the southeast with an elevation of 35 feet, NGVD in the northwestern corner of the yard near Tufo's parking area and an elevation of 26 feet, NGVD in the southeastern corner of the yard adjacent to Heathcote Avenue and Marbo Used Auto Parts. In contrast, the topography of the remainder of the site (Office/Warehouse, North Yard, Old Plant, New Plant, and South Yard) is relatively flat with elevations ranging from approximately 35 feet to 38 feet, NGVD. However, it is important to note that prior to the IRM and subsequent RI field investigation, much of this area was occupied by the Old Plant, New Plant, and Hydrotherm No. 2. During the subsurface sampling conducted in this area as part of the RI field investigation, it was difficult to distinguish between native soil and fill material brought in to level the area for building construction. Consequently, it is difficult to infer the natural surface topography of this area prior to its development.

Major surface features on the Hexagon Laboratories property include the three remaining buildings (Office/Warehouse, Hydrotherm No. 1, and cinder block building), the Old Plant and New Plant floor slabs, and three concrete slabs associated with aboveground storage tank secondary containment systems. The majority of the surface of the upper portion of the site is impermeable due to the presence of the Office/Warehouse building, Hydrotherm No. 1, the Old Plant and New Plant concrete floor slabs, and the secondary containment concrete slabs all of which comprise approximately 60 percent of the surface area in this portion of the site. Similarly, the majority (approximately 80 percent) of the East Yard is covered with concrete and macadam paving and, as such, is relatively impermeable. Major areas of exposed soil on site include the UST excavation areas in the North Yard, South Yard, East Yard, and the western portion of the East Yard in the vicinity of the earthen ramp constructed during the IRM. However, much of this exposed soil is clean fill material brought on site during the IRM demolition and tank removal activities.

The Hexagon Laboratories Site is largely surrounded by chain-link fence. While the fence does not extend around the perimeter of the Office/Warehouse building, all accessible openings in the Office/Warehouse building located outside of the fenced area were sealed with cinder blocks during the IRM to deter unauthorized access to the site. Access to the site is provided by three gates, one located at the entrances to each of the yard areas. These gates are chained and locked at all times.

As described in Section 1.1.2, the site is largely surrounded by industrial properties including several automotive salvage yards. In addition, a wholesale pre-packaged food distribution facility, Tufo's Wholesale Dairy, is immediately adjacent to the site. There are no residential properties in the immediate vicinity of the Hexagon Laboratories Site. However, Co-op City, a densely populated New York City housing project, is located approximately one-half mile south of the site.

3.2 Surface Water Hydrology

Bronx County has an extensive natural drainage system consisting of the Bronx River, Westchester Creek, and the Hutchinson River. The Hutchinson River is in closest proximity to the site (approximately 700 feet northeast of the site at its nearest point). It flows south through Bronx County and discharges into Eastchester Bay, which then discharges to Long Island Sound. This portion of the Hutchinson River is tidal. Pelham Bay Park is located less than one mile east of the site, on the eastern side of the Hutchinson River. Two tidal marsh areas are located in Pelham Bay Park as is the Thomas Pell Wildlife Refuge and Sanctuary. The Hutchinson River, Eastchester Bay, and Long Island Sound are classified as NYSDEC Class SB waters in Bronx County. Class SB waters are saline surface waters and are suitable for primary and secondary recreation contact and fishing (6 NYCRR 701).

As discussed in Section 3.1, the upper portion of the site is relatively flat (refer to Figure 1-2) and is largely impermeable. There is, however, a slight slope across the upper portion of the site to the southwest (approximately 0.02 feet per foot) towards Peartree Avenue. In addition, the North Yard and the western half of the South Yard are slightly sloped towards Peartree Avenue. In order to reduce off-site flow from the North Yard and South Yard UST excavation areas, small earthen berms (approximately 0.5 feet high) were constructed at the North Yard and South Yard entrances along Peartree Avenue at the completion of the IRM.

Based on the topography of the site, it appears that surface water runoff from the upper portion of the site drains towards Peartree Avenue. Runoff from the southern end of the upper portion of the site flows along Peartree Avenue towards Hollers Avenue where it is collected in catch basins located near the intersection of these streets and diverted to the combined sanitary/storm sewer which extends along Hollers Avenue. Flow from the northern end of the upper portion of the site flows along Peartree Avenue towards Boston Post Road where it is collected in the catch basins located at the intersection of these streets and diverted to the combined sanitary/storm sewer which extends along Boston Post Road. The combined sewers transport storm water runoff to a wastewater treatment plant during periods of low flow. However, during high flow storm events, the combined storm water/wastewater sewers discharge directly to the Hutchinson River.

In contrast to the upper portion of the site, the East Yard is sloped in an easterly direction (approximately 0.07 feet per foot) toward Heathcote Avenue. In addition, as indicated in Figure 1-2, the northeastern corner of the South Yard slopes toward the East Yard along an earthen ramp, constructed as part of the IRM, which connects these yard areas. As noted in Section 3.1, much of the East Yard surface is impermeable (asphalt, concrete, etc.).

Based on the topography of the site, it appears that surface water flow from the northeastern portion of the South Yard combines with surface water flow in the East Yard and drains towards Heathcote Avenue. The site runoff then flows southwest along Heathcote Avenue towards Hollers Avenue where it is collected in the catch basins located at the intersection of these streets and diverted to the combined storm/sanitary sewer which extends along Hollers Avenue. As noted previously, the combined sewers transport storm water runoff to a wastewater treatment plant during periods of low flow. However, during high flow storm events, the combined storm water/wastewater sewers discharge directly to the Hutchinson River.

3.3 Climate

The climate of Bronx County is predominantly continental with warm summers and long cold winters. However, the summer heat and winter cold are both tempered by oceanic influences. The average annual air temperature is 54°F with average daily extremes varying from 25°F to 85°F. Precipitation is moderate and distributed fairly evenly throughout the year with an average annual amount of 47 inches.

3.4 Geology and Soils

Geologic information was obtained from published literature and from RI field investigation activities including installation of exploratory soil borings, extraction of bedrock cores, and sampling of UST excavations.

3.4.1 Regional Geology

The geology of Bronx County includes near-surface glacial deposits, and metamorphic and sedimentary bedrock (Perlmutter and Arnow, 1953). The unconsolidated deposits beneath the site consist of Upper Pleistocene glacial till which was deposited directly from melting ice in an extensive ground moraine. The till, which covers most of Bronx County, is poorly sorted and consists of brown, unsaturated clay, sand, and boulders. The till in Bronx County ranges in thickness from 0 to 85 feet with an average thickness of 35 feet. Bedrock is exposed in some locations.

Bronx County is underlain by Precambrian rocks, including the Manhattan Schist, the Fordham Gneiss, and the Inwood Limestone (Perlmutter and Arnow, *op. cit.*). The eastern two-thirds of Bronx County, including the Hexagon Laboratories Site, is underlain by the Manhattan Schist, a dark-green to black, micaceous metamorphic rock. An outcrop of the Manhattan Schist was noted approximately 1,000 feet west of the site along Hollers Avenue. The geologic structure of the Manhattan Schist is complex. The formation is intensely folded and metamorphosed, with well-developed foliation. Geologic mapping indicates that a north-northwest tending fault lies approximately three miles west of the site.

3.4.2 Site-Specific Geology

Information obtained from literature review prior to the RI field investigation indicated that bedrock was present at shallow depths beneath the site. Depths to bedrock ranged from 1.2 to 12.6 feet in NYC sewer department borings along Boston Post Road in the vicinity of the site. In addition, bedrock was reported at 4 feet bgs in an abandoned production well located on the site. Note that the location of the production well was not reported and could not be determined during the RI field investigation. The shallow depth to bedrock was confirmed during the IRM UST removal activities in that it appeared that bedrock was excavated for the installation of all of the North Yard USTs and for a few, if not all, of the South Yard USTs. As part of the RI field investigation, 15 exploratory soil borings were drilled on site. Each of these borings were drilled to the top of bedrock. In addition, core runs were collected at five of six monitoring well locations; rock core was collected at only one (MW-2) of the co-located shallow and deep monitoring wells (MW-1/MW-2) installed in the East Yard.

As indicated in Figure 3-1, depth to bedrock is very shallow across most of the site. Bedrock is closest to the surface near the Office/Warehouse building at MW-6 where it was encountered at a depth of 1 foot bgs. Depth to bedrock along Peartree Avenue appears to be approximately 5 to 6 feet bgs. As illustrated in Figures 3-2 and 3-3 (cross-section A-A'), the bedrock surface beneath the North Yard and the Old Plant appears to rise to the north towards Tufo's Wholesale Dairy to a depth of 2 to 3 feet bgs (B-13 and B-11, respectively). However, in the East Yard, the bedrock surface appears to drop off steeply as evidenced by the bedrock elevation at MW-1 and MW-2 of 11 feet NGVD, 20 feet lower than encountered at MW-3 in the South Yard as shown on cross-section B-B' in Figure 3-3. Given the close proximity of the Hutchinson River to the site, it is possible that the steep drop-off in bedrock surface could be attributed to incision from a former paleochannel of the river.

3.5 Hydrogeology

As part of the RI field investigation, six monitoring wells, five shallow and one deep, were installed to determine groundwater elevation, flow direction and gradient at the site. As indicated in Figure 3-1, the thickness of overburden soils is typically between 2 feet and 6 feet across most of the site with the exception of the East Yard and the eastern corner of the South Yard. As a result of the shallow depth to bedrock, only one (MW-1) of the five shallow monitoring wells installed during the RI is screened entirely within overburden soils. Two of the shallow monitoring wells (MW-3 and MW-4) are screened across the soil-bedrock interface and the remaining two shallow monitoring wells (MW-5 and MW-6) are screened below the top of bedrock. The deep monitoring well, MW-2, is screened entirely within bedrock. Locations of wells and screened intervals relative to the local ground surface and soil/bedrock interface are presented in Figure 3-3.

Three synoptic rounds of water level measurements were recorded during the RI field investigation over a period of approximately 6 weeks from January 21, 1998 through March 5, 1998. Additional measurements were recorded for monitoring wells MW-1 through MW-5 extending back to early December 1997. These data are provided in Table 3-1 and the groundwater contours corresponding to the synoptic rounds of water level measurements are provided in Figures 3-4, 3-5, and 3-6.

Comparison of the elevation of the top of bedrock (Figure 3-2) to groundwater elevation (Figures 3-4, 3-5 and 3-6) indicates that groundwater is present in the overburden soils across the entire site with the exception of MW-6. Groundwater at MW-6 is first encountered at a depth of approximately 2 to 3 feet below the top of bedrock suggesting that the groundwater table at the site crosses the soil/bedrock interface between MW-5 and MW-6.

3.5.1 Horizontal Groundwater Flow Direction

As is evident in Figures 3-4, 3-5, and 3-6, the groundwater elevation is highest at monitoring well MW-5 and it appears that groundwater generally flows in an easterly direction across the site. However, it is difficult to determine the true direction of groundwater flow at the site due to the limited number of sampling points and the absence of a clear trend in the five shallow monitoring wells. Groundwater level measurements at MW-1, MW-3, MW-4 and MW-5 indicate an easterly direction of flow across most of the site as shown on Figure 3-4, which was based on measurements taken prior to the installation of MW-6. This apparent easterly flow direction has remained consistent since the monitoring wells were installed.

It is important to note that monitoring well MW-6 was installed in what was assumed to be an upgradient location based on local topography. However, as is indicated in Figures 3-5 and 3-6, MW-6 appears to be downgradient of MW-5. Specifically, groundwater elevations measured at MW-6 are 8 to 9 feet lower than those measured at MW-5, suggesting a groundwater flow direction to the northwest. The contour maps presented in Figures 3-4, 3-5 and 3-6 show groundwater flow radiating out from a hydrologic high area extending from Peartree Avenue to MW-5 towards Boston Post Road and Heathcote Avenue (an arc of at least 120 degrees). It is possible that there is a groundwater divide in the vicinity of MW-5 separating groundwater flow at the site. However, this presence of a groundwater divide cannot be confirmed based on the limited number of sampling points.

3.5.2 Hydraulic Gradients

Horizontal Gradient

Horizontal hydraulic gradients were calculated for the site based on the groundwater contours maps presented in Figures 3-4, 3-5 and 3-6. As discussed in the previous section, groundwater at the site appears to be moving in several directions, emanating from a groundwater high at MW-5 and dispersing out across a wide arc from this location. There is some evidence to suggest the presence of a groundwater divide in the vicinity of MW-5. Hydraulic gradients across the Old Plant, New Plant and South Yard appear to be relatively low with values of 0.010 to 0.013 feet per foot. Groundwater elevation measurements recorded at MW-1 indicate that the water table elevation is approximately 16 feet lower in the east corner of the East Yard than in the upper portion of the site indicating a rapid increase in gradient as groundwater flow continues toward the east. The steepest gradients in groundwater flow were noted between the upper portion of the site and the East Yard with values ranging from 0.101 to 0.109 feet per foot. This trend matches the measured surface elevation and depth to bedrock trends as shown on cross-section B-B' in Figure 3-3. The northwesterly groundwater flow direction from MW-5 towards MW-6 indicates a relatively steep gradient in groundwater flow of 0.084 to 0.079 feet per foot.

Vertical Gradient

Deep monitoring well MW-2 was installed adjacent to shallow monitoring well MW-1 in the South Yard. As discussed previously, MW-1 is screened entirely within the overburden while MW-2 is screened within a highly fractured zone of the bedrock (Manhattan Schist). The screened intervals are separated by approximately 25 feet. Comparison of groundwater elevations indicate a downward component to flow in the bedrock aquifer as groundwater level measurements in MW-1 are consistently higher (ranging from 0.44 feet to 1.29 feet) than in MW-2. Comparison of the groundwater elevations for the two wells (Table 3-1) show similar rising groundwater elevations through the monitoring period. These data indicate that groundwater within the bedrock is hydraulically connected to the overburden aquifer.

3.6 Geophysical Survey Results

As discussed in Section 2-2, a geophysical survey was conducted by Hager-Richter Geoscience, Inc. as part of the IRM in order to identify potential locations of USTs or subsurface structures (e.g. vaults) which had not been removed or addressed as part of the IRM. Two geophysical methods were utilized in the survey of the site: ground penetrating radar (GPR) and precision utility location (PUL). The GPR signal penetration was limited at the site due to soil conditions. Hager-Richter estimated that signal penetration was approximately 3 to 4 feet bgs. GPR reflections similar to that of USTs were detected at two locations. Three areas exhibited magnetic anomalies based on the PUL survey, suggesting the presence of buried metal.

One of the two potential USTs, located in the southeast corner of the New Plant along Peartree Avenue, was excavated. While several small diameter metal pipes were recovered, no UST or vault was encountered. The second potential UST, located within the footprint of the former Hydrotherm No. 2, was assumed to correspond to a concrete vault located below the Hydrotherm No. 2 floor slab. The vault had formerly housed a UST. However, this UST had been previously removed and the vault backfilled. The three areas identified as potential buried metal by the PUL survey were not investigated. Results of the geophysical survey are provided in Volume II, Appendix A.

4.0 NATURE AND EXTENT OF CONTAMINATION

This section presents the analytical results of samples collected during the IRM and during the remedial investigation. These results are evaluated relative to Federal and State standards, background sample concentrations, and literature values representative of background or typical concentrations. Applicable Federal and State standards for those contaminants detected in soil and groundwater at the Hexagon Laboratories Site are provided in Table 4-1. Typical background inorganics concentrations obtained from various literature sources are summarized in Table 4-2. The analytical data are summarized in Tables 4-3 through 4-28. Sampling locations are indicated in Figure 2-1.

Except as noted, samples collected by TAMS during the IRM and the remedial investigation were analyzed by NYSDEC Analytical Services Protocol (ASP) Contract Laboratory Program (CLP) protocols for Target Compound List (TCL) volatile and semivolatile organics, pesticides and PCBs, and Target Analyte List (TAL) inorganics (23 metals plus cyanide). Several samples were also analyzed for total petroleum hydrocarbons (TPHC), total organic carbon (TOC), and for toxicity (Toxicity Characteristic Leaching Procedure - TCLP). Those samples collected by Trade-Winds during the IRM were analyzed by SW-846 Methods for volatile organics, semivolatile organics, PCBs, RCRA metals, and toxicity by TCLP for metals. Only data associated with samples collected by TAMS during the IRM and remedial investigation have been validated. The results of the specific analyses conducted on the surface soil, subsurface soil, groundwater, and miscellaneous (oily material and concrete floor slab) samples are discussed below on a matrix-specific basis.

4.1 Evaluation Criteria

In order to provide a meaningful discussion of the analytical data, matrix appropriate criteria were compiled. These criteria are summarized in Tables 4-1 and 4-2. These criteria considered during evaluation of the data are discussed below.

4.1.1 Regulatory Criteria

Surface Soils

Federal soil criteria exist only for PCBs and lead. The Federal criterion for lead is a preliminary remediation goal and is not a promulgated standard. These criteria were considered in conjunction with New York State recommended soil cleanup objectives (RSCOs) obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046 in evaluation of the surface soil data. While the NYSDEC soil criteria are not promulgated standards, they provide soil cleanup objectives which are based on consideration of human health risk, protection of groundwater and drinking water, background concentrations of contaminants, and analytical detection limits.

As discussed in Section 2.4, no surface soil background samples were collected due to the variety of surface contaminants expected to be endemic to the area and because of the extremely limited amount of surface soil present on the Hexagon Laboratories Site. However, in evaluation of inorganics in the surface soil, background subsurface soil samples (HXBK1, HXBK2, and HXBK3) were considered in combination with various literature values, summarized in Table 4-2, since, for inorganics, the NYSDEC RSCOs list "background" as a cleanup level.

Concentrations of most of the inorganics measured in the site-specific subsurface soil background samples fell within typical background concentrations reported by NYSDEC for New York State soils (NYSDEC, 1991) and by the New Jersey Department of Environmental Protection and Energy (NJDEP, 1993) for urban New Jersey soils (Table 4-2). With the few exceptions discussed below, the maximum typical background concentrations reported by NYSDEC for New York State soils were used as representative of background conditions for the inorganics. Typical background concentrations reported by NJDEP for urban New Jersey soils were used for antimony, cadmium, mercury, and silver since, with the exception of mercury, background concentrations for New York State soils were not reported for these compounds. The NJDEP-reported background concentration for mercury was used since mercury was detected in site-specific background sample HXBK1 at a concentration which exceeds the NYSDEC-reported maximum for New York State soils but is less than the NJDEP-reported concentration for mercury in urban New Jersey soils. The NJDEP-reported value for mercury is consistent with background concentrations listed for eastern United States soils (Shacklette and Boerngen, 1984) and for United States soils (*e.g.*, McClanahan, 1986).

Maximum site-specific background concentrations of seven metals (chromium, copper, iron, magnesium, nickel, thallium, and zinc) were used as representative of background concentrations since the concentrations of these metals detected in at least one of the three site-specific background samples exceed the corresponding background concentrations reported by NYSDEC for New York State soils and by NJDEP for urban New Jersey soils. With the exception of thallium, the site-specific background concentration for each of these metals is well within the typical ranges of concentrations reported in various studies for eastern United States soils (Shacklette and Boerngen, 1984) and United States soils (*e.g.*, McClanahan, 1986). No literature values were reported for thallium. A summary of the background concentrations used in evaluating the surface soil samples is provided in Table 4-6.

For each contaminant with a background concentration in excess of the specific numeric RSCO provided by NYSDEC, the background concentration has been used as the evaluation criteria. For two metals, selenium and vanadium, the specific numeric NYSDEC RSCO is greater than the corresponding background concentration and has been used as the evaluation criteria for these two metals.

Subsurface Soils

As with surface soils, Federal criteria for PCBs and lead were considered in conjunction with the NYSDEC RSCOs in evaluation of the subsurface soil data. In addition, data from the three off-site subsurface soil background samples collected during the remedial investigation (HXBK1, HXBK2, and HXBK3) were considered. Various literature values, summarized in Table 4-2, were also considered for those inorganic constituents for which the NYSDEC RSCOs specify background concentration as the cleanup objective. The rationale for selecting appropriate background concentrations for the inorganics in the subsurface soil samples is identical to that discussed above for surface soils. A summary of the background concentrations used in evaluating inorganic constituents of the subsurface soil samples is provided in Tables 4-11 and 4-16.

Toxicity, as defined by the TCLP test results, is one of four characteristics used to identify hazardous wastes under the Resource Conservation and Recovery Act (RCRA). TCLP extract concentrations were compared to both Federal and State standards for the maximum concentration of contaminants in TCLP extract as provided in Table 4-1. Any sample which exceeds the TCLP criteria for one or more contaminants is considered to be hazardous by characteristic.

Groundwater

New York State standards for Class GA groundwater were considered to be applicable criteria in the evaluation of site groundwater data. Primary and secondary Federal Maximum Contaminant Levels (MCLs - 40 CFR 141 and 143) and New York State drinking water standards (10 NYCRR 5) were not considered to be applicable or relevant and appropriate given the fact that there are no known uses of groundwater in Bronx County as potable water. Drinking water for Bronx County is obtained from the Croton Reservoir, located approximately 18 miles north of the site. In addition, the closest well, based on a search of the USGS water well database and the New York Public Well database performed by Environmental Data Resources, Inc. in March 1996, is more than one-half mile north of the site; the closest public water supply well is approximately three miles northeast of the site. It is important to note that New York State does not require well registration. Therefore, the New York Public Well database may not accurately represent the presence of wells in the vicinity of the site.

Miscellaneous Samples

There are no specific Federal or State regulatory criteria for the miscellaneous samples (oily material and concrete floor slab samples) collected at the Hexagon Laboratories Site. However, the analytical results of the oily material sample (HX-OM1), which was analyzed for toxicity using TCLP, were compared to both Federal and State standards for the maximum concentration of contaminants in TCLP extract as provided in Table 4-1. Any sample which exceeds the TCLP criteria for one or more contaminants is considered to be hazardous by characteristic.

4.1.2 Background Concentrations

Typical background concentrations of metals obtained from various literature sources were used as criteria in evaluating the metals content of surface and subsurface soil samples. These typical background concentrations, which are provided in Table 4-2, were considered in combination with the analytical data obtained from the three background subsurface soil samples collected as part of the RI. While not pristine, these samples were designed to provide information on subsurface background conditions in the vicinity of the site. As discussed previously, no surface soil background samples were collected due to the variety of surface contaminants expected to be endemic to the area and because of the extremely limited amount of surface soil present on the Hexagon Laboratories Site.

4.2 Surface Soil

A total of ten surface soil samples (HX-SS1 through HX-SS10) and six shallow subsurface soil samples (HXB6S1, HXB10S1, HXB13S1, HXB16S1, HXB18, and HXB19), all collected at a depth of less than two feet below ground surface, were used to characterize the extent of contamination in the surface soil across the site. As shown on Figure 2-1, nine samples (HX-SS1, HX-SS2, HX-SS6 through HX-SS10, HXB18, and HXB19) were collected in the East Yard. The remainder of the samples were collected in the upper portion of the site (Office/Warehouse, North Yard, Old Plant, New Plant, and South Yard), which includes the primary chemical manufacturing areas on site. Except as noted, these samples were analyzed for TCL organics, pesticides, PCBs, and TAL inorganics (see Table 2-1). Selected samples were also analyzed for TPHC, and TOC. Analytical results for the surface soil samples are provided in Tables 4-3 through 4-7. Distributions of various contaminants detected in surface soils across the site are presented in Figures 4-1 through 4-4.

4.2.1 Volatile Organic Compounds

Various VOCs were detected in the surface soil and shallow subsurface soil samples collected across the site at concentrations well below NYSDEC RSCOs. However, for shallow subsurface soil sample (HXB10S1), several contaminants including toluene (610,000 μg/kg), ethylbenzene (98,000 μg/kg), xylenes (590,000 μg/kg), trichloroethene (2,900 μg/kg), tetrachloroethene (13,000 μg/kg), acetone (6,100 μg/kg), and chlorobenzene (24,000 μg/kg) were detected at concentrations well above the NYSDEC RSCOs; contaminant concentrations exceed the soil cleanup levels by as little as four times for trichloroethene to as much as greater than two orders of magnitude for toluene and xylene. This heavily contaminated sample was collected at the southern end of the former New Plant building directly adjacent to the South Yard UST area. High levels of contamination in the shallow subsurface at this sampling location are expected given the observation of loose UST fill pipes during the removal of USTs from the South Yard during the IRM. Based on a UST inventory provided by Hexagon Laboratories to NYSDEC in 1987 and listed in Table 1-1, several compounds including acetone and toluene were stored in the South Yard USTs.

Acetone was also detected at a concentration slightly greater than the RSCO of 200 µg/kg in shallow subsurface soil sample HXB19, collected in the central portion of the East Yard. The source of the acetone contamination in the East Yard is unknown.

With the exception of samples HXB10S1 and HXB19, none of the surface soil or shallow subsurface soil samples exceed NYSDEC RSCOs for specific compounds. While bromomethane was detected in East Yard surface soil sample HX-SS1 at a concentration of 2 µg/kg, there is no NYSDEC RSCO for this compound. Two samples, HXB10S1 and HXB13S1, exceed the NYSDEC RSCO for total VOCs of 10,000 µg/kg with total VOC concentrations, including tentatively identified compounds (TICs), of 1,533,000 µg/kg and 12,132 µg/kg, respectively. Sample HXB10S1 was collected adjacent to the South Yard UST area and sample HXB13S1 was collected approximately 20 feet east of the North Yard UST area below the floor slab in Hydrotherm No. 1. At the time of sampling, there was evidence of oil spillage in the vicinity of sample HXB13S1; oily material sample OM-1 was collected approximately three feet from the shallow subsurface soil boring location.

4.2.2 Semivolatile Organic Compounds

Three phenolic compounds (phenol, 2-methylphenol, and 4-methylphenol) were detected at concentrations which exceed the NYSDEC RSCOs for these compounds in shallow subsurface soil sample HXB10S1. 4-Methyl phenol was detected at 1,800 µg/kg, the highest of the three; 2-methylphenol was detected at a concentration of 1,100 µg/kg and phenol was detected at a concentration of 180 µg/kg. The NYSDEC RSCOs for these compounds are 900 µg/kg, 100 µg/kg, and 30 µg/kg, respectively. As noted above, this sample was collected at the southern end of the former New Plant building directly adjacent to the South Yard UST area. While these compounds were not listed as South Yard UST contents in the tank inventory (see Table 1-1), the contents of several leaking USTs, reportedly taken out of service in 1977, were listed as unknown. No phenolic compounds were detected in the remaining 15 surface soil and shallow subsurface soil samples.

Polycyclic aromatic hydrocarbons (PAHs) were detected in 10 of the 16 surface soil and shallow subsurface soil samples collected across the Hexagon Laboratories Site at concentrations in excess of the NYSDEC RSCOs. PAHs which exceed the cleanup levels include benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(a)pyrene, and dibenz(a,h)anthracene. Total PAH concentrations range from non detect in surface soil samples HX-SS6 and HX-SS7, both collected beneath paved surfaces in the East Yard, to 323,120 µg/kg in shallow subsurface soil sample HXB13S1. Concentrations of chrysene, which exceed the corresponding NYSDEC RSCO of 400 µg/kg in nine of the 16 samples, range from non detect in East Yard surface soil samples HX-SS6, HX-SS7, and HX-SS9 to 300,000 µg/kg in shallow subsurface soil sample HXB13S1. At the time of sampling, there was evidence of oil spillage within Hydrotherm No.1 in the immediate vicinity of HXB13S1;

the sample of oily material (HX-OM1) was collected within approximately three feet of the soil boring location. PAHs are a constituent of petroleum products such as automotive and industrial oils. In addition, PAHs tend to be ubiquitous in the environment, especially in urban or industrial areas, since they are also the products complete combustion (*e.g.*, in automotive exhaust). Therefore, the pervasive presence of these compounds across the site is expected due to the proximity of the site to three major highways (US Route 1, Interstate 95, and the New York State Thruway). The auto salvage facilities adjacent to the site likely contribute to the PAH contamination at the site due to the frequent car/oil fires at these facilities as observed during the IRM. As noted previously, the particularly high levels of PAHs in Hydrotherm No. 1 shallow subsurface boring sample HXB13S1 are most likely due to an apparent oil spillage observed near this location.

Only one sample, HXB13S1 exceeds the NYSDEC RSCO of 500,000 µg/kg for total SVOCs. Total SVOCs were detected in this sample at a concentration of 2,895,720 µg/kg, the bulk of which (2,572,600 µg/kg) corresponds to TICs.

4.2.3 Pesticides/PCBs

While several pesticides were detected in surface and shallow subsurface soil at the Hexagon Laboratories Site, only aldrin was detected at levels in excess of the NYSDEC RSCOs. (Note that the supplemental East Yard surface soil and shallow subsurface soil samples collected as part of the Phase II RI were not analyzed for pesticides). Aldrin was detected in surface soil samples HX-SS2 (67 µg/kg) and HX-SS3 (180 µg/kg) at concentrations in excess of the NYSDEC RSCO of 41 µg/kg. While it is possible that pesticides were used at the site, the pesticide data for all media sampled as part of the remedial investigation are considered suspect due to significant matrix interference. This interference issue is discussed in detail in Section 8.0 - Data Quality and Usability.

PCBs were detected in four of the 10 surface soil samples and in four of the six shallow subsurface soil samples. Of the samples in which PCBs were detected, total PCB concentrations range from 90 µg/kg in shallow subsurface soil sample HXB6S1, located immediately north of the Office/Warehouse building and adjacent to Boston Post Road, to 1,500 µg/kg in surface soil sample HX-SS3, located in the South Yard. Both surface soil sample HX-SS3 and shallow subsurface soil sample HXB19, located in the central portion of the East Yard, exceed the NYSDEC RSCO of 1,000 µg/kg for surface soil. The source of the PCB contamination is unknown but may have been a component of the heat transfer oil used in manufacturing processes at the site.

4.2.4 Inorganic Compounds

As discussed in Section 4.1.1, concentrations of inorganics detected in surface soil and shallow subsurface soil samples were compared to subsurface background samples as well as various literature values for New York and urban New Jersey soils. A summary of the background concentrations used in evaluating the surface soil and shallow subsurface soil samples is provided in Table 4-6.

Many metals were detected in the surface soil and shallow subsurface soil samples at levels greater than the corresponding evaluation criteria (*i.e.*, the greater of the applicable background concentration and NYSDEC RSCOs). These metals include antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, thallium, and zinc. While there are exceedances of calcium, iron, magnesium, and sodium in the surface and shallow subsurface soils across the site, these metals are common to the dominant mineral species in Manhattan Schist (mica and hornblende) which underlies the site. Because of the likelihood of the presence of these metals as inherent constituents of the weathered bedrock soils at the site, they are not discussed further.

Various metals exceed the evaluation criteria in eight of the nine East Yard surface soil and subsurface soil samples. Metals detected at elevated concentrations in these samples include antimony, arsenic, barium, cadmium, chromium, copper, lead, nickel, selenium, thallium, and zinc. The highest concentrations of nickel (217 mg/kg) and thallium (2.7 mg/kg) were detected in surface soil sample HX-SS9, collected in the southeastern corner of the East Yard. The highest concentrations of antimony (24.3 mg/kg), arsenic (27.5 mg/kg), barium (1,840 mg/kg), cadmium (31.5 mg/kg), chromium (123 mg/kg), copper (3,720 mg/kg), lead (1,400 mg/kg), selenium (8.6 mg/kg), and zinc (8,100 mg/kg) were detected in shallow subsurface soil sample HXB19, collected in the central portion of the East Yard. This sample represents the highest concentrations of antimony, barium, cadmium, copper, lead, selenium, and zinc detected in surface soil and shallow subsurface soil at the Hexagon Laboratories Site. These exceedances range from approximately three times greater than the background concentration for lead to more than 35 times greater than the background concentration for antimony.

Metals, including antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, thallium, and zinc, were also detected at elevated concentrations in the seven surface soil and shallow subsurface soil samples collected in the upper portion of the site (*i.e.*, North Yard, Old Plant, New Plant, and South Yard). The highest concentrations of arsenic (63.8 mg/kg), barium (812 mg/kg), cadmium (11.7 mg/kg), chromium (257 mg/kg), copper (1,050 mg/kg), lead (1,040 mg/kg), nickel (265 mg/kg), and zinc (1,270 mg/kg) detected in the upper portion of the site were detected in surface soil sample HX-SS4, collected in the main plant area of the former New Plant. These exceedances range from approximately 1.1 times greater than the background concentration for zinc to more than five times greater than the background concentration for arsenic. The concentrations of arsenic, chromium, and nickel detected in this sample are also the highest concentrations of these metals detected in the surface soil and shallow subsurface soil at the Hexagon Laboratories Site.

The highest concentrations of antimony (0.83 mg/kg), mercury (7.3 mg/kg), and selenium (3 mg/kg) detected in the upper portion of the site were detected in surface soil sample HX-

SS3, collected in the South Yard. These exceedances range from approximately 1.2 times the background concentration for arsenic to approximately three times the RSCO for mercury. This sample represents the highest reported mercury concentration for all site surface and shallow subsurface soils. The highest concentration of thallium (4 mg/kg) observed in surface and shallow subsurface soil samples collected in the upper portion of the site, as well as across the entire Hexagon Laboratories Site, is approximately three times greater than the corresponding background concentration and was detected in shallow subsurface soil sample HXB6S1, collected north of the Office/Warehouse and adjacent to Boston Post Road.

Of the inorganic contamination, nickel appears to be the most pervasive with exceedances detected in seven of the 16 surface and shallow subsurface soil samples. Antimony and nickel appear to be pervasive in the East Yard, each with exceedances detected in four of the six East Yard surface and shallow subsurface soil samples.

4.2.5 Total Organic Carbon

TOC concentrations of three of the six surface soil samples (HX-SS1, HX-SS3, and HX-SS5) analyzed for TOC are fairly consistent ranging from 21,800 mg/kg to 25,900 mg/kg (approximately 2.2% to 2.6% TOC). In contrast, the TOC concentration in the two shallow subsurface soil samples HXB6S1 and HXB10S1 and surface soil sample HX-SS2 are much lower, ranging from 3,260 mg/kg to 6,630 mg/kg (0.33% to 0.66%). These TOC values are relatively low as compared to values of 1% to 3% TOC typically used as default TOC concentrations in soil. The TOC concentration detected in surface soil sample HX-SS9 falls within the low end of this typical range with a concentration of 13,400 mg/kg (approximately 1.3%). The TOC concentration of sample HX-SS4 (50,800 mg/kg or approximately 5.1%), collected within the footprint of the former New Plant main work area, is the highest of the surface soil and shallow subsurface soil samples collected and analyzed for TOC.

4.2.6 Total Petroleum Hydrocarbons

Total petroleum hydrocarbon (TPHC) analysis was performed for two on-site surface soil samples and one shallow subsurface soil sample collected from areas where oil contamination seemed likely. TPHC was detected in surface soil sample HX-SS3, collected in the vicinity of Hydrotherm No. 2, at a concentration of 1,500 mg/kg. TPHC was detected in surface soil sample HX-SS2, collected near the western edge of the East Yard beneath a drainage pipe which appeared to drain runoff from behind the retaining wall separating the South Yard from the East Yard, at a concentration of 330 mg/kg. The highest concentration of TPHC in the surface soil and shallow subsurface soil samples was observed in shallow subsurface soil sample HXB13S1 (28,000 mg/kg), collected from beneath the floor slab in Hydrotherm No. 1. As noted previously, at the time of sampling, there was evidence of oil spillage in the vicinity of HXB13S1; the sample of oily material (HX-OM1) was collected within approximately three feet of HXB13S1.

4.2.7 Hazardous Characteristic

As discussed in Section 4.1.1, toxicity, as defined by the TCLP test results, is one of four characteristics used to identify hazardous wastes under the Resource Conservation and Recovery Act (RCRA). Two of the four shallow subsurface soil boring samples, HXB10S1 and HXB13S1, were analyzed for TCLP organics and metals. No TCLP analytes were detected at concentrations which exceed the TCLP regulatory criteria listed in Table 4-1.

4.3 Subsurface Soil

A total of 31 subsurface soil samples, consisting of 16 subsurface soil boring samples (excluding the six shallow subsurface soil boring samples discussed in Section 4.2 and three off-site background soil boring samples) and 15 subsurface soil samples from the four UST areas on site were used to characterize the nature and extent of contamination in the subsurface soil across the site. Of these samples, 11 were collected in the East Yard, nine were collected in the South Yard, three were collected in the North Yard, three were collected beneath the Old Plant floor, and five were collected below the New Plant floor slab. Three off-site background subsurface soil boring samples were also collected to assist in identifying site-related contamination. In addition to the samples listed above, six samples (LD1-2-3, #1-2-3, SYS1, SYS2, SYS3, and SYTEX-1) were collected from soil excavated from the South Yard UST area and four samples (FOT#1, FOT#2, FO1, and FO2) were collected from soil excavated from the New Plant UST area during tank removal activities performed as part of the IRM. With the exception of sample SYTEX-1, all excavated soil samples were collected by Trade-Winds for disposal purposes. Each of these excavated soil samples corresponds to soil removed from the site and replaced by clean fill during the IRM. While these samples were not used to assess the nature and extent of contamination in the subsurface soil across the site, their analytical results are presented herein to provide a reference point in the evaluation of the nature and extent of contamination remaining on site.

Except as noted, the subsurface soil samples were analyzed for TCL organics, pesticides, PCBs, TAL inorganics, TPHC, TOC, and toxicity using TCLP (see Table 2-2). Analytical results for the subsurface soil samples are provided in Tables 4-8 through 4-17. Sample locations are shown in Figure 2-1. Distributions of various contaminants detected in the subsurface soil samples are presented in Figures 4-5 through 4-8.

4.3.1 Volatile Organic Compounds

<u>East Yard</u>

Of the 11 samples collected in the East Yard (HXB1S3, HXB1S7, HXB7S2, HXB7S4, HXB17, HXB20, HXB21, EYT34-1, EYT35-1, EYT36-1, and EYT37-1), two samples, HXB7S2 and HXB17, contained contaminants at concentrations greater than the NYSDEC RSCOs. Xylene was detected in sample HXB7S2 at a concentration of 2,400 μg/kg, which exceeds the NYSDEC RSCO of 1,200 μg/kg, and both benzene (330 μg/kg) and acetone

(240 µg/kg) were detected in sample HXB17 at concentrations which exceed their respective NYSDEC RSCOs of 60 µg/kg and 200 µg/kg. In addition, the concentrations of total VOCs, including TICs, detected in sample HXB7S2 (16,709 µg/kg) and in sample HXB17 (12,837 µg/kg) both exceed the NYSDEC RSCO of 10,000 µg/kg.

South Yard

A total of nine samples (HXB3S2, HXB8S4, HXB9S3, HXB9S5, SYTN-1, SYTS-1, SYTE-1, SYTW-1, SYTC-1) were collected from the South Yard. Of these, eight were grab samples which were analyzed for VOCs. The four UST sidewall grab samples analyzed for VOCs (SYTN-1, SYTS-1, SYTE-1, SYTW-1) were composited to form a single sample (SYTC-1) which was analyzed for the other TCL/TAL fractions; the composite sample was not analyzed for VOCs.

Most of the VOC contamination identified in the South Yard is associated with the South Yard UST area. VOCs were detected in each of the four South Yard UST excavation sidewall samples analyzed for VOCs at concentrations greater than the NYSDEC RSCOs. Benzene, toluene, ethylbenzene, and xylenes (BTEX compounds) comprise the bulk of the contamination in these samples. Total BTEX concentrations in these UST excavation sidewall samples range from 132,600 µg/kg in sample SYTE-1 to 320,000 µg/kg in sample SYTW-1. Only one (HXB9S5) of the four subsurface boring samples collected in the South Yard contains BTEX compounds in excess of the NYSDEC RSCOs. Total xylenes were detected in this sample at a concentration of 3,000 µg/kg which exceeds the NYSDEC RSCO of 1,200 µg/kg.

Four chlorinated compounds, 1,2-dichloroethane, trichloroethene, tetrachloroethene, and chlorobenzene, were detected in the South Yard UST excavation sidewall samples at concentrations greater than the corresponding NYSDEC RSCOs. 1,2-Dichloroethane was detected in sample SYTN-1 at a concentration of 5,000 µg/kg which exceeds the NYSDEC RSCO of 100 µg/kg by 50 times. Trichloroethene (3,200 µg/kg), also detected in sample SYTN-1, exceeds the NYSDEC RSCO of 700 µg/kg. Tetrachloroethene was detected in three of the four South Yard UST area samples at a maximum concentration of 7,600 µg/kg in sample SYTS-1, and chlorobenzene was detected in two of the four samples at a maximum concentration of 75,000 µg/kg in sample SYTE-1. The NYSDEC RSCO for tetrachloroethene is 1,400 µg/kg and is 1,700 µg/kg for chlorobenzene. Of the four subsurface boring samples collected in the South Yard, only methylene chloride (570 µg/kg) was detected in sample HXB9S5, located in the southeast corner of the South Yard, at a concentration greater than the corresponding NYSDEC RSCO of 100 µg/kg.

Acetone was detected in one South Yard subsurface boring sample, HXB9S3, at a concentration of 250 µg/kg which is greater than the NYSDEC RSCO of 200 µg/kg. It was also detected at elevated concentration in South Yard UST area sample SYTN-1 (9,200 µg/kg). Another ketone, 2-butanone, was detected in two South Yard UST excavation sidewall samples, SYTN-1 and SYTE-1, at concentrations of 500 µg/kg and 720 µg/kg, respectively. The NYSDEC RSCO for 2-butanone is 300 µg/kg.

In two of the four South Yard subsurface soil boring samples and in all four of the South Yard UST excavation sidewall soil samples analyzed for VOCs, total VOC concentrations exceed the NYSDEC RSCO of 10,000 µg/kg. The maximum total VOC concentration of 615,020 µg/kg, was detected in UST excavation sidewall sample SYTE-1. The majority of this VOC contamination (405,000 µg/kg) corresponds to TICs. It is important to note that both of the subsurface soil boring samples which exceed the NYSDEC RSCO for total VOCs were collected at boring B-9, located in the southeast corner of the South Yard. Sample HXB9S5, which was collected at a depth of 8 to 10 feet below ground surface, contained nearly four times the concentration of total VOCs, including TICs, than the shallower sample, HXB9S3, collected at a depth of 4 to 6 feet below ground surface.

Contaminants identified at concentrations greater than NYSDEC RSCOs in the samples collected from excavated soil removed from the South Yard UST excavation as part of the IRM are consistent with those identified in the South Yard UST excavation sidewall samples discussed above and include BTEX compounds, 1,2-dichloroethane, trichloroethene, tetrachloroethene, chlorobenzene, acetone, and 2-butanone (see Tables 4-13 and 4-23). In general, the maximum concentrations of the TCL VOCs detected in the excavated soil samples are either greater than or comparable to the maximum concentrations detected in the sidewall samples.

Several non-TCL VOCs were also detected in the South Yard UST excavated soil samples collected by Trade-Winds as part of the IRM and analyzed using SW 846 Methods. These compounds include isopropylbenzene, naphthalene, n-propylbenzene, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene. There are no NYSDEC RSCOs for these compounds.

North Yard

VOCs were detected in two of the three subsurface soil samples collected in the North Yard (HXB15S1, NYT-1, and NYT-2) at concentrations in excess of NYSDEC RSCOs. While BTEX compounds were detected in all three of the North Yard subsurface soil samples, none exceed the corresponding NYSDEC RSCO. Acetone was detected at concentrations greater than the NYSDEC RSCO of 200 µg/kg in North Yard UST excavation sidewall sample NYT-2 (230 µg/kg). In addition, 1,2-dichloroethane was detected in North Yard UST excavation sidewall sample NYT-1 at a concentration of 130 µg/kg, which exceeds the NYSDEC RSCO of 100 µg/kg. No other specific VOCs exceed NYSDEC RSCOs. However, the total VOCs concentration in sample NYT-1 (81,889 µg/kg), including TICs, exceeds the NYSDEC RSCO of 10,000 µg/kg for total VOCs.

Old Plant

VOCs were detected in all three of the subsurface soil boring samples collected beneath the Old Plant floor slab (HXB5S2, HXB11S2 and HXB12S2) at concentrations greater than NYSDEC RSCOs. For each sample, BTEX compounds represent the bulk of the contamination. The total BTEX concentration in sample HXB11S2, collected along the eastern edge of the former Old Plant, is 25,198,000 μg/kg and, as such, is the most BTEX-concentrated sample of all the subsurface soil samples collected at the Hexagon Laboratories Site. The total BTEX concentration measured in sample HXB12S2, collected near the oil/water separator at the western edge of the former Old Plant, is 205,700 μg/kg, and the total BTEX concentration in sample HXB5S2, collected in the entryway to the Old Plant, is 607,000 μg/kg.

The chlorinated compounds trichloroethene, tetrachloroethene, and chlorobenzene were also detected in samples HXB11S2 and HXB12S2 at concentrations greater than the NYSDEC RSCOs for these compounds. Maximum concentrations of 880,000 μg/kg, 310,000 μg/kg, and 200,000 μg/kg for trichloroethene, tetrachloroethene, and chlorobenzene, respectively, were detected in sample HXB11S2. Various other chlorinated compounds, including methylene chloride, 1,1-dichloroethane, 1,2-dichloroethane, and 1,1,1-trichloroethane were also detected in sample HXB11S2 at concentrations in excess of the NYSDEC soil cleanup criteria for these compounds. Of these compounds, 1,2-dichloroethane was the most concentrated at 5,100,000 μg/kg. No halogenated compounds were detected in sample HXB5S2 at concentrations greater than the NYSDEC RSCOs.

Acetone was detected in sample HXB5S2 at a concentration of 4,700 μg/kg which exceeds the NYSDEC RSCO of 200 μg/kg. No other ketones were detected in the subsurface soil samples collected beneath the Old Plant floor slab.

Each of the Old Plant subsurface soil samples yielded total VOC concentrations in excess of the 10,000 μg/kg NYSDEC RSCO for total VOCs. The total concentration of VOCs detected in sample HXB12S2 is 288,140 μg/kg, including TICs. The total VOC concentration (including TICs) detected in sample HXB5S2 is 641,110 μg/kg. The total VOC concentration of 33,230,000 μg/kg, including TICs, in sample HXB11S2 is the highest concentration of VOCs in all of the subsurface soil samples collected at the Hexagon Laboratories Site.

New Plant

Various VOCs were detected at concentrations in excess of the NYSDEC RSCOs in all five of the subsurface soil samples collected beneath the floor slab of the former New Plant (HXB4S2, NPT-1, NPT-2, NPT-3, NPT-4). For each of these samples, BTEX contamination represents the majority of the contamination. The maximum BTEX concentration of 6,990,000 μg/kg was detected in sample HXB4S2, collected within the main plant area of the former New Plant and downgradient of the New Plant UST, and the lowest

BTEX concentration (63,260 µg/kg) was detected in sidewall sample NPT-1, collected from the New Plant UST excavation. It is important to note that the New Plant UST, removed during the IRM, was filled with fuel oil.

Several chlorinated compounds, including methylene chloride, 1,2-dichloroethene, 1,2-dichloroethane, 1,1,1-trichloroethane, 1,2-dichloropropane, trichloroethene, tetrachloroethene, and chlorobenzene, were detected in subsurface soil samples collected beneath the New Plant floor slab at concentrations greater than the NYSDEC RSCOs for these compounds. The highest concentrations of five of these compounds (1,2-dichloroethane [68,000 µg/kg], 1,1,1-trichloroethane [15,000 µg/kg], 1,2-dichloropropane [140,000 µg/kg], trichloroethene [150,000 µg/kg], and tetrachloroethene [1,100,000 µg/kg]), were detected in sample HXB4S2. Of these compounds, 1,2-dichloroethane is the most pervasive, detected in all five of the New Plant subsurface soil samples. The highest concentrations of methylene chloride (1,500 µg/kg), 1,2-dichloroethene (3,700 µg/kg), and chlorobenzene (12,000 µg/kg) were detected in samples NPT-3, NPT-4, and NPT-2, respectively, all of which were collected from sidewalls of the New Plant UST excavation.

Acetone was detected in two of the New Plant UST area sidewall samples, NPT-1 (1,000 µg/kg) and NPT-3 (3,200 µg/kg), at concentrations greater than the NYSDEC RSCO of 200 µg/kg.

The concentration of total VOCs exceeds the NYSDEC RSCO of 10,000 µg/kg in all five of the New Plant subsurface soil samples. The highest concentration (8,546,000 µg/kg), including TICs, was detected in sample HXB4S2.

TCL VOCs detected at concentrations in excess of the NYSDEC RSCOs in the four samples collected from excavated soil removed from the New Plant UST excavation as part of the IRM were also detected at elevated concentrations in the New Plant UST excavation sidewall samples discussed above and include BTEX compounds, 1,2-dichloroethene, 1,2-dichloroethane, trichloroethene, tetrachloroethene, and chlorobenzene (see Tables 4-13 and 4-23). Of these compounds, only 1,2-dichloroethene and 1,2-dichloroethane were detected in the excavated soil samples at concentrations greater than those detected in the sidewall samples.

Several petroleum-related non-TCL VOCs were also detected in the New Plant UST excavated soil samples collected by Trade-Winds as part of the IRM and analyzed using SW 846 Methods. These compounds include n-butylbenzene, isopropylbenzene, p-isopropyltoluene, n-propylbenzene, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene. There are no NYSDEC RSCOs for these compounds.

Background

Low concentrations of VOCs were detected in the three background subsurface soil boring samples (HXBK1, HXBK2, and HXBK3) collected at off-site locations in the immediate vicinity of the Hexagon Laboratories Site. No VOCs were detected at concentrations greater than the NYSDEC RSCOs in any of these samples. The highest contaminant concentrations in these samples were consistently detected in sample HXBK1, collected in the parking area of Tufo's Wholesale Dairy. VOCs detected in this sample include toluene, trichloroethene, tetrachloroethene, acetone, and 2-butanone. Only acetone was detected in the remaining two background samples. The total VOC concentration in sample HXBK1 is 4,299 µg/kg, 4,169 µg/kg of which corresponds to TICs. Of the target compounds, acetone is the most significant with a concentration of 89 µg/kg, much less than the NYSDEC RSCO of 200 µg/kg. The relatively low levels of VOCs detected in the background samples suggest that the VOC contamination discussed above is site-related and not endemic to the area.

4.3.2 Semivolatile Organic Compounds

East Yard

Of the 11 samples collected in the East Yard, five samples (HXB1S3, HXB7S2, HXB17, HXB20, and HXB21) exhibited SVOC concentrations greater than the NYSDEC RSCOs. Phenol and 2-methylphenol were detected in sample HXB21 at respective concentrations of 160 µg/kg and 140 µg/kg. The NYSDEC RSCO for phenol is 30 µg/kg and 100 µg/kg for 2-methylphenol. Benzo(a)pyrene was detected in all five of these samples at a maximum concentration of 720 µg/kg in sample HXB21 which exceeds the NYSDEC RSCO of 61 µg/kg. Benzo(a)anthracene and chrysene were detected in three of these five samples with maximum concentrations of 690 µg/kg and 1,200 µg/kg, respectively, also in sample HXB21. The NYSDEC RSCO for benzo(a)anthracene is 224 µg/kg and the NYSDEC RSCO for chrysene is 400 µg/kg. Carbazole was detected in sample HXB1S3 at a concentration of 60 µg/kg. However, there is no NYSDEC RSCO for this compound.

South Yard

Three SVOCs (4-methylphenol, chrysene, and 1,2-dichlorobenzene) were detected at concentrations in excess of the corresponding NYSDEC RSCO in one of the five subsurface soil samples collected in the South Yard and analyzed for SVOCs. This sample, SYTC-1, is a composite sidewall sample collected from the South Yard UST excavation. 4-Methylphenol was detected in this sample at a concentration of 2,300 µg/kg which exceeds the NYSDEC RSCO for this compound of 900 µg/kg. Chrysene, a PAH, was detected at a concentration of 40,000 µg/kg which exceeds the NYSDEC RSCO of 400 µg/kg by two orders of magnitude. 1,2-Dichlorobenzene was detected at a concentration of 140,000 µg/kg, which exceeds the NYSDEC RSCO by more than 17 times. This sample also exceeds the NYSDEC RSCO of 500,000 µg/kg for total SVOCs. Total SVOCs were detected in this sample at a concentration of 539,070 µg/kg, 320,800 µg/kg of which corresponds to TICs.

4-Methylphenol and chrysene, detected at elevated concentrations in the South Yard UST area sample SYTC-1 as discussed above, were also detected at elevated concentrations in the three excavated soil samples collected from the South Yard UST excavation and analyzed for SVOCs (see Tables 4-14 and 4-24). While the highest concentration of 4-methylphenol (2,900 µg/kg) detected in excavated soil sample LD1-2-3 is comparable to that detected in sidewall sample SYTC-1, the concentration of chrysene in the sidewall sample is nearly 50 times greater than that detected in the excavated soil sample. Other SVOCs detected at elevated concentrations in the excavated soil samples include dibenz(a,h)anthracene and nitrobenzene. Dibenz(a,h)anthracene was detected in sample #1-2-3 at a concentration of 70 µg/kg which exceeds the NYSDEC RSCO of 14 µg/kg, and nitrobenzene was detected in sample LD1-2-3 at a concentration of 5,600 µg/kg which exceeds the NYSDEC RSCO of 200 µg/kg. Neither of these two compounds was detected in the sidewall sample collected from the South Yard UST excavation.

North Yard

One of the three subsurface soil samples collected in the North Yard contains SVOCs at concentrations greater than the corresponding NYSDEC RSCO. This sample, NYT-2, is a sidewall sample collected from the North Yard UST excavation. One phenolic compound, 2-methyl phenol, was detected in this sample at a concentration of 130 µg/kg which exceeds the NYSDEC RSCO of 100 µg/kg for this compound. Benzo(a)pyrene and 4-nitroaniline were also detected at concentrations of 180 µg/kg and 1,000 µg/kg, respectively. The concentration of benzo(a)pyrene exceeds the NYSDEC RSCO of 61 µg/kg. There is no NYSDEC RSCO for 4-nitroaniline.

Old Plant

SVOCs were detected in all three of the subsurface soil boring samples (HXB5S2, HXB11S2 and HXB12S2) collected beneath the floor slab of the former Old Plant at concentrations greater than the corresponding NYSDEC RSCO. In general, the concentrations of SVOCs are greater in sample HXB11S2, collected near the eastern edge of the former Old Plant, than in sample HXB12S2, collected near the oil/water separator at the western edge of the former Old Plant or in sample HXB5S2, collected in the entryway to the Old Plant near the North Yard. Three phenolic compounds, phenol (5,100 µg/kg), 2-methylphenol (4,600 µg/kg), and 4-methylphenol (1,000 µg/kg), were detected in sample HXB11S2 at concentrations greater than the corresponding NYSDEC RSCOs of 30 µg/kg, 100 µg/kg, and 1,000 µg/kg, respectively. Phenol was also detected in sample HXB12S2 at a concentration of 360 µg/kg, and 2-Methylphenol was detected in sample HXB5S2 at a concentration of 820 µg/kg.

Naphthalene, the only PAH detected in sample HXB11S2, was reported at a concentration of 14,000 µg/kg. This concentration is slightly greater than the NYSDEC RSCO of 13,000 µg/kg. Benzo(a)pyrene, also a PAH, was detected in sample HXB12S2 at a concentration of 120 µg/kg. The corresponding NYSDEC RSCO for this compound is 61 µg/kg. 4-Chloroaniline was also detected in this sample at a concentration of 660 µg/kg, which exceeds the NYSDEC RSCO of 220 µg/kg. Two phthalates, dimethylphthalate (6,500 µg/kg) and diethylphthalate (38,000 µg/kg) exceed the respective NYSDEC RSCOs of 2,000 µg/kg and 38,000 µg/kg in sample HXB11S2. While no other specific compounds exceed

NYSDEC RSCOs for these samples, the total SVOC concentration of 922,120 µg/kg in sample HXB11S2 almost doubles the NYSDEC RSCO for total SVOCs of 500;000 µg/kg. More than 90% of the total SVOC concentration in this sample is derived from TICs.

New Plant

Various SVOCs were detected in the four sidewall samples collected from the New Plant UST excavation (NPT-1, NPT-2, NPT-3, NPT-4) as well as in the subsurface boring sample HXB4S2, collected within the main plant area of the former New Plant and downgradient of the New Plant UST. 4-Methylphenol was detected in New Plant UST sidewall samples NPT-1 and NPT-4 and in subsurface boring sample HXB4S2 at concentrations ranging from1,400 µg/kg (HXB4S2) to 6,400 µg/kg (NPT-4). Other phenolic compounds detected in the New Plant UST sidewall samples include phenol and 2-methylphenol. Phenol was detected in samples NPT-1 and NPT-3 at concentrations of 1,200 µg/kg and 310 µg/kg, respectively. The corresponding NYSDEC RSCO is 30 µg/kg. 2-Methylphenol was detected in samples NPT-1 (510 µg/kg) and NPT-2 (2,800 µg/kg) at concentrations which exceed the NYSDEC RSCO of 100 µg/kg.

Several PAHs, including benzo(a)anthracene, chrysene, and benzo(a)pyrene, were detected in New Plant UST excavation sidewall samples NPT-3 and NPT-4 at concentrations greater than the corresponding NYSDEC RSCOs. Chrysene was detected in both samples at a concentration of 1,900 µg/kg in NPT-3 and 780 µg/kg in NPT-4. Benzo(a)anthracene and benzo(a)pyrene were detected in sample NPT-4 only at concentrations of 680 µg/kg and 220 µg/kg, respectively. The NYSDEC RSCO is 224 µg/kg for benzo(a)anthracene and 61 µg/kg for benzo(a)pyrene.

One benzene compound, 1,2-dichlorobenzene, was detected at concentrations in excess of the corresponding NYSDEC RSCO of 7,900 µg/kg in subsurface boring sample HXB4S2 (9,400 µg/kg) and in New Plant UST excavation sidewall sample NPT-2 (27,000 µg/kg). 4-Chloroaniline was also detected in sample NPT-2 at a concentration of 2,700 µg/kg which exceeds the NYSDEC RSCO of 220 µg/kg. Carbazole was detected in sample NPT-3 at a concentration of 1,300 µg/kg. However, there is no NYSDEC RSCO for this compound.

In addition to NYSDEC RSCO exceedances by specific SVOCs in the New Plant samples, the NYSDEC RSCO of 500,000 µg/kg for total SVOCs was exceeded in two samples (HXB4S2 and NPT-2). The total SVOC concentration of NPT-2 is 727,370 µg/kg, 689,300 µg/kg of which is TICs. Similarly, the total SVOC concentration of HXB4S2 is 1,029,600 µg/kg, 1,018,800 µg/kg of which is TICs. For the most part, these TICs were merely identified as "unknown" by the laboratory, although several of the TICs were generically identified as various substituted benzenes and benzene derivatives.

4-Methylphenol is the only SVOC detected at concentrations in excess of the NYSDEC RSCO of 900 µg/kg in the two excavated soil samples collected from the New Plant UST excavation and analyzed for SVOCs (see Table 4-24). The highest concentration of 4-

methylphenol (23,000 µg/kg) was detected in excavated soil sample FOT#2 and is more than three times greater than its maximum concentration (6,400 µg/kg) in the New Plant UST excavation sidewall samples. None of the other SVOCs detected in the sidewall samples, discussed above, were detected in the excavated soil samples.

Background

Several PAHs were detected at concentrations in excess of the NYSDEC RSCOs in sample HXBK1, one of the three off-site subsurface soil background samples collected as part of the RI. These PAHs include benzo(a)anthracene (4,900 µg/kg), chrysene (6,600 µg/kg), benzo(b)fluoranthene (3,900 µg/kg), benzo(k)fluoranthene (1,800 µg/kg), benzo(a)pyrene (1,500 µg/kg), and dibenz(a,h)anthracene (480 µg/kg). In general, the concentrations of these compounds in the background sample are comparable to if not greater than those detected in the subsurface soil samples collected on site. This finding suggests that some of the PAH contamination observed in the site samples may be endemic to the site vicinity as its presence is likely due to the proximity of the site to three major highway systems (US Route 1 - Boston Post Road, Interstate 95, and the New York State Thruway). Similarly, carbazole, which was detected in a few of the on-site subsurface soil samples, was detected in background sample HXBK-1 at a concentration of 330 µg/kg. This also suggests that carbazole contamination observed in the site samples may not be entirely site-related.

4.3.3 Pesticides/PCBs

Various pesticides were detected in the subsurface soil samples at concentrations greater than the corresponding NYSDEC RSCO. While it is possible that pesticides were used at the Hexagon Laboratories Site, the pesticide data for all media sampled as part of the RI are considered suspect as possible/probable false positives due to significant matrix interference. This interference issue is discussed in detail in Section 8.0 - Data Quality and Usability.

East Yard

While pesticides were detected in two of the eight subsurface soil samples (HXB1S3 and HXB7S2) collected in the East Yard and analyzed for pesticides, none was detected at levels which exceed the NYSDEC RSCOs. Only one (endrin aldehyde) of the three analyzed pesticides for which there is no NYSDEC RSCO was detected in sample HXB7S2 at a concentration of 5.5 µg/kg. PCBs were detected in three of the 11 East Yard samples analyzed for PCBs, but at levels well below the NYSDEC soil cleanup criteria of 10,000 µg/kg for subsurface soils. It is important to note that pesticides were detected in both of the subsurface soil boring samples collected in the East Yard at depths of less than six feet below ground surface and analyzed for pesticides. Similarly, PCBs were detected in three of the five subsurface soil boring samples collected in the East Yard at depths of less than six feet below ground surface. Neither pesticides nor PCBs were detected in the two subsurface soil boring samples collected in the East Yard at depths greater than six feet below ground surface. No pesticides or PCBs were detected in sample HXB1S7, which was collected at a depth of 11 to 13 feet below ground surface, five feet below sample HXB1S3. Similarly, no pesticides or PCBs were detected in sample HXB7S4, which was collected at a depth of six to eight feet below ground surface, two feet below sample HXB7S2. This suggests that, in the East Yard, pesticide and PCB contamination may be limited to the subsurface soil less than six feet below ground surface.

South Yard

Of the five subsurface soil samples collected in the South Yard and analyzed for pesticides, two samples, SYTC-1 and HXB8S4, had concentrations of one pesticide, aldrin, in excess of the NYSDEC RSCO of 41 µg/kg for aldrin. Aldrin was detected at the highest concentration of 220 µg/kg in soil boring sample HXB8S4. PCBs were detected in four of the five subsurface soil samples collected in the South Yard and analyzed for PCBs. However, none had total PCB concentrations in excess of the NYSDEC RSCO of 10,000 µg/kg for subsurface soils.

Pesticide contamination detected in the soil removed from the South Yard UST excavation (see Tables 4-15 and 4-25) is consistent with the subsurface soil samples collected from the sidewalls of the UST excavation discussed above. Aldrin was detected in one (SYTEX-1) of the two excavated soil samples analyzed for pesticides at a concentration of 330 µg/kg. PCBs were detected in three of the four excavated soil samples analyzed for PCBs. In one of these excavated soil samples, LD1-2-3, the concentration of total PCBs (106,000 µg/kg) is much greater than the total PCB concentrations detected in the UST excavation sidewall samples and exceeds the NYSDEC RSCO of 10,000 µg/kg for subsurface soils.

North Yard

Neither pesticides nor PCBs were detected at concentrations which exceed the corresponding NYSDEC soil cleanup levels in the three samples collected in the North Yard. Methoxychlor was detected in North Yard UST excavation sidewall sample NYT-1 at a concentration of 26 µg/kg. There is no NYSDEC soil cleanup criterion for this compound.

Old Plant

Pesticides were detected at concentrations greater than the corresponding NYSDEC soil cleanup levels in two of the three samples collected beneath the floor slab of the former Old Plant. Lindane (gamma-BHC) was detected in sample HXB11S2 at a concentration of 130 µg/kg which is more than two times the NYSDEC RSCO of 60 µg/kg for this compound. Heptachlor epoxide was detected in sample HXB12S2 at a concentration of 28 µg/kg, slightly greater than the corresponding NYSDEC RSCO of 20 µg/kg. No other pesticides were detected in these samples at concentrations greater than the NYSDEC RSCOs. However, endrin ketone was detected in sample HXB11S2 (140 µg/kg) and endrin aldehyde (590 µg/kg) was detected in sample HXB12S2. There are no NYSDEC RSCOs for these compounds. No PCBs were detected in any of the three Old Plant subsurface soil samples.

New Plant

Three of the five samples collected beneath the floor slab of the former New Plant had concentrations of pesticides in excess of the corresponding NYSDEC RSCO. Aldrin was detected at elevated concentrations in sample HXB4S2 (970 µg/kg) and in New Plant UST excavation sidewall samples NPT-2 (350 µg/kg) and NPT-3 (350 µg/kg). The NYSDEC RSCO for aldrin is 41 µg/kg. Delta-BHC was also detected in sample HXB4S2 at a concentration of 310 µg/kg, which slightly exceeds the NYSDEC RSCO of 300 µg/kg for this compound. In addition, endrin was detected in New Plant UST excavation sidewall sample NPT-3 at a concentration of 180 µg/kg which exceeds the NYSDEC RSCO of 100 µg/kg. Methoxychlor was detected in New Plant UST excavation sidewall sample NPT-4 at a concentration of 200 µg/kg. There is no NYSDEC RSCO for this compound. While PCBs were also detected in three of the five New Plant subsurface soil samples, only one sample, HXB4S2, had a total PCB concentration (18,000 µg/kg) greater than the NYSDEC RSCO of 10,000 µg/kg for PCBs in subsurface soil.

No analysis for pesticides was conducted on the four New Plant UST excavated soil samples collected by Trade-Winds during the IRM. In contrast to the PCB results for the New Plant UST excavation sidewall samples discussed above, no PCBs were detected in any of the excavated soil samples (see Table 4-25).

Background

Several pesticides were detected in two of the three background subsurface soil samples collected at off-site locations. However, only aldrin, at a concentration of 370 µg/kg in sample HXBK3, is greater than the NYSDEC RSCO of 41 µg/kg for this compound. It is important to note that the concentration of aldrin detected in the off-site background sample is exceeded by only one on-site sample (HXB4S2). This suggests that the aldrin contamination observed in the on-site samples may not be site related.

PCBs were detected in one off-site background sample (HXBK3) at a concentration well below the NYSDEC soil cleanup level of 10,000 µg/kg for subsurface soil.

4.3.4 Inorganic Compounds

As discussed in Section 4.1.1, concentrations of inorganic compounds detected in subsurface soil samples were compared to subsurface background samples as well as various literature values for New York and urban New Jersey soils. A summary of the background concentrations used in evaluating the subsurface soil samples is provided in Tables 4-11 and 4-16. While there are exceedances of magnesium and sodium in the subsurface soils across the site, these metals are common to the dominant mineral species in Manhattan Schist (mica and hornblende) which underlies the site. Because of the likelihood of significant presence of these metals in the weathered bedrock soils at the site, they are not discussed further.

East Yard

Various metals exceed the evaluation criteria (*i.e.*, the greater of the applicable background concentration and NYSDEC RSCOs) in six of the 11 subsurface soil samples collected in the East Yard. Metals detected at elevated concentrations in these samples include antimony, arsenic, barium, cadmium, chromium, copper, lead, nickel, selenium, thallium, and zinc. The majority of the metals exceedances were detected in subsurface soil samples HXB17, HXB20, and HXB21. The highest concentrations of antimony (29.7 mg/kg), arsenic (18.4 mg/kg), barium (1,790 mg/kg), cadmium (28.2 mg/kg), copper (509 mg/kg), nickel (181 mg/kg), selenium (7.1 mg/kg), and zinc (12,000 mg/kg) were detected in sample HXB21, collected in the southeast corner of the East Yard. These exceedances range from approximately 1.5 times greater than the background concentration for arsenic to approximately 43 times the background concentration for antimony. Further, these exceedances represent the highest concentrations of these metals detected in the subsurface soil across the entire site. The highest concentration of chromium (78.3 mg/kg) detected in the East Yard subsurface soil samples was detected in sample HXB1S7, also collected in the southeast corner of the East Yard, and exceeds the corresponding background concentration by approximately 1.2 times. The highest concentrations of lead (3,850 mg/kg) and thallium (2.4 mg/kg) were detected in samples HXB20 and HXB17, respectively. The concentration of thallium detected in sample HXB17, collected in northeastern quadrant of the East Yard, is approximately 1.6 times greater than its background concentration and represents the highest concentration of thallium detected in the subsurface soils at the site. The concentration of lead detected in sample HXB20, collected in the southeast corner of the East Yard, exceeds the corresponding background concentration by approximately 7.7 times and is the highest lead concentration detected in subsurface soil samples at the Hexagon Laboratories Site.

South Yard

Elevated concentrations of mercury, nickel, and cyanide were detected in one of the five subsurface soil samples collected in the South Yard. This sample, SYTC-1, is a composite sidewall sample from the South Yard UST excavation. Mercury was detected at a concentration of 4.1 mg/kg which is approximately 1.5 times greater than its background concentration of 2.71 mg/kg. Nickel was detected at a concentration of 101 mg/kg which is also approximately 1.5 times greater than its background concentration of 72.3 mg/kg. Cyanide was detected at a concentration of 1.0 mg/kg. There is no NYSDEC RSCO for cyanide. Cyanide was not detected in the other four South Yard subsurface soil samples (HXB3S2, HXB8S4, HXB9S3, and HXB9S5).

None of the inorganics detected at elevated concentrations in the South Yard UST excavation sidewall samples were detected at elevated concentrations in excavated soil samples collected from the South Yard UST excavation (see Tables 4-16 and 4-26). Cyanide was detected in excavated soil sample SYTEX-1 at a concentration of 1.4 mg/kg. However, as noted above, there is no NYSDEC RSCO for cyanide. Selenium was also detected at an elevated concentration of 3.74 mg/kg in excavated soil sample #1-2-3. Selenium was not detected above background concentration in any of the South Yard UST excavation sidewall samples.

North Yard

Several inorganic compounds were detected at concentrations greater than the evaluation criteria in the three subsurface soil samples collected in the North Yard. Cadmium was detected in subsurface soil boring sample HXB15S1, collected in the northwestern corner of the North Yard beneath a former loading dock, at a concentration of 5.6 mg/kg which is approximately two times greater than the background concentration of 2.36 mg/kg. Cadmium was also detected at a slightly elevated concentration of 2.6 mg/kg in North Yard UST excavation sidewall sample NYT-2. In addition, chromium (88.9 mg/kg), mercury (4.2 mg/kg), and nickel (94.1 mg/kg) were detected at elevated concentrations in this sample. Similarly, nickel (135 mg/kg) was detected at a concentration above background in North Yard UST excavation sidewall sample NYT-1. These compounds exceed the corresponding background concentrations by as little as 1.4 times for chromium to as much as 1.9 times for nickel.

Old Plant

Antimony, chromium, copper, mercury, nickel, and thallium were detected at elevated levels in subsurface soil samples collected beneath the former Old Plant floor slab. The highest concentrations of antimony (0.86 mg/kg), chromium (174 mg/kg), nickel (85.1 mg/kg), and thallium (1.6 mg/kg) were detected in sample HXB5S2, collected in the entryway to the Old Plant near the North Yard. Background concentrations for these metals are 0.69 mg/kg, 64.5 mg/kg, 72.3 mg/kg, and1.5 mg/kg, respectively. The chromium detection in this sample represents the highest concentration of chromium detected in subsurface soil samples at the site.

Mercury was detected at an elevated concentration in sample HXB11S2 (11.9 mg/kg), collected near the eastern edge of the former Old Plant. The background concentration for mercury is2.71 mg/kg. This mercury detection represents the highest concentration of mercury detected in subsurface soil samples at the site.

Chromium and copper were detected at elevated concentrations in sample HXB12S2, collected at the western end of the former Old Plant near the oil/water separator pit. Chromium was detected at a concentration of 162 mg/kg, which exceeds the background concentration of 64.5 mg/kg, and copper was detected at a concentration of 467 mg/kg, which exceeds the background concentration of 196 mg/kg.

New Plant

No inorganics were detected at concentrations greater the evaluation criteria in any of the five samples collected beneath the floor slab of the former New Plant. Similarly, no inorganics were detected at elevated concentrations in the excavated soil samples collected by Trade-Winds during New Plant UST removal activities. Inorganics data for the excavated soil samples are provided in Table 4-26.

4.3.5 Total Organic Carbon

TOC analysis was conducted on nine of the 19 subsurface soil boring samples (excluding the shallow subsurface soil boring samples discussed in Section 4.2), in three of the15 subsurface soil samples from the four UST areas on site, and in one excavated soil sample from the South Yard UST excavation. TOC concentrations in the subsurface soil samples vary greatly as can be seen in Tables 4-12 and 4-17. Concentrations range from 519 mg/kg (0.05% TOC) in sample HXB1S7, collected in the southeastern corner of the East Yard, to 25,900 mg/kg (2.6% TOC) in sample HXB11S2, collected near the eastern wall of the former Old Plant. A comparison of samples HXB1S3 (11,000 mg/kg or 1.1% TOC), collected at a depth of four to six feet below ground surface, with co-located sample HXB1S7 (519 mg/kg or 0.05% TOC), collected at depth of 11 to 13 feet below ground surface, suggests that TOC content may decrease significantly with depth. The TOC concentrations in the three background samples, HXBK1, HXBK2, and HXBK3, are fairly consistent, ranging from 3,690 mg/kg to 6,210 mg/kg (or 0.37% to 0.62% TOC). In general, the TOC concentrations in the subsurface soil are relatively low since, as noted in Section 4.2, default TOC values for soil typically range from 1% to 3% TOC.

4.3.6 Total Petroleum Hydrocarbons

TPHC analysis was performed for subsurface boring samples HXB12S2 and HXBK3. As can be seen in Table 4-12, the TPHC concentration in sample HXB12S2 (1,200 mg/kg), collected approximately 20 feet south of the former Old Plant oil/water separator pit, is much higher than that detected in background subsurface boring sample HXBK3 (58 mg/kg).

4.3.7 Hazardous Characteristic

As discussed in Section 4.1.1, toxicity, as defined by the TCLP test results, is one of four characteristics used to identify hazardous wastes under the Resource Conservation and Recovery Act (RCRA). Four subsurface soil boring samples (HXB1S3, HXB1S7, HXB5S2, and HXB12S2), excluding the shallow subsurface soil boring samples discussed in Section 4.2, were analyzed for TCLP organics and metals. In addition, one South Yard UST area excavated soil sample (SYA), collected by Trade-Winds during the IRM, was analyzed for TCLP metals. No TCLP analytes were detected at concentrations which exceed the TCLP regulatory criteria listed in Table 4-1.

4.4 Groundwater

Two rounds of groundwater samples were collected from each of the six monitoring wells (five shallow wells, one deep well) installed at the Hexagon Laboratories Site. As discussed in Section 2.5.4, five of the six wells (MW-1, MW-2, MW-3, MW-4, and MW-5) were first sampled on January 2, 1998. MW-6, which was installed on January 16, 1998, was first sampled on February 18, 1998. The second round of groundwater sampling included all six monitoring wells and took place on March 5, 1998. As indicated in Table 2-3, all samples were analyzed for TCL organics, pesticides, PCBs, TAL inorganics, total suspended solids (TSS), total dissolved solids (TDS), and, with the exception of MW-6, total organic carbon (TOC). As discussed in Section 2.5.4, both total (unfiltered) and dissolved (filtered) metals samples were collected in the field due to high turbidity levels (greater than 50 NTU) associated with each of the groundwater samples. Both filtered and unfiltered groundwater samples were analyzed for TAL metals. The analytical data for the two groundwater sampling rounds is provided in Tables 4-18 through 4-22. Sampling locations are indicated in Figure 2-1. Distributions of various contaminants detected in the groundwater samples are presented in Figures 4-9 through 4-12.

It is important to note that, as discussed in Section 3.5.1, monitoring well MW-6, which is located immediately north of the Office/Warehouse adjacent to Boston Post Road, was installed in a presumed upgradient location based on site topography considerations. However, based on groundwater elevation data, it appears that monitoring well MW-6 may be downgradient of monitoring well MW-5, located within the North Yard, and thus, potentially affected by site-related contamination.

4.4.1 Volatile Organic Compounds

VOCs were detected at concentrations which exceed NYSDEC Class GA groundwater standards in each sample collected from each monitoring well. As discussed below, similar to the contamination observed in the surface and subsurface soils, BTEX contamination is particularly pervasive, being detected at varying levels in all but one groundwater sample collected during the two sampling rounds.

Several VOCs were detected in the shallow (MW-1) and deep (MW-2) monitoring wells located in the East Yard at concentrations greater than the corresponding NYSDEC Class GA groundwater standards. BTEX compounds were detected in both wells during both rounds of sampling with a maximum concentration in monitoring well MW-1 of 271 μg/kg and a maximum concentration in monitoring well MW-2 of 738 μg/kg. The halogenated VOCs chloroethane and chlorobenzene were detected in both monitoring wells during both sampling events at concentrations greater than the corresponding NYSDEC Class GA groundwater standard of 5 μg/L (μg/kg) for each of these compounds. Chloroethane was detected at a maximum concentration of 250 μg/L in monitoring well MW-1 and at a maximum concentration of 180 μg/L in monitoring well MW-2. Chlorobenzene was detected at a maximum concentration of 830 μg/L in monitoring well MW-1 and at a maximum concentration of 460 µg/L in monitoring well MW-2. One other halogenated VOC, 1,1-dichloroethane, was detected in monitoring well MW-2 during the second round of sampling at a concentration of 24 µg/L. This exceeds the NYSDEC Class GA groundwater standard of 5 µg/L. No other VOCs were detected in these wells at concentrations greater than the corresponding NYSDEC Class GA groundwater standard. The maximum total VOC concentration, including TICs, measured in monitoring wells MW-1 and MW-2 is 1,351 µg/L and 1,884 µg/L, respectively.

The highest levels of VOC contamination were observed in monitoring well MW-3, located near the southern edge of the South Yard and adjacent to the South Yard UST excavation, monitoring well MW-4, located within the main plant area of the former New Plant, and in monitoring well MW-5, located in the entryway to the former Old Plant adjacent to the North Yard. Monitoring wells MW-3 and MW-4 are approximately 60 feet apart, and, based on groundwater elevation data, appear to be side-gradient of each other. Monitoring well MW-5 is approximately 100 feet upgradient from these wells. Concentrations of BTEX compounds, various halogenated VOCs, and acetone in samples from each of the three wells exceed the corresponding NYSDEC Class GA groundwater standards for both rounds of sampling. The maximum total BTEX concentration detected in monitoring well MW-3 is 13,550 µg/L, 8,800 µg/L of which is toluene. The maximum total BTEX concentration detected in monitoring well MW-4 is 315,800 µg/L, 290,000 µg/L of which is also toluene. BTEX compounds were detected in monitoring well MW-5 at a maximum concentration of 47,310 µg/L, 42,000 µg/L of which is toluene.

Halogenated VOCs which exceed the NYSDEC Class GA groundwater standards in these wells include vinyl chloride, chloroethane, methylene chloride, 1,1-dichloroethene, 1,1-dichloroethane, 1,2-dichloroethene, 1,2-dichloroethane, trichloroethene, and tetrachloroethene. In monitoring well MW-3, the maximum concentrations of these halogenated VOCs range from 16 µg/L for chloroethane to 4,300 µg/L for 1,2-dichloroethene. In monitoring well MW-4, the maximum concentrations range from 1,200 µg/L for vinyl chloride to 440,000 µg/L for 1,2-dichloroethane. 1,2-Dichloroethane (140 µg/L) was the only halogenated VOC detected in monitoring well MW-5. The NYSDEC Class GA groundwater standard for each of these compounds is 5 µg/L with the exceptions of vinyl chloride and chloroform which have standards of 2 µg/L and 7 µg/L, respectively.

Acetone was detected in all three wells during both sampling rounds at maximum concentrations of 14,000 µg/L in monitoring well MW-3, 24,000 µg/L in monitoring well MW-4, and 11,000 µg/L in monitoring well MW-5. The NYSDEC Class GA groundwater guidance value for acetone is 50 µg/L. While 4-methyl-2-pentanone was also detected in the second round of sampling at monitoring well MW-3 at a concentration of 17 µg/L, there is no NYSDEC Class GA groundwater standard for this compound. The maximum concentrations of total VOCs detected in monitoring wells MW-3, MW-4, and MW-5, including TICs, are 37,340 µg/L, 919,900 µg/L, and 53,780 µg/L, respectively.

As noted previously, monitoring well MW-6 was installed in a presumed upgradient location based on site topography considerations. However, based on groundwater elevation data, it appears that monitoring well MW-6 may be downgradient of monitoring well MW-5, located within the North Yard, and thus potentially affected by site-related contamination. The VOC data for this well does not definitively support the groundwater elevation data since, of the BTEX compounds, only benzene was detected in monitoring well MW-6 at a concentration of 2 µg/L during the second round of sampling. No BTEX compounds were detected during the first sampling effort. In contrast, as discussed above, BTEX was detected at a maximum concentration of 47,310 µg/L in apparent upgradient monitoring well MW-5.

Three halogenated VOCs were detected at concentrations greater than the NYSDEC Class GA groundwater standards in monitoring well MW-6. These compounds include 1,2-dichloroethene, 1,2-dichloroethane, and trichloroethene. Of these compounds, trichloroethene was detected at the maximum concentration of 26 µg/L. The NYSDEC Class GA groundwater standard for each of these compounds is 5 µg/L. The maximum total VOC concentration measured in monitoring well MW-6 is 197 µg/L, including a TIC concentration of 143 µg/L.

4.4.2 Semivolatile Organic Compounds

As observed for the VOC contamination, the SVOC contamination detected in the East Yard monitoring wells MW-1 and MW-2 is relatively minor. No SVOC contaminants were detected at concentrations above the NYSDEC Class GA groundwater standards for either well during the first round of sampling. In the second round of sampling, phenol was detected in monitoring well MW-1 at a concentration of 5 µg/L and a concentration of 41 µg/L in monitoring well MW-2. One other phenolic compound, 2-chlorophenol, was also detected in monitoring well MW-1 at a concentration of 3 µg/L. The NYSDEC groundwater standard for total phenols is 1 µg/L. 1,2-Dichlorobenzene was also detected in both wells at concentrations greater than the NYSDEC groundwater standard of 4.7 µg/L for the sum of 1,2-dichlorobenzene and 1,4-dichlorobenzene. 1,2-Dichlorobenzene was detected at a maximum concentration of 11 µg/L in monitoring well MW-1. 1,4-Dichlorobenzene was not detected in either well. While carbazole was also detected in MW-2 at a concentration of 1 µg/L, there is no NYSDEC Class GA groundwater standard for this compound.

Similar to the distribution of VOCs in groundwater discussed above, the bulk of the SVOC contamination observed in the groundwater at the Hexagon Laboratories Site was detected in monitoring wells MW-3 (South Yard), MW-4 (main plant area of the former New Plant), and MW-5 (entryway to former Old Plant) with the highest concentrations observed in monitoring well MW-4. Various phenolic compounds including phenol, 2-methylphenol, 4-methylphenol, and 2,4-dimethylphenol were detected in these wells. The maximum total concentration of phenolic compounds in these monitoring wells ranges from 890 µg/L in monitoring well MW-3 to 14,800 µg/L in monitoring well MW-4. The NYSDEC Class GA groundwater standard for total phenols is 1 µg/L. Naphthalene, a PAH, was detected in monitoring wells MW-3 and MW-4 at concentrations greater than the NYSDEC guidance value of 10 µg/L. The maximum concentration of this compound detected in monitoring well MW-3 is 44 µg/L while the maximum concentration in monitoring well MW-4 is 430 µg/L. Another PAH, 2-methylnaphthalene, was also detected in monitoring well MW-3 at a maximum concentration of 17 µg/L. However, there is no NYSDEC Class GA groundwater standard for this compound. No PAHs were detected in monitoring well MW-5.

1,2-Dichlorobenzene was detected in each of these three wells during each sampling event at concentrations ranging from a minimum of 14 µg/L in monitoring well MW-5 to a maximum concentration of 320 µg/L in monitoring well MW-4. The NYSDEC Class GA groundwater standard for the sum of 1,2-dichlorobenzene and 1,4-dichlorobenzene is 4.7 µg/L. 1,4-Dichlorobenzene was not detected in any of these wells. Two phthalates, dimethylphthalate and diethylphthalate, were also detected in monitoring well MW-4 at concentrations which exceed the NYSDEC Class GA groundwater guidance value of 50 µg/L. Dimethylphthalate was detected in the second round of sampling only at a concentration of 270 µg/L. Diethylphthalate was detected in both sampling rounds at a maximum concentration of 130 µg/L. The maximum total SVOC concentration, including TICs, in each of these three wells ranges from 1,690 µg/L in monitoring well MW-3 to 80,220 µg/L in monitoring well MW-4.

The SVOC contamination detected in monitoring well MW-6, located north of the Office/Warehouse building, is relatively minor. One phenolic compound, 2,4-dimethyl phenol, was detected in the second round of sampling at a concentration of 3 µg/L which exceeds the NYSDEC Class GA groundwater standard of 1 µg/L for total phenols. In addition, 1,2-dichlorobenzene was detected in both sampling events at a maximum concentration of 11 µg/L. The NYSDEC groundwater standard for the combined total of 1,4-dichlorobenzene and 1,2-dichlorobenzene is 4.7 µg/L. 1,4-Dichlorobenzene was not detected in this monitoring well in either sampling event. No other SVOCs were detected in monitoring well MW-6. The maximum total SVOC concentration measured in this well, including TICs, is 158 µg/L.

4.4.3 Pesticides/PCBs

Various pesticides were detected in the groundwater samples at concentrations greater than the corresponding NYSDEC Class GA groundwater standard. While it is possible that pesticides were used at the Hexagon Laboratories Site, the pesticide data for all media sampled as part of the RI are considered suspect as possible false positives due to significant matrix interference. This interference issue is discussed in detail in Section 8.0 - Data Quality and Usability. The PCB data are considered usable and are not subject to the same concerns as the pesticide data.

One pesticide, 4,4'-DDT, was detected in the East Yard monitoring wells MW-1 and MW-2. This compound was detected in monitoring well MW-1 during the second round of sampling at a concentration of 0.21 µg/L. It was detected in monitoring well MW-2 during both sampling rounds with a maximum concentration of 0.33 µg/L. The NYSDEC Class GA groundwater standard for this compound is "non-detectable". No PCBs were detected in these monitoring wells.

Two pesticides, heptachlor and dieldrin, were detected in the South Yard monitoring well MW-3. Heptachlor was detected in the first round of sampling at a concentration of 0.12 µg/L. Dieldrin was detected in both sampling rounds with a maximum concentration of 0.26 µg/L. The NYSDEC Class GA groundwater standard for both of these compounds is "non-detectable". No PCBs were detected in this monitoring well.

Several pesticides were detected in the first round of sampling at monitoring well MW-4, located in the main plant area of the former New Plant. These compounds include beta-BHC, heptachlor, 4,4'-DDE, endrin, and gamma-chlordane. Concentrations range from 0.20 µg/L for gamma-chlordane to 1.9 µg/L for heptachlor. Only heptachlor was detected in the second round of sampling at a concentration of 1.2 µg/L. The NYSDEC Class GA groundwater standard for heptachlor, dieldrin, 4,4'-DDE, and endrin is "non-detectable". The standard for chlordane (no isomer specified) is 0.1 µg/L. There is no NYSDEC Class GA groundwater standard for beta-BHC. PCBs were detected in both sampling rounds at this monitoring well with a maximum concentration of 17 µg/L. The NYSDEC Class GA groundwater standard for PCBs is 0.1 µg/L.

Neither pesticides nor PCBs were detected in both rounds of groundwater sampling at monitoring well MW-5, located in the entryway to the former Old Plant, and monitoring well MW-6, located north of the Office/Warehouse building adjacent to Boston Post Road.

4.4.4 Inorganics

Six TAL metals, including aluminum, calcium, cobalt, nickel, potassium and vanadium, do not have NYSDEC Class GA groundwater standards. Four TAL metals, including arsenic, barium, cadmium and silver, were not detected above their Class GA groundwater standards in the total metals samples collected during both rounds of sampling. Thus, these ten metals will not be discussed further.

Four other TAL metals (iron, magnesium, manganese and sodium) were reported at concentrations significantly greater than the corresponding NYSDEC Class GA groundwater standard or guidance value in both the total and the dissolved metals samples collected during both sampling rounds. However, these four metals are common components of the Manhattan Schist bedrock beneath the site. Field observations of the rock cores indicated that the bedrock was weathered. In addition, field measurements collected during monitoring well development and sampling indicated very turbid conditions at all monitoring wells except MW-6. Based on these field observations and measurements, the exceedances of these four metals in both total and filtered metals analyses are considered to be indicative of background conditions. Consequently, these four metals will not be discussed further.

As discussed below, the remaining nine TAL metals, which include antimony, beryllium, chromium, copper, lead, mercury, selenium, thallium and zinc, were reported at concentrations above their corresponding NYSDEC Class GA groundwater standard or guidance value in the total metals samples. Three metals, antimony, chromium, and zinc, were also detected in dissolved metals samples at concentrations greater than the corresponding NYSDEC Class GA groundwater standard or guidance value.

Antimony, beryllium, chromium, copper, lead, thallium, and zinc were detected in at least one of the two total metals samples collected at monitoring well MW-1, located in the East Yard, at concentrations greater than the corresponding NYSDEC Class GA groundwater standard or guidance value. Maximum concentrations of these metals range from 1.3 times the NYSDEC Class GA guidance value of 3 µg/L for beryllium to approximately 11 times the NYSDEC Class GA groundwater standard of 300 µg/L for zinc. However, only zinc was detected at an elevated concentration (866 µg/L) in the dissolved metals (filtered) samples collected at this monitoring well. No metals were detected at concentrations in excess of the NYSDEC Class GA groundwater standards or guidance values in either the total or dissolved metals samples collected from deep monitoring well MW-2, also located in the East Yard.

Two metals, antimony (3.9 µg/L) and lead (27.2 µg/L) were detected at concentrations slightly greater than the respective NYSDEC Class GA groundwater standards of 3 µg/L (guidance value) and 25 µg/L in monitoring well MW-3, located in the South Yard adjacent to the South Yard UST excavation. Neither was detected at an elevated concentration in the dissolved metals samples.

Several inorganics, including chromium, copper, lead, thallium, zinc, and cyanide, were detected at concentrations in excess of the corresponding NYSDEC Class GA groundwater standard or guidance value in total metals samples collected during both rounds of sampling from monitoring well MW-4, located in the main plant area of the former New Plant. Mercury was detected at an elevated concentration in only the second round of sampling from this well. Maximum concentrations of these inorganics were all detected in the second round of groundwater sampling and range from 2.2 times the NYSDEC Class GA groundwater standard of 2 µg/L for mercury to 20 times the NYSDEC Class GA groundwater standard of 100 µg/L for cyanide. Only chromium was detected at elevated concentrations in the dissolved metals samples collected from this well; chromium was detected at a maximum concentration of 221 µg/L which exceeds the NYSDEC Class GA groundwater standard for chromium of 50 µg/L.

Chromium was detected in both rounds of total metals samples collected from monitoring well MW-5, located in the entryway of the Old Plant, at concentrations which exceed the NYSDEC Class GA groundwater standard for chromium. It was detected at a maximum concentration of 220 µg/L which exceeds the NYSDEC Class GA groundwater standard of 50 µg/L by approximately four times. Antimony was detected in one total metals sample at a concentration of 4.7 µg/L, which exceeds the NYSDEC Class GA guidance value of 3 μg/L, and selenium was detected in one total metals sample at a concentration of 12.3 μg/L, which slightly exceeds the NYSDEC Class GA groundwater standard of 10 μg/L.

Both chromium and antimony were also detected at elevated concentrations in dissolved metals samples collected from this well. Chromium was detected in both dissolved metals samples at a maximum concentration of 76.2 μg/L, which exceeds the NYSDEC Class GA groundwater standard for chromium by approximately 1.5 times. Antimony was detected at a concentration of 3.2 μg/L which only slightly exceeds the NYSDEC Class GA guidance value of 3 μg/L. Antimony was not detected (at a detection limit of 3 μg/L) in the corresponding total metals fraction of this sample.

Antimony was detected in one total metals sample collected from monitoring well MW-6, located north of the Office/Warehouse and adjacent to Boston Post Road, at an elevated concentration (3.6 μg/L). As noted above, the NYSDEC Class GA guidance value for antimony is 3 μg/L. No other metal was detected at an elevated concentration in either the total or dissolved metals samples collected from this well.

4.4.5 Total Dissolved Solids and Total Suspended Solids

As indicated in Table 2-3, TDS and TSS were analyzed in each of the six monitoring wells during both rounds of sampling. The TDS concentrations measured during the first round of groundwater sampling range from 440 mg/L in monitoring well MW-6 to 1500 mg/L in monitoring well MW-3. The TDS concentrations measured in the second round of groundwater sampling range from 540 mg/L in monitoring well MW-6 to 1,500 mg/L in monitoring well MW-4. There is no significant difference in the TDS concentrations measured in the deep well MW-2 as compared to the co-located shallow monitoring well MW-1.

TSS concentrations measured during the first round of groundwater sampling range from 26 mg/L in monitoring well MW-2 to 700 mg/L in monitoring well MW-1. During the first round of sampling, the turbidity goal of less than 50 NTU was met by samples collected from monitoring wells MW-1 and MW-6. TSS concentrations of samples collected during the second round of groundwater sampling range from 60 mg/L in monitoring well MW-2 to 1,200 mg/L in monitoring well MW-1. During the second round of sampling, the turbidity goal was met by the sample collected from monitoring well MW-6 only. There does not appear to be a strong correlation between the measured TSS and the turbidity measurements made at the time of sampling. However, the TSS concentration appears to be consistently lower in the samples obtained from deep monitoring well MW-2 than from those obtained from the co-located shallow monitoring well MW-1.

4.4.6 Total Organic Carbon

TOC was measured in the first round of groundwater sampling for all wells except monitoring well MW-6. The TOC concentrations vary greatly as can be seen in Table 4-22.

The minimum TOC concentration of 16.6 mg/L was detected in monitoring well MW-1. The maximum TOC concentration of 2720 mg/L was detected in monitoring well MW-3. The concentration of TOC in deep monitoring well MW-2 is approximately three times greater than that measured in co-located shallow monitoring well MW-1. TOC concentrations measured in monitoring wells MW-1 and MW-2 are less than those measured in the other three wells sampled and analyzed for TOC.

4.5 Miscellaneous Samples

4.5.1 Oily Material

During the RI field investigation, one sample of an oily material present on the floor slab of Hydrotherm No. 1 was collected. As can be seen in Table 2-4, this sample was analyzed for TCL organics, pesticides, PCBs, TAL inorganics, TPHC, TOC, and toxicity using TCLP. Analytical results for this sample are provided in Tables 4-3 through 4-7.

Several VOCs were detected in sample OM-1, including BTEX compounds, halogenated aliphatics, and ketones. However, none of the VOCs detected exceed NYSDEC soil cleanup levels. While the NYSDEC criteria are not applicable to the oily material sample, they do provide a frame of reference in evaluating contaminant concentrations. Total BTEX was detected in this sample at a concentration of 91 µg/kg. Four chlorinated aliphatic compounds (chloromethane, methylene chloride, 1,2-dichloroethane, and tetrachloroethene) were detected in this sample at concentrations of 12 µg/kg, 2 µg/kg, 6 µg/kg, and 5 µg/kg, respectively. One ketone, acetone, was detected in this sample at a concentration of 97 µg/kg. Data for several VOCs reported by the laboratory as not detected were rejected during data validation (as possible false negatives - refer to Section 8 - Data Quality and Usability). The total VOC concentration reported for this sample is 274 µg/kg, including TICs. This value is potentially biased low.

PAHs were the only target SVOCs detected in sample OM-1. PAHs detected include acenaphthene, fluorene, phenanthrene, and chrysene. PAH concentrations range from 120,000 µg/kg for acenaphthene to 7,200,000 µg/kg for chrysene. The total concentration of SVOCs detected in this sample is 134,360,000 µg/kg, 126,000,000 µg/kg of which corresponds to TICs. The concentrations of each of the four PAHs detected and the total SVOC concentration exceed NYSDEC RSCOs.

Due to poor surrogate recovery, all pesticide/PCB data for sample OM-1 was rejected during data validation.

Several metals were detected in sample OM-1 at concentrations which exceed the evaluation criteria (*i.e.*, the greater of the applicable background concentration and NYSDEC RSCOs) for these compounds. While these evaluation criteria are not applicable to the oily material sample, they do provide a frame of reference in evaluating contaminant concentrations. Metals which exceed the evaluation criteria include antimony (9.5 mg/kg), cadmium (6.5

mg/kg), chromium (318 mg/kg), copper (293 mg/kg), iron (69,300 mg/kg), lead (1,190 mg/kg), magnesium (15,200 mg/kg), and nickel (110 mg/kg). These exceedances range from approximately 1.2 times the evaluation criteria for iron to approximately 14 times greater than the evaluation criteria for antimony.

Oily material sample OM-1 was also analyzed for TOC and TPHC. TOC was detected at a concentration of 647,000 mg/kg (approximately 65% TOC) and TPHC was detected at a concentration of 280,000 mg/kg (28% TPHC). This sample was also analyzed for toxicity by TCLP for organics and inorganics. As discussed in Section 4.1.1, toxicity, as defined by the TCLP test results, is one of four characteristics used to identify hazardous wastes under the Resource Conservation and Recovery Act (RCRA). No TCLP analytes were detected at concentrations which exceed the TCLP regulatory criteria listed in Table 4-1.

4.5.2 Old Plant and New Plant Concrete Floor Slabs

Three surficial concrete chip samples were collected from the Old Plant floor slab (OP1, OP2, OP3) and from the New Plant floor slab (NP4, NP5, NP6) by Trade-Winds during the IRM in order to assess the need for remediation of the floor slabs. As indicated in Table 2-5, these samples were analyzed for VOCs and SVOCs (but not for pesticides, PCBs, or metals). Analytical results for these samples are provided in Tables 4-27 and 4-28. Sample locations are shown in Figure 2-1.

BTEX compounds, exclusive of benzene, were detected in all six of the floor slab samples. Total BTEX concentrations range from 296 µg/kg in sample NP4, collected in the northeastern corner of the former New Plant, to 83,500 µg/kg in sample OP1, collected approximately 10 feet southeast of the oil/water separator in the former Old Plant. 1,2-Dichloroethane was detected in all three of the Old Plant floor slab samples and in New Plant floor slab sample NP6, located near the eastern wall of the former New Plant in the main plant area. The maximum concentration of this chlorinated aliphatic was detected in Old Plant sample OP2 (4,600 µg/kg), located approximately 30 feet southeast of the oil/water separator in the Old Plant. 1,2-Dichlorobenzene was detected in samples NP5 and NP6 at a maximum concentration of 33 µg/kg in sample NP5, located approximately 20 feet east of the New Plant UST excavation. Isopropylbenzene was detected in samples OP1 and NP6 at a maximum concentration of 830 µg/kg in sample OP1. 1,2,4-Trimethylbenzene was also detected in sample OP1 at a concentration of 330 µg/kg. The maximum total VOCs concentration of 86,260 µg/kg was detected in sample OP1.

One phenolic compound, 4,6-dinitro-2-methylphenol, was detected in sample OP2, at a concentration of 850 µg/kg. No other phenolic compounds were detected in the floor slab samples. Chrysene is the only PAH detected in the floor slab samples. It was detected in all six samples with a maximum concentration of 950 µg/kg in sample OP2. Nitrobenzene was also detected in sample OP2 at a concentration of 4,100 µg/kg. Bis(2-ethylhexyl)phthalate was detected in all of the Old Plant floor slab samples and in New Plant floor slab sample NP4. The maximum concentration of this phthalate was detected in sample NP4 (47,000 µg/kg). Di-n-octyl phthalate was also detected in sample NP4 at a concentration of 1,400 µg/kg. The presence of phthalates in the floor slab samples may be attributable to the paint used by Hexagon Laboratories to surface the concrete floor slabs in certain areas of the Old Plant and New Plant. One other SVOC, benzyl alcohol, was detected in Old Plant floor slab sample OP1.

Because of the high concentration of BTEX compounds in sample OP1, NYSDEC directed Trade-Winds to encapsulate the highly contaminated portion of the floor slab using masonry paint as a concrete sealant. The sealant was applied to the Old Plant floor slab and extends from the edge of the slab adjacent to Peartree Avenue to the location of sample OP2. This work was performed as part of the IRM.

5.0 CONTAMINANT FATE AND TRANSPORT

The previous section outlines the occurrence of contamination across the Hexagon Laboratories Site in surface soil, subsurface soil, groundwater, and miscellaneous matrices including concrete floor slabs and oily waste material. While the types of contamination observed at the site are quite varied, the bulk of the contamination consists of BTEX compounds, chlorinated VOCs, phenolic compounds, PAHs, and PCBs. In addition, unidentified VOC and SVOC compounds (*i.e.*, TICs) comprise a significant portion of the total contamination measured on site. Elevated concentrations of some metals including antimony, arsenic, cadmium, chromium, copper, mercury, nickel, selenium, thallium, and zinc were also observed. Cyanide was also detected at an elevated concentration in groundwater samples collected from one monitoring well.

5.1 Potential Routes of Migration

Of the environmental media studied, surface soil and groundwater have the greatest potential for off-site migration. Subsurface soils do not have the potential for off-site transport unless exposed by excavation, although contaminants may leach from subsurface soils and be transported to groundwater or deeper soils.

Surface soils can migrate or be carried off site by overland runoff/entrainment during precipitation events, in the form of airborne dust, and by users of the site (via vehicle tires or shoes, for example). In addition, contaminants can move from the surface soils through leaching by infiltration of precipitation and into the groundwater for subsequent transport, and by volatilization into ambient air.

Significant organic and inorganic contamination was observed in the shallow groundwater monitoring wells as well as in the deep monitoring well. However, the extent of off-site migration of contaminated groundwater is unknown since no off site monitoring wells were installed or sampled as part of this RI. It is important to note that groundwater is not used as a source of potable water for the Hexagon Laboratories Site or its vicinity.

5.2 Contaminant Distribution and Observed Migration

The following subsection discusses the contaminant presence across the site, as outlined in Section 4, in combination with the migration pathways presented above to provide an understanding of contaminant persistence and migration at the site. The discussions below are presented with respect to contaminants or contaminant groups. Contaminants observed in the samples collected at the Hexagon Laboratories Site include VOCs, SVOCs, PCBs, and inorganics.

As used in this report, surface soils are considered to be those designated as such, as well as shallow (0 to 2 feet bgs) subsurface soil samples. The data for surface soil samples are presented in Tables 4-3 through 4-7. Subsurface soils include samples from borings (Tables 4-8 though 4-12) and the subsurface UST excavation sidewall samples (Tables 4-13 through 4-17). South Yard UST excavation soil sample SYTEX-1 is excluded from this discussion since it represents excavated material which has since been removed and disposed off site, and, as such, does not represent current site conditions. For the same reason, the UST excavated soil sample data (Tables 4-23 through 4-26) corresponding to samples collected by Trade-Winds during the IRM are also excluded from this discussion. Subsurface soil samples collected as background samples (HXBK1, HXBK2, and HXBK3) are also excluded from this discussion since these samples were collected off site and do not represent site conditions.

5.2.1 Volatile Organic Compounds

VOC contamination is fairly widespread at the Hexagon Laboratories Site. While relatively low concentrations of VOCs were detected in the surface soil at the site, higher concentrations were observed in the subsurface soils and in the groundwater. Total concentrations of VOCs, including TICs, in the surface soil range from 4 µg/kg in sample HX-SS7, collected in the central portion of the East Yard, to 1,533,000 µg/kg in sample HXB10S1, collected in the former New Plant adjacent to the South Yard UST excavation. Total concentrations of VOCs, including TICs, in subsurface soil samples, excluding background samples, range from 0 µg/kg in samples EYT34-1 and EYT36-1, collected from the East Yard UST excavation, to 33,230,000 µg/kg (3.3%) in sample HXB11S2, collected beneath the floor slab of the former Old Plant. Total concentrations of VOCs, including TICs, in groundwater samples range from 75 µg/L in monitoring well MW-6, located north of the Office/Warehouse adjacent to Boston Post Road, to 919,900 µg/L in monitoring well MW-4, located in the main plant area of the former New Plant. The VOCs detected at the site include aromatic hydrocarbons, chlorinated aliphatics, ketones, and miscellaneous VOCs (*i.e.*, chlorobenzene and TICs).

Aromatic Hydrocarbons

The most commonly detected VOCs on site are the aromatic hydrocarbons benzene, toluene, ethylbenzene, and xylenes, or BTEX compounds. Toluene, ethylbenzene, and xylenes were detected in approximately 70% of the surface soil samples (11 of 16 samples) although concentrations exceeded NYSDEC RSCOs in only one sample (HXB10S1). Excluding background samples, toluene, ethylbenzene, and xylenes were detected in approximately 85% of the subsurface soil samples (26 of 30 samples) analyzed for VOCs. Half of the subsurface soil samples (15 of 30 samples) had BTEX concentrations in excess of NYSDEC RSCOs. Benzene was detected at low concentration in only one surface soil sample and was detected in half (15 out of 30 samples) of the subsurface soil samples. Of the BTEX compounds, toluene was generally detected at the highest concentration. The highest total BTEX concentration of 25,198,000 µg/kg, 21,000,000 µg/kg of which is toluene, was detected in subsurface soil sample HXB11S2, collected near the eastern wall of the former

Old Plant. Toluene is known to have been stored in USTs in both the South Yard and the North Yard, and xylene was stored in an UST in the North Yard. Benzene was also reported to have been stored on site although the location of its storage is unknown. There is no specific record of ethylbenzene having been used or stored at the site. However, there are eight USTs in the South Yard for which there are no records of their former contents.

BTEX compounds were also detected in 11 of 12 (approximately 90%) of the groundwater samples. The highest BTEX concentration of 315,800 µg/L, 290,000 µg/L of which is toluene, was detected in monitoring well MW-4, located in the main plant area of the former New Plant.

The principal mechanism for the natural removal of aromatic VOCs is through volatilization. As shown on Table 5-1, vapor pressures (at approximately 20°C) of the BTEX compounds range from 7 to 76 mm Hg and Henry's Law Constants range from 5.4×10^{-3} to 6.7×10^{-3} atm-m^3/mole. The environmental half-life of the BTEX compounds is fairly short (28 days or less) in soil, but may be substantially longer (up to 1 year for xylenes and 2 years for benzene) in groundwater where biodegradation is not significant.

The adsorption of BTEX compounds to soil particles is related to the amount of organic carbon in the soil and is represented numerically by the organic carbon-water partition coefficient (K_{oc}). The BTEX compounds have similar log K_{oc} values, ranging from 1.94 to approximately 2.5. The compounds with higher K_{oc} values would be preferentially partitioned to organic matter in soils and so would be less likely to leach from the soils and transported to the groundwater. These log K_{oc} values indicate a low to moderate tendency of BTEX compounds to adsorb to soils.

Based on the aqueous solubility and K_{oc} values, BTEX compounds are fairly mobile in soil; however, the Henry's Law Constant and the environmental half-life data indicate that soil concentrations are expected to attenuate naturally fairly rapidly. Any BTEX compounds reaching the groundwater would be expected to be fairly persistent and mobile.

The importance of volatilization as a removal mechanism for BTEX compounds is consistent with the site data in that concentrations of BTEX compounds in the surface soil are generally quite low as compared to the deeper subsurface soil samples. The groundwater data do show evidence of the migration (leaching) of BTEX compounds into the groundwater. In fact, the BTEX concentrations in the deep well (MW-2) are about the same as those in the co-located shallow well (MW-1), indicating no attenuation of contamination with depth. (This same observation regarding groundwater contamination at depth also holds true for other contaminant classes.)

Chlorinated Aliphatics

Chlorinated aliphatics including methylene chloride, 1,2-dichloroethene, 1,2-dichloroethane, 1,1,1-trichloroethane, trichloroethene, and tetrachloroethene were most commonly detected in the subsurface soil samples across the site. Of these compounds, 1,2-dichloroethane, trichloroethene, and tetrachloroethene are the most pervasive, being detected in approximately half (15 to 17 of 30 samples) of the subsurface soil samples. 1,2-Dichloroethane was detected at the highest concentration of 5,100,000 µg/kg (0.5%) in subsurface soil sample HXB11S2, collected near the eastern wall of the former Old Plant. While chlorinated aliphatics (*e.g.*, methylene chloride, 1,2-dichloroethane, trichloroethene, and tetrachloroethene) were also detected in surface soil samples (14 of 16 samples), concentrations were generally quite low.

Chlorinated aliphatics were also detected in groundwater samples. Contaminants detected include vinyl chloride, chloroethane, methylene chloride, 1,1-dichloroethene, 1,1-dichloroethane, 1,2-dichloroethene, chloroform, 1,2-dichloroethane, 1,1,1-trichloroethane, trichloroethene, and tetrachloroethene. 1,1-Dichloroethane, 1,2-dichloroethane, and trichloroethene are the most pervasive of these compounds, being detected in approximately 60% of the groundwater samples. 1,2-Dichloroethane was detected at the highest concentration of 440,000 µg/L in monitoring well MW-4, located in the main plant area of the former New Plant.

Ethylene dichloride (*i.e.*, 1,2-dichloroethane) was reportedly stored in two USTs in the South Yard. The only other chlorinated compound reported to have been stored at the Hexagon Laboratories Site is methylene chloride, which was also stored in a South Yard UST. Although many of the other chlorinated aliphatics detected on site are common industrial solvents and intermediates (*e.g.*, trichloroethene and tetrachloroethene), there is no specific record of their having been stored on site.

Chlorinated aliphatics should exhibit a similar fate and transport pattern as discussed for the BTEX compounds. The log K_{oc} values for the chlorinated VOCs detected at the Hexagon Laboratories Site are similar to or lower than those for the BTEX compounds; their vapor pressures, aqueous solubilities, and Henry's Law Constants tend to be somewhat higher. Therefore, both volatilization and leaching of the chlorinated VOCs would be expected to be at least as rapid as for the BTEX compounds. The environmental half-lives of the chlorinated VOCs are also much longer indicating less rapid natural attenuation of these compounds in both soil and groundwater. Therefore, the chlorinated VOCs are expected to be fairly persistent, especially in groundwater. Chlorinated aliphatics are relatively insoluble in water. However, their solubilities (typically in the mg/L range, as shown on Table 5-1) are significant with regard to groundwater contamination even at trace levels. For example, 1,2-dichloroethane has been detected at concentrations up to 440,000 µg/L in groundwater samples, which is less than its aqueous solubility of about 8,300,000 µg/L (about 0.8%).

Chlorinated aliphatics such as trichloroethene, tetrachloroethene, and 1,1,1-trichloroethane can be transformed by chemical and biological processes in soils and groundwater to form a variety of other chlorinated aliphatics including chloroform, methylene chloride, 1,2-dichloroethene, 1,1-dichloroethene, vinyl chloride, 1,1-dichloroethane, and chloroethane (USEPA, 1993). While most of these compounds can be transformed by biological processes, generally, the environmental conditions are not present to sustain this transformation. Thus, these compounds are less amenable to biodegradation than the BTEX compounds. The presence of some of the low molecular weight chlorinated organics which were not known to have been used or stored on site is likely attributable to the breakdown of chlorinated aliphatics which were used or stored on site.

Ketones

Acetone and 2-butanone (methyl ethyl ketone, or MEK) were detected in surface and subsurface soil samples. Acetone was detected in 75% (12 of 16 samples) of the surface soils samples at a maximum concentration of 6,100 µg/kg in sample HXB10S1, located in the former New Plant adjacent to the South Yard UST excavation. Acetone was also detected in approximately half (16 of 30 samples) of the subsurface soil samples at a maximum concentration of 9,200 µg/kg in sample SYTN-1, a sidewall sample from the South Yard UST excavation. 2-Butanone was detected in four surface soil samples at a maximum concentration of 39 µg/kg in East Yard sample HXB19. It was also detected in one third (10 of 30 samples) of the subsurface soil samples at a maximum concentration of 720 µg/kg in South Yard UST sidewall sample SYTE-1. Acetone (stored in USTs in both the North Yard and South Yard), along with diethyl ketone (3-propanone, which is not a TCL analyte; stored in East Yard USTs), were the two ketones reported to have been stored at the Hexagon Laboratories Site.

Acetone, 4-methyl-2-pentanone (methyl isobutyl ketone, or MIBK), and 2-hexanone (methyl n-butyl ketone) were detected in groundwater samples. Acetone was detected in 75% (9 of 12 samples) of the samples with a maximum concentration of 24,000 µg/L in monitoring well MW-4. MIBK was detected in one sample from monitoring well MW-3, located in the South Yard and hexanone was detected in one sample from each of monitoring wells MW-2 and MW-3.

The ketones detected at the Hexagon Laboratories Site are all very soluble in water (ranging from 1.4% to infinite solubilities) and, with the exception of 2-hexanone, have low log K_{oc} values (less than 1.0). Coupled with the fairly high vapor pressures of these compounds, the ketones are highly mobile and thus subject to leaching into groundwater from soil. However, the ketones also have short environmental half-lives in soil (7 days) and groundwater (14 days). Therefore, rapid natural attenuation of these compounds is expected in soil and groundwater. The relatively low levels of acetone and 2-hexanone in the downgradient monitoring wells (MW-1 and MW-2) reflects the short anticipated environmental half-lives of these compounds.

Miscellaneous VOCs and TICs

Chlorobenzene was detected in two surface soil samples with a maximum concentration of 24,000 µg/kg in sample HXB10S1, collected in the former New Plant adjacent to the South Yard UST excavation. It was also detected in more than half (16 of 30 samples) of the subsurface soil samples, excluding background samples, with a maximum concentration of 200,000 µg/kg in sample HXB11S2, collected near the eastern wall of the former Old Plant. In addition, chlorobenzene was detected in 11 of the 12 groundwater samples collected during the RI. The highest groundwater concentration of chlorobenzene (3,900 µg/L) was detected in monitoring well MW-4, located in the main plant area of the former New Plant.

Chlorobenzene has the potential to leach into groundwater, particularly in soil low in organic matter; some biodegradation occurs but slowly (Howard, 1989). The observed data (*i.e.*, the presence of chlorobenzene in virtually all of the groundwater samples) is consistent with the expected fate and transport (*e.g.*, leaching into groundwater and apparent environmental persistence). Continued transport of chlorobenzene to and with groundwater can be expected due to continued leaching from soil and only slow degradation (*i.e.*, limited attenuation of the source concentrations) and little or no retardation or adsorption to soils once in the groundwater, due to the low organic carbon content in the saturated zone.

TICs make up a significant portion of the total VOC contamination observed on site. The highest concentration of TICs detected in the surface soil samples is 189,000 µg/kg in sample HXB10S1. The maximum concentration of TICs detected in subsurface soil samples is 919,000 µg/kg in sample HXB11S2. In addition, a TIC concentration of 48,000 µg/L was detected in monitoring well MW-4. While it is difficult to evaluate environmental fate and transport of TICs without knowing the characteristics of the specific compounds, it is important to note the significant contribution that TICs make to the overall VOC contamination at the Hexagon Laboratories Site. However, review of the TIC data suggests that a large portion of the VOC TICs are unknown (unidentified) benzene derivatives and alkanes and lower molecular weight PAHs, all of which may be associated with petroleum contamination. The environmental fate and transport of these TICs may be expected to be similar to that of related compounds (*e.g.*, BTEX compounds and semivolatile PAHs). Halogenated (*e.g.*, chlorinated) compounds were rarely, if ever, detected as TICs.

The VOC analysis of South Yard and New Plant UST excavated soils, sampled by Trade-Winds as part of the IRM, included identification and quantitation of additional constituents which were not part of the TCL VOC analyses conducted on samples collected by TAMS. The reported presence of constituents such as isopropyl benzene and trimethyl benzene in the excavated material is consistent with the TIC identifications of substances such as "unknown C9H12 isomer" and supports the hypothesis that many of these TICs are petroleum-related compounds.

5.2.2 Semivolatile Organic Compounds

SVOC contamination is also widespread across the Hexagon Laboratories Site. SVOCs, including phenolic compounds, PAHs, aniline compounds, chlorinated benzene compounds, phthalates, and miscellaneous SVOCs (carbazole, dibenzofuran, and TICs) were detected in site surface and subsurface soils. SVOCs detected in groundwater include phenolic compounds, PAHs, chlorinated benzene compounds, phthalates, and miscellaneous SVOCs (carbazole and TICs). The highest SVOC concentration detected in surface soils, including TICs, is over 2,895,000 µg/kg in sample HXB13S1, located in Hydrotherm No. 1; with the exception of TICs, the SVOC contamination in this sample is entirely comprised of PAH contamination. The maximum total SVOC concentration observed in site subsurface soils is about 1,030,000 µg/kg (about 0.1%) detected in sample HXB4S2, located in the main plant area of the former New Plant. The TIC concentration in this sample is over 1,000,000 µg/kg, and comprises about 99% of the total SVOC contamination in this sample. While SVOCs were detected in each of the groundwater samples, the most contaminated samples were collected at monitoring well MW-4, located in the main plant area of the former New Plant. The maximum total SVOC concentration detected in groundwater is 80,220 µg/L, 64,300 µg/L of which corresponds to TICs.

Phenolic Compounds

Phenolic compounds including phenol, 2-methylphenol (o-cresol), and 4-methylphenol (p-cresol) were detected in the site subsurface soils. Of these compounds, 4-methylphenol is the most pervasive, being detected in 9 of the 27 subsurface soil samples analyzed for SVOCs. It was also detected at the highest concentration of the phenolic compounds (6,400 µg/kg) in sample NPT-4, collected from a sidewall of the New Plant UST excavation. Methylphenols (cresols) have been reported to be present in petroleum at low concentrations. With the exception of about 3,100 µg/kg total phenols in sample HXB10S1, phenolic compounds were not detected in the site surface soils.

In addition to the three phenolic compounds detected in the surface and subsurface soils, 2-chlorophenol and 2,4-dimethylphenol were detected in groundwater samples collected during the RI. In contrast to the distribution of phenolic compounds in the subsurface soil, phenol was detected most frequently in the groundwater samples (8 of 12 samples). However, 4-methylphenol was detected at the highest concentration of 9,900 µg/L in monitoring well MW-4. Monitoring well MW-4 is located in the main plant area of the former New Plant and is approximately 30 feet southeast of the New Plant UST excavation.

The phenolic compounds detected at the Hexagon Laboratories Site are relatively water soluble and, with the exception of the chlorinated derivatives, are relatively amenable to biodegradation in both soil and groundwater. Biodegradation of phenol is reportedly rapid in water and soil (two to five days; Howard, 1989); 2-chlorophenol is also subject to biodegradation. Volatilization is generally not significant for this class of compounds, although phenol may volatilize from surface soils. 2-Chlorophenol is expected to have low to moderate adsorption to soil and may leach to groundwater (Howard, 1989). The phenolic compounds are expected to be mobile in soils and subject to leaching to groundwater. This is consistent with the site data in that all of the phenols detected in site soils have also been detected in groundwater. In addition, the environmental half-life of the phenolic compounds is fairly short in both soil and groundwater. Therefore, fairly rapid natural attenuation of these compounds is expected. This is consistent with the relatively low levels of phenolic compounds detected in the downgradient monitoring wells (MW-1 and MW-2).

Polycyclic Aromatic Hydrocarbons

PAHs were detected at varying concentrations in approximately 85% (14 of 16) site surface soil samples (Table 4-4) and in 70% (19 of 27 samples) of the on-site subsurface soil samples analyzed for SVOCs (Table 4-9). The maximum concentration of PAHs detected in surface soil samples is 323,120 µg/kg (300,000 µg/kg of which is chrysene) in HXB13S1, collected from beneath the floor slab of Hydrotherm No. 1, followed by 14,560 µg/kg in sample HX-SS3, located in the South Yard. The maximum concentration of PAHs detected in subsurface soil samples is 75,120 µg/kg in sample SYTC-1, a composite sample collected from the sidewalls of the South Yard UST excavation. Chrysene is the principal PAH constituent in this sample with a concentration of 40,000 µg/kg. Significant PAH contamination was also observed in oily material sample HX-OM1, scraped from the floor slab of Hydrotherm No. 1. Chrysene was detected in this sample at a concentration of 7,200,000 µg/kg. This, along with the TPHC and TOC data for samples HX-OM1 and HXB13S1, suggests that the contamination in sample HXB13S1 is likely due to a spill of fuel oil or similar petroleum-based material, quite possibly the same oily material detected in HX-OM1.

PAH contamination is not nearly as prevalent in the groundwater as in the surface and subsurface soils; this observation is consistent with the low aqueous solubility of PAHs and their affinity to remain adsorbed to the organic carbon in soils. Low concentrations of PAHs were detected 6 of the 12 groundwater samples at a maximum concentration of 430 µg/L in monitoring well MW-4. Naphthalene was the only PAH detected in this sample.

Due to their low aqueous solubility, low volatility, and high K_{oc} values, PAHs tend to stay adsorbed to soils and are fairly immobile. The mobility of the PAHs is inversely related to molecular weight; low molecular weight PAHs, such as naphthalene, are more mobile and sorb less strongly to soil than higher molecular weight PAHs. This is consistent with site data in that only naphthalene was detected in groundwater at a concentration greater than the corresponding NYSDEC Class GA groundwater standard. Biodegradation of some PAHs (*e.g.*, naphthalene; benzo(a)pyrene) does occur but only slowly and to a limited extent (Howard *et al.*, 1991). Because PAHs tend to be fairly immobile, off-site transport of PAHs via leaching from site soils into groundwater is not expected to be significant.

Aniline Compounds

Aniline compound contamination at the Hexagon Laboratories Site is quite localized. These compounds (*i.e.*, 4-chloroaniline and 4-nitroaniline) were detected in only 3 of the 27 on-site subsurface soil samples. 4-Chloroaniline was detected at a maximum concentration of 2,700 µg/kg in New Plant UST excavation sidewall sample NPT-2, while 4-nitroaniline was detected at a maximum concentration of 1,000 µg/kg in North Yard UST excavation sidewall sample NYT-2.

Aniline compounds were not detected in the site surface soil samples or the groundwater samples.

Chloroaniline tends to bind to organic (humic) substances in soil which tend to retard its mobility and biodegradation (Howard, 1989). No fate data were found for nitroaniline. No evidence of leaching of aniline compounds into groundwater has been noted to date.

Chlorinated Benzene Compounds

1,2-Dichlorobenzene was detected in 11 of the 12 groundwater samples at a maximum concentration of 320 µg/L in monitoring well MW-4, located in the main plant area of the former New Plant. It was also detected in four of the 16 surface soil samples and in eight of the 27 subsurface soil samples analyzed for SVOCs. The maximum surface soil concentration is 740 µg/kg in sample HX-SS3, collected in the South Yard, and the maximum subsurface soil concentration is 140,000 µg/kg in South Yard UST excavation composite sidewall sample SYTC-1.

Sporadic detections of other substituted benzene compounds, including 1,3-dichlorobenzene and 1,4-dichlorobenzene, were observed in the surface and subsurface soil samples.

Although the K_{oc} values for dichlorobenzenes (see Table 5-1) indicate that they tend to sorb moderately to strongly to soils, leaching to groundwater can and does occur. (This is confirmed by the detection of 1,2-dichlorobenzene at low to moderate concentrations [2 µg/L to 320 µg/L] in 11 of the 12 groundwater samples.) Aerobic biodegradation may occur, although slowly if at all (Howard, 1989). Dichlorobenzenes are not considered to be susceptible to anaerobic biodegradation.

Phthalates

Generally low levels of phthalate contamination were observed in the surface and subsurface soil samples collected at the Hexagon Laboratories Site. Phthalates detected include dimethyl phthalate, diethyl phthalate, di-n-butyl phthalate, butylbenzyl phthalate, bis(2-ethylhexyl)phthalate, and di-n-octyl phthalate. The maximum total phthalate concentration in surface soils (7,390 µg/kg) was detected in sample HX-SS4, collected in the main plant area of the former New Plant. The highest total phthalate concentration (51,250 μg/kg) in subsurface soils was detected in sample HXB11S2, collected near the eastern wall of the former Old Plant. This sample is the only soil (surface and subsurface) sample with individual phthalate compound concentrations greater than the corresponding NYSDEC RSCOs.

Low concentrations of phthalates (1 to 270 μg/L) were also detected in seven of the 12 groundwater samples. Two phthalates, dimethyl phthalate and diethyl phthalate, were detected at concentrations greater than the NYSDEC Class GA groundwater standards in samples collected from monitoring well MW-4. No other phthalates were detected at elevated levels in any other groundwater sample.

Phthalates generally exhibit low solubility and high K_{oc}, and, as such, are not particularly amenable to water transport except in suspension as solid-bound phthalates. Phthalates are subject to moderate to rapid aerobic biodegradation (Howard, 1989). Leaching of phthalates from soils into groundwater is also possible to a limited extent; the presence of phthalates in landfill leachate has been attributed to leaching of phthalates from plastics in the landfill (Howard, 1989).

Miscellaneous SVOCs and TICs

Carbazole and dibenzofuran were detected sporadically at low concentrations in surface and subsurface soil samples. Low levels of dibenzofuran were detected in three of 16 surface soil samples and seven of the 27 subsurface soil samples analyzed for SVOCs. Similarly, low levels of carbazole were detected in two of the 16 surface soil samples and two of the 27 subsurface soil samples analyzed for SVOCs. Carbazole was also detected in one groundwater sample. Contamination by these compounds is not pervasive at the site.

TICs make up a significant portion of the total SVOC contamination observed on site. The maximum concentration of TICs detected in surface soil samples is 2,572,600 μg/kg (about 0.25%) in sample HXB13S1, followed by 214,400 μg/kg in sample HXB10S1. The maximum concentration of TICs detected in the subsurface soil samples is 1,018,800 μg/kg detected in sample HXB4S2. In addition, a TIC concentration of 64,300 μg/L was detected in a groundwater sample from MW-4. While it is difficult to evaluate environmental fate and transport of TICs without knowing the characteristics of the specific compounds, it is significant that TICs are a substantial fraction of the overall SVOC contamination at the Hexagon Laboratories Site. While the general class of some of the SVOC TICs was identified by the laboratory (*e.g.*, "unknown PAH"), for the most part these TICs were reported simply as "unknown". Therefore, the fate and removal processes for these unknowns cannot be predicted.

5.2.3 Pesticides and PCBs

Sporadic detections of pesticides were observed in surface soil, subsurface soil, and groundwater at the Hexagon Laboratories Site. Pesticides detected at concentrations greater than the corresponding regulatory criteria include aldrin, delta-BHC, gamma-BHC, heptachlor, heptachlor epoxide, dieldrin, 4,4-DDE, endrin, 4,4-DDT, and chlordane. However, the pesticide data for all media sampled as part of the RI are considered suspect (*i.e.*, there is a strong possibility of false positives) due to significant matrix interference. This interference issue is discussed in detail in Section 8.0 - Data Quality and Usability.

Generally low levels of PCBs were detected in surface soil and subsurface soil samples. PCBs were detected in half (8 of 16 samples) of the surface soil samples; however, the NYSDEC RSCO (1,000 µg/kg for surface soil) was exceeded in only two samples, HX-SS3 (1,500 µg/kg) and HXB19 (1,200 µg/kg). PCBs were detected in less than half (12 of 27 samples) of the subsurface soil samples analyzed for PCBs; however, in only one subsurface soil sample (18,000 µg/kg Aroclor 1242 in sample HXB4S2) did the concentration exceed the NYSDEC RSCO of 10,000 µg/kg for subsurface soil. PCB concentrations in all other subsurface soil samples were well below the regulatory criteria. PCBs were detected in groundwater samples collected from one monitoring well; however, the reported concentrations (13 µg/L and 17 µg/L in the two samples from monitoring well MW-4) are significantly greater than the NYSDEC Class GA groundwater standard of 0.1 µg/L.

Based on their physical properties, PCBs tend to sorb strongly to soil, are not subject to volatilization, and leaching and biodegradation occur slowly or not at all. PCBs have very low solubility in water. However, PCBs can exist in water at concentrations exceeding health-based criteria. PCBs are persistent in soils and significant reductions in concentrations are not expected (although recent studies have suggested that some dechlorination of some, but not all, PCB congeners does occur) (TAMS *et al.*, 1997). Ordinarily, PCBs would not be expected at significant concentrations in groundwater. The detected concentrations of PCBs in MW-4 may be a result of co-solvency (*i.e.*, the PCBs are dissolved in and transported or leached with other solvents such as BTEX and chlorinated aliphatics, which were also detected in MW-4).

5.2.4 Inorganics

The behavior of metals in soils is not fully understood. However, most metals are more susceptible to leaching at lower (acidic) pH values. A recently-developed USEPA test (the Synthetic Precipitation Leaching Procedure; SW-846 method 1312) attempts to simulate the effect of in-situ soils exposed to the somewhat acidic precipitation typical of the Eastern United States; however, since metals were not presumed to be contaminants of significant concern, nor was there a documented history of their use or disposal on site, this test was not performed. The Toxicity Characteristic Leaching Procedure (TCLP) test (SW-846 method 1311) was performed on a number of samples. While the TCLP test attempts to simulate the leaching behavior of contaminants in a landfill, not in the environment, it is the case that significant leaching of metals from site soils did not occur under TCLP test conditions.

5.3 Summary

The future behavior of contaminants at the site is difficult to predict since there are no historic data with which to compare (and evaluate trends). However, based on knowledge of site conditions and site history, current conditions, and the physical properties of the contaminants at the site, a few general observations can be made.

Overland Transport

Overland transport, for the most part, is not expected to be a significant contaminant transport route. The data indicate that the concentrations of volatile organics in surface soils are relatively low; probably due to the fact that VOCs have, in the years since closure of Hexagon Laboratories, volatilized or leached to deeper soils or groundwater. Therefore, neither runoff nor entrained sediments (soils) leaving the site are expected to be significantly contaminated with VOCs. Semivolatile organics are still present at relatively high concentrations in the surface soils and may be subject to some transport with entrained sediments during rainfall. As discussed in Section 3.2, transport of surface water is to the combined sewers (storm and sanitary) along Boston Post Road and Hollers Avenue. The limited amount of contaminated sediment transported to the sewer system during normal rainfall is unlikely to be a problem for the treatment plant. However, during significant storms (*i.e.*, when the treatment plant is allowed to let some of the CSO flow bypass treatment), the sediments (along with untreated wastes from other sources) would be discharged directly to the Hutchinson River.

Groundwater Transport

Groundwater transport is likely to be the most significant pathway for off-site migration of contamination from the Hexagon Laboratories Site. Although no off-site wells were installed, the detection of significant concentrations (hundreds of µg/L) of aromatic VOCs in both the shallow (overburden) and deep (top of screen about 25 feet below top of bedrock, with a total well depth of about 50 feet bgs) wells in a downgradient location on site (southeastern corner of the East Yard) suggest that BTEX contamination has already permeated the groundwater in the area; there is nothing preventing this contamination from migrating ultimately to the Hutchinson River. Contamination migrating by this pathway is expected to be primarily VOCs; the SVOCs and PCBs are expected to stay adsorbed to soils and the small amount of these compounds which do enter groundwater will migrate slowly in the overburden (due to re-sorption to organic carbon in the soils). However, what small amounts of SVOCs and PCBs do enter the bedrock aquifer would be expected to migrate with the groundwater, since there is no organic carbon in the rock to impede their migration.

VOCs in subsurface soils are expected to continue to leach into groundwater, creating an ongoing source for continued groundwater contamination. Leaching of SVOCs and PCBs is likely to be much less significant. However, the data suggest that the high concentrations of VOCs are allowing transport of normally immobile constituents by co-solvency.

Volatilization

Volatilization is no longer expected to be a significant route of contaminant transport under current conditions, although it is likely that volatilization may have played a significant role in the past in reducing the concentrations of VOCs in the surface soils. Volatilization could become more significant in the future if site activities (*e.g.*, excavation) expose VOC-contaminated subsurface soils to the ambient air.

6.0 BASELINE RISK ASSESSMENT

This baseline Human Health Risk Assessment (HHRA) examines the potential impact to human health from exposure to current concentrations of surface soil contaminants at the Hexagon Laboratories Site. Potential current and future risks in the absence of any remedial action are addressed pursuant to Section 200.68(f) (ii) of the National Contingency Plan (NCP). Surface soils represent only a portion of the contaminated media at the Hexagon Laboratories Site, and, therefore, this risk assessment provides a limited human health evaluation of potential risks associated with exposure to contaminants at the Hexagon Laboratories Site.

Risk Assessment Methodology

Methods used in this assessment are in accordance with the USEPA "Risk Assessment Guidance for Superfund" (RAGS), Volume I, Human Health Evaluation Manual (USEPA, 1989), the "Policy for Risk Characterization" (USEPA, 1995), and incorporates more specific guidance from USEPA on certain portions of the risk assessment (*e.g.*, USEPA, 1991, 1992b). The following steps were used to conduct this risk assessment:

- Identification of contaminants of concern;
- Exposure assessment;
- Toxicity assessment (hazard identification and dose-response);
- Risk characterization; and
- Uncertainty discussion.

A brief summary of this methodology is presented below.

Identify Contaminants of Concern - Identification and selection of site-specific Contaminants of Concern (COCs) for surface soils at the Hexagon Laboratories Site was based primarily on Risk-Based Concentration (RBC) screening (USEPA Region III, 1998). The selection criteria for a compound to be retained as a compound of concern for quantitative evaluation were: (1) it was detected above the applicable analytical detection limit; (2) toxicological data were available for the compound; and (3) the RBC screening level was exceeded.

Exposure Assessment- Potential human exposure pathways were defined subsequent to selecting the contaminants of concern. Exposure pathways were limited to ingestion and dermal contact with surface soils, as directed by NYSDEC (NYSDEC, 1998). These potential pathways were evaluated for each receptor group by examining site-specific conditions to determine if the pathway was complete. Complete pathways were retained for further evaluation.

After exposure pathways were defined, exposure factors, based on USEPA guidance, were selected. Human exposure levels for chronic and subchronic compound intakes were considered for each contaminant through the use of exposure scenarios. Exposure scenarios are plausible sets of human exposure pathways that help to define the intake levels of compounds in site media. Individual scenarios were developed for all receptors. The "high end risk" exposure scenario employs the 95% Upper Confidence Limit (UCL) exposure point concentration and Reasonable Maximum Exposure (RME), or high end exposure, circumstances. Average, or central tendency estimates, were performed for pathways where the high end risk exposure was calculated to exceed target levels.

Toxicity Assessment - The toxicity assessment is generally based on hazard identification and a dose-response assessment. The first step, hazard identification, is the process of determining whether exposure to an agent can cause an increase in the incidence of an adverse health effect. The second step, a dose-response assessment, is the process of quantitatively evaluating the toxicity information and characterizing the relationship between the dose of the contaminant administered and the incidence of adverse health effects in the exposed population.

The contaminants of concern were reviewed for human toxicity. Data on compound toxicity, summarizing the hazard identification and dose-response assessment processes, were obtained from USEPA's on-line information service, the Integrated Risk Information System (IRIS; USEPA, 1998). On the basis of these data, compounds were separated into two groups: those exhibiting noncarcinogenic effects (noncarcinogens) and those with carcinogenic effects (carcinogens). Although all compounds detected in site media were reviewed for toxicological effects, only those compounds with USEPA-promulgated toxicity criteria were used in the quantitative evaluation.

Risk Characterization - The final step in this risk assessment was the actual health risk characterization. Risk characterization combines the contaminants of concern, human exposure pathways, compound toxicity, exposure point concentrations, and contaminant intake evaluations to calculate risk estimates.

Quantitative estimates of high end and central tendency risks were calculated to determine the potential noncarcinogenic and carcinogenic risks to the exposed population.

Uncertainty Discussion - The uncertainties inherent in various parts of the risk assessment process were identified and their potential impacts on the findings of the risk assessment discussed.

6.1 Identification of Contaminants of Concern (COCs)

Surface soil samples collected as part of the RI were evaluated in order to select COCs. The data set used for analysis of surface soil contaminants consisted of ten surface soil samples (HX-SS1 through HX-SS10) and six shallow subsurface soil samples (HXB6S1, HXB10S1, HXB13S1, HXB16S1, HXB18, and HXB19) for a total of sixteen samples. All samples were taken at a depth of 0 to 2 ft (0 to 0.6 m). It is important to note that surface soil samples HX-SS6 through HX-SS10 and shallow subsurface soil samples HXB18 and HXB19 were collected from beneath paved surfaces in the East Yard. In addition, areas of the Hexagon Laboratories Site that already have been remediated (*i.e.*, soil removal and placement of clean fill) were not included in the sampling effort.

The analytical data used in this assessment were generated in accordance with NYSDEC-ASP-CLP protocols and have been determined to be useable after formal validation. Details of the analytical and validation program are discussed in Section 8 (Data Usability) of this report.

The following general rules were applied to COC selection:

1. Inorganic compounds detected at levels comparable to site background were not retained.

2. Aluminum, calcium, iron, magnesium, potassium, and sodium were not considered in the selection of contaminants of concern, since these essential nutrients are major soil components.

3. When a sample was diluted, one-half the Contract Required Quantitation Limit (CRQL) for organics and one-half the Instrument Detection Limit (IDL) for metals were used as the default value for nondetected analytes so as not to upwardly bias the contaminant concentration.

Contaminants were detected in the site surface soils from all four Target Compound List (TCL)/Target Analyte List (TAL) fractions analyzed (*i.e.*, volatile organics, semivolatile organics, pesticides/PCBs, and inorganics). In addition to the listed compounds, Tentatively Identified Compounds (TICs) represent a substantial portion of the contaminant mass.

6.1.1 Risk-Based Concentration (RBC) Screening

The preliminary review of the site data generated an initial list of 30 contaminants detected in the site media. For most sites, baseline risk assessments are dominated by a few contaminants and a few routes of exposure (USEPA Region III, 1993). To effectively concentrate on the compounds presenting potential health risks in this limited HHRA, an effort was made to reduce the number of COCs to include only those contaminants that may contribute significantly to the risk.

A RBC table, developed by USEPA Region III (USEPA Region III, 1998), was used to screen contaminants. RBCs screen data by using an absolute comparison of risk. USEPA Region III has developed a table of nearly 600 chemicals in air, drinking water, fish tissue, and soil that correspond to a systematic hazard quotient of 0.1 or a lifetime cancer risk of

1×10^{-6}. The USEPA Region III RBCs were developed using protective default exposure scenarios suggested by USEPA (USEPA, 1991) and the best available Reference Doses (RfD) and carcinogenic potency Slope Factors (SF), and represent relatively protective environmental concentrations at which USEPA would not typically take action (USEPA Region III, 1993). The reference doses and carcinogenic potency slope factors used for calculating the RBCs were obtained from IRIS (USEPA, 1998), the Superfund Health Risk Technical Support Center, and other USEPA sources. The RBCs for industrial soil ingestion were used since, as discussed below in Section 6.2.1, no residential exposure scenarios were considered in this assessment.

The Technical and Administrative Guidance Memorandum (TAGM) on Determination of Soil Cleanup Objectives and Cleanup Levels (NYSDEC, 1994) was not used in the selection of COCs due to the exposure assumptions associated with it. TAGMs are based on a soil exposure scenario involving children ages one to six with an average weight of 16 kg ingesting 0.2 gram/day of soil for a five-year exposure period. This age class exhibits the greatest tendency to ingest soil. Since residential use of the site is not considered as a current- or future-use alternative in this assessment, TAGMs are considered to represent an unrealistically conservative scenario and were not used to select COCs.

Lead currently has no promulgated criteria, but a directive from USEPA (USEPA, 1994) recommends using a residential screening level for Superfund and RCRA sites of 400 ppm in soil and dust. Since lead was detected at concentrations above this criterion, it was retained as a COC in surface soil.

Using the RBCs to screen contaminants, the following two COCs were identified:

- Lead (residential screening level of 400 mg/kg, maximum concentration of 1,400 mg/kg); and
- Benzo(a)pyrene (RBC of 0.78 mg/kg, maximum concentration of 3.20 mg/kg).

One other contaminant group, semivolatile tentatively identified compounds (TICs) were retained for qualitative discussions because of their presence in many samples. Although this group lacks toxicological criteria, it represents a significant proportion of site contamination.

6.2 Exposure Assessment

The exposure assessment identifies exposure pathways and potential receptor populations. Each of these elements is described below.

6.2.1 Identification of Exposure Pathways

A complete exposure pathway generally consists of the following four elements (USEPA, 1989): (1) a source and mechanism of chemical release; (2) a transport medium; (3) a point of potential human contact with the contaminated medium (referred to as the exposure point); and (4) an exposure route (*e.g.*, ingestion, inhalation) at the contact point. This step of the risk assessment involves defining and characterizing the populations at risk and determining the circumstances and levels of exposure. To estimate the levels of exposure for populations likely to be at risk, several current- and future-use scenarios depicting activities of site workers, trespassers, and construction workers were developed.

Residential use of the Hexagon Laboratories Site was not considered probable, since the site is not currently used for housing and the site is zoned as an M2 District, which is defined as zoned for general industrial use with performance characteristics less desirable than those permitted in M1 (light industrial) districts as well as for most commercial uses (New York City Department of City Planning, 1998).

Each potential exposure pathway was evaluated to determine whether it is complete or not. Table 6-1 summarizes potential receptors and associated complete exposure pathways.

6.2.2 Characterization of Potentially Exposed Populations

Three populations were considered to have complete current- or future-use exposure pathways. These groups are trespassers, site workers, and construction workers. Table 6-1 outlines the potential exposure pathways considered at the Hexagon Laboratories Site.

Trespasser Exposure to Contaminated Surface Soils

The Hexagon Laboratories Site is surrounded by a locked fence to keep trespassers and transients off site. However, it is possible for individuals to climb over the fence to gain access to the site. Therefore, the trespasser exposure pathway was evaluated. Trespassers are assumed to be teenage males and females between the ages of 12 to 18 years (inclusive). Trespassers may come into contact with soils while playing or hanging out on site. Therefore, trespasser exposure is examined as a combined current- and future-use scenario, using the default parameters recommended by USEPA (USEPA, 1989; 1991; and 1997) and as listed on Table 6-2. The high end ingestion exposure (100 mg/day) is an arbitrary assumption; due to lack of good study data, USEPA (USEPA, 1997) has no recommendations for an RME value for this parameter. It is important to note that prior to the IRM, adult transients resided at the Hexagon Laboratories Site. However, due to the building demolition and building sealing activities performed as part of the IRM, this type of exposure scenario is no longer considered likely.

Trespassers may incidentally ingest soil during activities such as eating or smoking. Soils may also contact exposed body areas. Volatile organics are the compounds most likely to enter the body (*i.e.*, they have the greatest dermal permeability). However, no volatile organics were selected as COCs. The next group of contaminants most likely to enter the body are semivolatile compounds, of which benzo(a)pyrene was selected as a contaminant of concern. The remaining COC, lead, is an inorganic analyte, and is considered to have low dermal permeability.

Site Worker Exposure to Contaminated Surface Soils

At the current time, no workers are present at the Hexagon Laboratories Site. In the past, site workers were employed at the site. If future site plans include development or remediation, the site will be actively used again. Therefore, worker exposure is examined as a future-use scenario, using USEPA-recommended exposure factors (*e.g.*,USEPA, 1997).

Site workers may incidentally ingest soil during activities such as eating or smoking. During work activities, soils may also contact exposed body areas. Individuals engaged in physical outdoor work are more likely to contact contaminated soils than those individuals working indoors who may only contact contaminated soils through dust. The default exposure of 50 mg/day was used for both central tendency and high end exposures for this scenario.

Another potential exposure for site workers is inhalation of soil and dust particles, especially during periods of heavy wind activity, vehicular activity, construction, or excavation. However, inhalation pathways are beyond the scope of this assessment and are not evaluated here.

Construction Worker Exposure to Contaminated Media

If the Hexagon Laboratories Site is redeveloped for industrial or commercial use, construction workers may be exposed to contaminants during redevelopment construction. Construction workers are assumed to be exposed to surface soils via ingestion and dermal contact. This risk assessment only examines exposure to contaminated surface soils (0 to 2 feet below ground surface), although it is likely that any major construction project would also result in exposure to subsurface soils. The soil ingestion for the construction worker is assumed to be 480 mg/kg (Hawley, 1985 as cited in USEPA, 1997). This value was used for both central and high end risk calculations for this scenario.

Summary of Exposure Pathways

The following exposure pathways were considered to be complete and were evaluated as part of this assessment of exposure to the Hexagon Laboratories Site.

<u>Current-Use</u>:

- Trespassers: Ingestion of and dermal contact with surface soil.

Future-Use:

- Trespassers: Ingestion of and dermal contact with surface soil.
- Site Workers : Ingestion of and dermal contact with surface soil.
- Construction Workers: Ingestion of and dermal contact with surface soil.

6.2.3 Uncertainties Associated with Exposure Pathways

Based on the scope of work outlined in the Project Management Plan (December 1996, Amended March 1997 and June 1997, Revised September 1997) and approved by NYSDEC, only ingestion and dermal exposure to surface soils were examined. Therefore, risks may be underestimated due to exclusion of other potential exposure pathways, such as inhalation of particulates. Inhalation of volatile compounds is not considered to significantly contribute to risks, since there are few volatile organic compounds present in site surface soils.

As part of the Phase II remedial investigation, seven additional soil samples were taken from 0 to 2 feet below ground surface in the East Yard to supplement the earlier sampling effort. Removal of an overlying layer of pavement (asphalt and/or concrete) was necessary prior to collection of these additional samples. Therefore, these samples represent soil that is unlikely to be subject to human contact in current use exposure scenarios. However, this soil could be subject to human contact in a future use construction worker exposure scenario in which construction activities include removal of the paved surface. While there is currently no exposure point associated with the additional samples, these samples were included in this assessment so that potential human health risks would not be underestimated.

Receptor populations were selected based on current local conditions and activities, and possible future-use scenarios. However, it should be noted that there is no verification of trespassers on site, although, as noted previously, homeless individuals resided at the site prior to the IRM. The possibility of transients living at the site is no longer considered likely due to the building demolition and building sealing activities performed as part of the IRM. Future exposure pathways are based on providing an estimate of maximum use and development of the site. These uses may not occur in the future, or may occur after remedial action has been taken.

The overall degree of uncertainty associated with current scenarios is moderate, while for future exposure pathways, it is significantly greater.

6.3 Exposure Factors

This section discusses exposure factors chosen for use in the exposure scenarios and the basis for their selection. Assumptions used for both receptor parameters and exposure point concentrations are discussed.

Exposure was calculated for high end and central tendency individuals. The high end risk descriptor is a plausible estimate of the individual risk for those persons at the upper end of the risk distribution USEPA (USEPA, 1992b). Central tendency parameters were also developed to provide estimates representing average exposures.

Exposure assumptions were primarily taken from USEPA documents (*e.g.*, USEPA, 1989; USEPA, 1997). In instances where more than one exposure factor was provided, factors from the most recent guidance available were used (*e.g.*, USEPA, 1997). High end and central tendency risk exposure assumptions used in this risk assessment are provided in Table 6-2.

6.3.1 Trespasser Exposure Assumptions

Site trespassers were assumed to be local adolescents (ages 12 through 18). Trespassers were assumed to enter the Hexagon Laboratories Site twice a week during warmer months (May to October; 52 days/year) for a period of six years for the high end exposure scenarios and once a week during the summer (13 days/year) for two years for the central tendency exposure scenario.

The soil ingestion rate of 50 mg/day was based upon USEPA's current recommendation to use that value for all age groups other than children (USEPA, 1997). The 100 mg per day soil ingestion value was considered to represent upper-bound values for soil and dust ingestion (USEPA, 1991). Although there is currently no upper percentile guidance provided by USEPA for soil ingestion (USEPA, 1997), the 100 mg/day value was used since teenage trespassers are assumed to have higher than average contact with soil. An ingestion absorption value of 100%, considered to be conservative, was used for all contaminants in the absence of compound-specific data. The body weight used for both exposure scenarios is 55.7 kg, based on the average of the 50th percentile male and female weights for this age group (USEPA, 1997). A body weight of 78.6 kg was used for the high end exposure, based on the average of the 95th percentile weights for this same population (Table 7-6, USEPA, 1997).

The exposed body surface area of 4,443 cm^2 for dermal exposure was based on the surface area of hands, forearms, lower legs, face, and feet (USEPA, 1997). Dermal absorption values were generally upper limits observed in laboratory studies (USEPA, 1992a). A default soil/skin adherence factor of 0.03 (3%), as recommended by USEPA Region II , was used for both scenarios. The dermal absorption factors used were 1% for metals and 13% for benzo(a)pyrene, as recommended by USEPA Region II (USEPA Region II, 1998).

A life expectancy of 70 years (USEPA, 1989) was used for all receptor groups to calculate averaging time for exposure to carcinogenic contaminants.

6.3.2 Site Workers Exposure Assumptions

Site workers were anticipated to work 5 days per week, 50 weeks per year, for a total of 250 days per year. For the high end exposure, workers were assumed to go outside daily for a total of 250 days per year. Central tendency workers were estimated to go outside three times a week during the summer months for a total of 39 days per year. The number of years worked at the site is considered to be 10 years for the central tendency exposure and 25 years for the high end exposure, based on the 95th percentile time period (Bureau of Labor Statistics, 1990).

An adult soil ingestion rate of 50 mg per day for industrial settings was used, as recommended by USEPA (USEPA, 1997). It should be noted that this represents a central tendency estimate of soil ingestion, but is considered to be highly uncertain and is given a low confidence rating.

The average adult body weight is considered to be 71.8 kg (USEPA, 1997). This value is a slight increase over the 70 kg value recommended previously by USEPA. The high end value for this parameter, 98.6 kg, is the weighted average of the 95th percentile of adult (male and female) weights for ages 18 through 64. The body surface area of 4,443 cm^2 for both high end and central tendency dermal exposure scenarios was based on the same assumptions as for trespassers, described above. Absorption and skin adherence values are consistent with those used for trespassers.

6.3.3 Construction Worker Exposure Assumptions

Construction workers were assumed to work at the Hexagon Laboratories Site during the hypothetical redevelopment of an industrial or commercial complex. Construction time was assumed to last for approximately six months for the central tendency scenario and 12 months for the high end risk scenario. Construction workers were assumed to work five-day weeks.

Owing to the nature of the job and close contact with site soils, workers were assumed to ingest 480 mg/day of soil (Hawley, 1985, as cited in USEPA, 1997). The exposed body surface area of 4,443 cm^2 for dermal exposure is the same as that used for trespassers and site workers. Weight and absorption values are consistent with those used for trespassers and site workers. However, a more conservative soil/skin adherence value of 0.045 mg/cm^2 was used for this scenario. This value is a weighted average value assuming that the most representative activity for which adherence values have been reported is that of irrigation installers (USEPA, 1997).

6.4 Estimation of Exposure Point Concentrations

Estimates of exposure point concentrations are calculated as part of the quantitative risk evaluations, since these estimates are used along with the exposure scenarios to estimate the Chronic Daily Intake (CDI) and subsequent human health risks.

Estimation of exposure point concentrations in surface soils are based on measured concentrations of the contaminants of concern. For high end exposure scenarios, the representative exposure point concentrations were taken as the 95th percentile UCL about the arithmetic mean for the measured contaminant levels.

The method of calculation of the UCL was selected based upon an analysis of the data distribution for the compound in question, following USEPA guidelines (USEPA, 1992b). To initially determine whether data were normally or log-normally distributed, the W test statistic was calculated (Shapiro and Wilk, 1965). This test examines the likelihood that the underlying population is normally distributed based on a random sample set containing less than fifty samples. Since all the contaminants in the data set exhibited log-normal distribution characteristics, the UCL was calculated by taking the natural log transform of all sample values and using the following formula:

$$UCL = EXP\left[\bar{X} + 0.50s^2 + \frac{Hs}{\sqrt{n-1}}\right]$$

where:

$\bar{X}$ = the arithmetic average of the natural log-transformed data,

s^2 = the variance of the transformed data,

s = the standard deviation of the transformed data,

H = the t-value for the transformed data. The H value differs from the t-values because the formula is designed to estimate the UCL on the basis of the log transformed data, and

n = the number of samples in the data set.

In cases where the contaminant was not detected, the concentration was assumed to be equal to one-half of the CRQL for organics, and one-half the IDL for metals (as recommended in USEPA, 1989).

Arithmetic means were used to calculate exposure concentrations for the central tendency analyses.

6.5 Toxicity Assessment

This section summarizes the procedures used to obtain toxicity values for noncarcinogenic and carcinogenic contaminants, and discusses associated uncertainties. Toxicological profiles, taken from IRIS (USEPA, 1998), providing specific information on each compound are found in Appendix F.

6.5.1 Health Effects Criteria for Noncarcinogens

The potential for noncarcinogenic health effects is typically measured by comparison to the "threshold" or tolerance limit that is considered to exist for noncarcinogenic contaminants. Based on this tolerance limit, organisms can undergo exposure ranging from zero to a finite threshold limit value, with essentially no chance of adverse effects (USEPA, 1989). The upper bound of this threshold level used in risk assessments is referred to as the Reference Dose (RfD) and incorporates uncertainty and modifying factors. In general, the RfD is an estimate, with incorporated uncertainty, of a daily exposure to humans (including sensitive subgroups) that is unlikely to have an appreciable risk of deleterious effects during a lifetime. RfDs are divided into subchronic and chronic values. Subchronic values are calculated for exposures during a portion of a lifetime (as a Superfund guideline, two weeks to seven years), while chronic risk are calculated for longer periods or an entire lifetime (USEPA, 1989). The RfD is expressed in units of mg contaminant per kg body weight per day.

Prior to calculating an RfD, the sources of uncertainty in the toxicity assessment are determined and quantified. Uncertainty factors may include a 10-fold safety factor to account for each of the following uncertainties: variation in human sensitivity among populations, extrapolation from animal to human data, extrapolation from a Lowest-Observed-Adverse-Effect-Level (LOAEL) to a No-Observed-Adverse-Effect-Level (NOAEL), and extrapolation from a subchronic to chronic exposure. To reflect professional assessment of the study and databases, an additional uncertainty factor or a modifying factor ranging from zero to ten is applied. The default value for this factor is one.

The oral RfDs used in this assessment provide benchmarks against which estimated doses can be compared. The CDI is divided by the RfD to obtain a ratio of the dose to the benchmark. Doses that produce a ratio greater than one (unity) may indicate that an inadequate margin of safety exists for exposure to a compound and an adverse health effect could occur. Chronic RfDs were used for all receptors, since no subchronic toxicity criteria were available. Construction workers and trespassers may have subchronic exposures.

6.5.2 Health Effects Criteria for Carcinogens

Carcinogenesis is considered to be "nonthreshold response", because there is believed to be no level of exposure to a carcinogenic compound that does not pose a probability, however small, of generating a carcinogenic response (USEPA, 1989). In estimating carcinogenic risks, an effects threshold cannot be determined. Instead, a two-part evaluation is performed, where first each substance is assigned a weight-of-evidence classification and then a Slope Cancer Factor (SF), based on the best available data, is calculated.

The weight-of-evidence classification determines the likelihood that a compound is a human carcinogen. Groups are classified from A (known human carcinogen) to E (evidence of noncarcinogenicity for humans). Evidence is characterized separately for human and animal studies, but a review of both data sets provide the basis for a provisional weight of evidence, which may be adjusted upward or downward. Benzo(a)pyrene was the only carcinogenic COC quantitatively evaluated in this risk assessment. It is classified as a B2 probable human carcinogen. While lead is also classified as a B2 probable human carcinogen, there is no SF currently available for this compound.

The SF is calculated based on the relationship between dose and response. When several studies are used, the geometric mean of the slope may be adopted as the SF. Generally, the 95th percent confidence interval of the slope of the dose-response curve is calculated for use in risk assessments. This value is expressed as mg of contaminant per kg of body weight per day.

To obtain an excess individual lifetime cancer risk the CDI is multiplied by the SF of a contaminant. Cancer risks are quantified as occurrences per million individuals exposed under defined circumstances. This is equivalent to a per-capita risk expressed as the odds per million that a hypothetical exposed individual will contract cancer as a result of exposure to contaminants at the Hexagon Laboratories Site over a lifetime. A risk of 1×10^{-6} is equivalent to one excess cancer occurrence in a million individuals. The general range of acceptable cancer risks at Superfund sites is between 10^{-4} and 10^{-7}..

6.5.3 Lead Toxicity Assessment

Although there is currently no RfD for lead, it is known to cause adverse neurological effects in children at levels so low as to be essentially without a threshold (USEPA, 1998). In addition, lead is also a probable human carcinogen (B2). The Integrated Exposure Uptake Biokinectic (IEUBK) Model for Lead in Children (USEPA, 1994) is the recommended approach for assessing residential lead risks. For nonresidential lead risks, the Technical Review Workgroup for Lead (TRW) recommends a methodology to relate soil lead uptake to blood lead concentrations in women of childbearing age (USEPA, 1996) to derive risk-based remediation goals (RBRGs). The soil lead concentration associated with a given exposure scenario is calculated as:

$$RBRG = PbS = \frac{(PbB_{adult,central,goal} - PbB_{adult,0}) \ x \ AT}{(BKSF \ x \ IR_s \ x \ AF_s \ x \ EF_s)}$$

where:

PbS = Soil lead concentration (µg/g) (appropriate average concentration for individual).

$PbB_{adult,central,\ goal}$ = Goal for central estimate of blood lead concentration (µg/dL) in adults (*i.e.*, women of child-bearing age) that have site exposures. The goal is intended to ensure that the blood level in the 95th percentile of the fetus does not exceed 10 µg/dL. This value was calculated to be about 5.3 µg/dL according to default parameters for a heterogeneous population (USEPA, 1996).

$PbB_{adult,0}$ = Typical blood lead concentration (µg/dL) in adults (*i.e.*, women of child-bearing age) in the absence of exposures to the site that is being assessed. The default value for this parameter was taken to be 2.0 µg/dL (USEPA, 1996).

AT = Averaging time; the total period during which soil contact may occur. This parameter was set at 365 days/year for continuing long term exposure (USEPA, 1994).

BKSF = Biokinetic slope factor relating (quasi-steady state) increase in typical adult blood lead concentration to average daily lead uptake (µg/dL blood lead increase per µg/day lead uptake). This value was assumed to be 0.4 µg/dL per µg/day based on the default parameters (USEPA, 1996).

IR_s = Intake rate of soil, including both outdoor soil and indoor soil-derived dust (g/day). This value was assumed to be 0.05 g/day based on the default parameters (USEPA, 1996). This is consistent with the 50 mg/day exposure assumption for site workers used in this assessment.

AF_s = Absolute gastrointestinal absorption fraction for ingested lead in soil and lead in dust derived from soil (dimensionless). This value was taken to be 0.12 based on the default parameters (USEPA, 1996).

EF_s = Exposure frequency for contact with soil (days of exposure during the averaging period). This value was assumed to be about 219 days/year based on the default parameters (USEPA, 1996).

Based on these assumptions, the RBRG for lead is calculated to be about 888 mg/kg, which approximately equal to the 95% UCL concentration of lead in surface soil detected at the Hexagon Laboratories Site (887 mg/kg). However, this calculation does not consider individuals who are actively exposed to surface soils, such as construction workers. If the intake rate is set to 480 mg/day, the default assumption for construction workers, the RBRG is calculated to be about 95 mg/kg, which is less than both the 95% UCL and average (347 mg/kg) concentrations of lead in surface soil at the Hexagon Laboratories Site.

6.5.4 Uncertainties in the Toxicity Assessment

Uncertainties in the toxicity assessment may result from a lack of toxicity values for some contaminants present at the site, as well as from uncertainties inherent in determining quantitative values for those contaminants having toxicity values. There are currently no toxicity values available for lead and semivolatile TICs. The lack of toxicity values for lead and semivolatile TICs introduces a moderate to high level of bias, where the risk is likely to be biased downward owing to the inability to calculate risk estimates without toxicity values.

The RfDs and SFs contain inherent uncertainties owing to the difficulties associated with deriving toxicity values. Most values are derived from animal studies because few epidemiological studies are available for human populations. Human epidemiological studies often examine potential toxic effects *a posteriori* rather than *a priori*. Therefore, even if human studies are available, there are still difficulties with confounding factors such as exposure periods and levels, and genetic compositions of a population. Animal studies, although controlled more carefully, have the problem of extrapolating between species since toxicity is rarely uniform among species. Toxicity values are usually based on a minimum of three points, consisting of a no dose, medium dose, and high dose level. Actual exposure doses may be significantly below the high dose level and may not produce the same effects seen at the high doses.

Uncertainty and modifying factors are included when deriving toxicological values to provide a measure of safety in the estimate. Toxicity values tend to be conservative in order to protect sensitive individuals; however, until more is known about specific contaminants, no definitive conclusions may be drawn about the level of uncertainty for each specific compound.

6.6 Risk Characterization

This section quantitatively estimates and characterizes the potential human cancer risks and the potential for noncancer adverse health effects associated with current- and future-use scenarios at the Hexagon Laboratories Site. CDIs of contaminants were calculated for each pathway based on estimated exposure point concentrations and exposure parameters. The estimated CDIs were then combined with health effects criteria (slope factors and reference doses for carcinogens and noncarcinogens, respectively) to calculate potential carcinogenic and noncarcinogenic risks. Equations used to calculate CDIs for each exposure are provided at the top of the corresponding risk calculation spreadsheet provided in Appendix E.

For noncarcinogens, exposure pathways were evaluated by comparing calculated CDIs to acceptable RfDs for each exposure pathway. Potential concerns for noncarcinogenic effects are evaluated as the ratio of the CDI to the RfD. The sum of all of the CDI:RfD ratios for the selected chemicals of concern is called the Hazard Index (HI) and is calculated as shown below:

$$HI = \sum_{i=1}^{n} \frac{CDI_i}{RfD_i}$$

where:

HI = Hazard index
CDI_i = Chronic daily intake for contaminant I (mg/kg/day)
RfD_i = Reference dose for contaminant I (mg/kg/day), and
n = Number of contaminants of concern in the medium under consideration.

A hazard index less than 1.0 is unlikely to be associated with health risks, while a hazard index greater than 1.0 indicates the potential for adverse effects. As a rule, the greater the hazard index, the greater the level of concern. However the level of concern does not increase linearly as unity (1.0) is approached or exceeded because the RfDs do not have equal accuracy or precision and are not based on the same severity of toxic effects. For the purposes of the following discussions, the threshold hazard index for unacceptable noncarcinogenic effects is taken as unity (1.0), based on current USEPA guidance (USEPA, 1989).

Carcinogenic effects were evaluated in terms of excess lifetime cancer risks. Excess lifetime cancer risk is defined as the additional probability that an individual will develop cancer as a result of exposure to carcinogenic contaminants. This probability is in addition to the expected probability of cancer development in the exposed population. For the purposes of this risk assessment a value of 10^{-6} was used as the threshold, or target risk level, above which cancer risks may be considered unacceptable; however, only carcinogenic risks exceeding were 10^{-4} were considered to be unequivocally unacceptable. The potential for excess lifetime cancer risk due to exposure to a specific carcinogenic compound is calculated by multiplying the compound specific CDI by its SF as follows:

$$Risk = CDI \times SF$$

where:

CDI = Chronic daily intake of the chemical (mg/kg/day), and
SF = Slope factor for the chemical $(mg/kg/day)^{-1}$

6.6.1 Calculation of Exposure Risks

Values determined in the contaminant of concern, exposure assessment and toxicity assessment sections were used to calculate estimates of risk. Calculated surface soil risks are discussed in terms of receptor population, time frame (current or future) and type of exposure. Summaries of risks for various receptor groups are provided in Tables 6-3 and 6-4. The discussions below summarize the results of the calculations.

6.6.2 Current-Use Exposure Scenarios

Current high end carcinogenic and noncarcinogenic risks were calculated for trespassers. The carcinogenic risks for incidental ingestion of and dermal contact with site soils were calculated to be 1.3×10^{-7} and 2.2×10^{-8}, respectively, for a total high end risk of 1.5×10^{-7} (Tables E-1 and E-2). The total noncarcinogenic hazard index was not calculable, due to the lack of quantitative toxicity values for the contaminants of concern. The carcinogenic risk was less than the target risk level of 1×10^{-6}. Carcinogenic central tendency risks were also calculated (Tables E-7 and E-8) and fell below target risk levels for both exposure pathways. Current risk calculations are assumed to be representative of future exposure risks to trespassers.

6.6.3 Future-Use Exposure Scenarios

Site Workers

Carcinogenic risks for high end risk site worker scenarios were above the target risk level with risks of 1.0×10^{-6} and 3.5×10^{-7} for soil ingestion and dermal contact, respectively, yielding a total high end risk of 1.4×10^{-6} (Tables E-3 and E-4). This carcinogenic risk level is slightly greater than the target risk level of 1×10^{-6}, but is within the 10^{-4} to 10^{-6} risk range considered acceptable. The total noncarcinogenic hazard index was not calculable, due to the lack of quantitative toxicity values for the contaminants of concern. Carcinogenic central tendency risks calculated were below target risk levels (Tables E-9 and E-10).

Construction Workers

High end carcinogenic risks for incidental ingestion of and dermal contact with site soils were calculated to be 3.9×10^{-7} and 2.1×10^{-8}, respectively, for a total high end risk of 4.1×10^{-7} (Tables E-5 and E-6). The total noncarcinogenic hazard index was not calculable, due to the lack of quantitative toxicity values for the contaminants of concern. Carcinogenic central tendency risks were also below target levels (Tables E-11 and E-12).

Summary

For future site workers, the target excess cancer risk of 1×10^{-6} was slightly exceeded for high end exposure scenarios. Benzo(a)pyrene is the only carcinogenic contaminant that was quantitatively evaluated for the Hexagon Laboratories Site. Soil ingestion exposure accounted for the majority of risk. Central tendency carcinogenic risks were below target risk levels for site workers. Carcinogenic risks were below target levels for construction workers for both high end and central tendency scenarios.

6.7 Uncertainties in the Risk Assessment

This section addresses potential sources of uncertainty in the risk estimates, possible impacts of the various sources of uncertainty, and potential bias in the risk estimates. This discussion provides a context in which the significance and limitations of various risk estimates can be understood as necessary to evaluate the overall potential health impacts associated with the Hexagon Laboratories Site.

Identification and Quantification of Contaminants of Concern

Samples were collected from various media present on site. Since sampling locations were biased toward areas suspected of being contaminated, the possibility that any significant contaminants were missed is considered to be low. However, it should be noted that many volatile organics have been found at the Hexagon Laboratories Site. Only surface soil was examined in this risk assessment. Since volatile organic compounds volatilize from surface soils, limiting the risk assessment to surface soils may underestimate health risks at the Hexagon Laboratories Site.

The concentrations of contaminants used in the high end risk assessment are the 95 percent UCLs calculated according to the distribution of the data for each contaminant or the maximum detected levels, whichever value was lower. The concentrations were calculated to represent the reasonable maximum exposure, hence, there tends to be a bias to represent the upper range of concentrations of contaminants to which an individual may be exposed. For the two COCs at this site, the high end exposure point concentrations were the 95 percentile UCLs since these values were lower than the maximum observed concentrations. The arithmetic mean concentrations were also calculated and used in central tendency exposure risk quantification.

Uncertainties Associated with Exposure Pathways

The receptor populations identified have a relatively high degree of uncertainty associated with them due to the uncertainty associated with future redevelopment plans. However, it is likely that the Hexagon Laboratories Site will be used in the future due to the value of real estate in New York City. Although no trespassers were observed during sampling activities on site, the possibility exists that it may be used since there is no security guard at the present time, and trespassing (along with other illicit uses) has been evident at the site in the past; however, frequency and duration of trespasser exposure is highly uncertain.

Uncertainties Associated with Exposure Factors

Physical parameters are considered to accurately represent the local population and have little systematic bias. Estimates of contaminant contact rate and intake factors were developed for high end risk and central tendency individuals, and a moderate degree of uncertainty is associated with them. There may be a greater degree of uncertainty associated with certain parameters such as incidental soil ingestion rate. The default soil/skin adherence factor used for the trespasser and site worker (0.03) recommended by USEPA Region II may be somewhat conservative; values calculated in a manner similar to that used for the future construction yield soil/skin adherence factors in the range of 0.016 to 0.022 (depending on the activity assumed to best represent future workers and trespassers).

Uncertainties Associated with Toxicological Methods

The RfDs and SFs contain inherent uncertainties owing to the difficulties associated with deriving toxicity values. Most values are derived from animal studies and lack evidence of toxicological effects on humans. Uncertainty factors and modifying factors are included in the toxicity values to provide a measure of safety in the estimate. Toxicity values tend to be conservative in order to protect sensitive individuals. However, until further information is available concerning the specific contaminants no definitive conclusions may be drawn about the level of uncertainty for each specific compound.

Risks may be underestimated for lead and semivolatile TICs, which have no current toxicological values.

Uncertainties Associated with Risk and Central Tendency Scenarios

The high end risk scenarios represent the plausible upper end of exposure an individual is likely to receive. Therefore, if noncarcinogenic and carcinogenic risks do not exceed target risk levels for high end risk scenarios, baseline (no action) risks are considered to fall within acceptable levels.

Target risk levels were exceeded for high end current- and future-use exposure scenarios for carcinogenic risks from incidental ingestion of surface soils. The carcinogenic central tendency analyses all were calculated to be below target risk levels. The central tendency analysis is designed to provide some measure of the mean or most likely exposure circumstances, as opposed to the high end risk scenario which is designed to examine plausible, but less likely exposure circumstances.

6.8 Summary of Risk Assessment

The Hexagon Laboratories Site HHRA examined current- and future-use exposure scenarios to determine whether contaminants in the surface soil are present above target risk levels. Carcinogenic risks were above target levels for the high end exposure for future-use site workers examined owing to the presence of benzo(a)pyrene in the surface soil.

For nonresidential lead risks, the USEPA-recommended methodology relating soil lead uptake to blood lead concentrations in women of childbearing age to derive RBRGs was used (USEPA, 1996). The 95% UCL for lead detected in surface soil exceeded the RBRG for construction workers. The average concentration of lead in the surface soil also exceeded the RBRG for construction workers.

VOC and SVOC TICs may also contribute to human health risks, but were not quantitatively evaluated due to the lack of quantitative toxicity values for TICs.

Only surface soil exposure was evaluated, although other media at the Hexagon Laboratories Site are also known to be contaminated. The limitation of this risk assessment may underestimate the potential risks to receptors at the Hexagon Laboratories Site.

7.0 ECOLOGICAL ASSESSMENT

7.1 Purpose of Ecological Assessment

This limited ecological assessment was performed to evaluate the adverse ecological impacts of contaminants at the Hexagon Laboratories Site on site biota. The technical guidance for this assessment comes primarily from the Interim Final Risk Assessment Guidance for Superfund: Volume II Environmental Evaluation Manual (USEPA, 1989). This assessment focuses on a general description of the site and a characterization of the impact of site contamination on site biota. The potential impact of site contamination on off-site biota was not evaluated as part of this limited ecological assessment.

7.2 Ecological Assessment

As discussed in Section 2.8, an evaluation of the existing ecological conditions at the Hexagon Laboratories Site was conducted through review of available background information and a field reconnaissance. The following background information sources were consulted:

- National Wetlands Inventory (NWI) Map (Mount Vernon, NY quad);
- NYSDEC Tidal Wetlands Map (Map 598-526);
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate (FIRM) Map (Community Panel Number 360497 0007 B); and
- Data from the NYSDEC Significant Habitat Unit on threatened and endangered species and significant habitats (NYSDEC Wildlife Resources Center, receipt of letter dated February 27, 1998).

A field reconnaissance of the Hexagon Laboratories Site was conducted by two TAMS ecologists on April 14, 1998.

7.3 Results of the Ecological Assessment

The Hexagon Laboratories Site is located in a highly developed, urban environment within the Eastchester section of Bronx County, New York. Prior to the IRM , most of the site was either covered with buildings or covered with asphalt or concrete paving and was generally devoid of vegetation as reported by TAMS' Project Manager (TAMS, 1998). As observed during the site reconnaissance, performed at the site in April 1998 after completion of the IRM, little vegetation is present at the site. Much of the site has been filled and paved and it is largely unvegetated. There is insufficient natural habitat to support most wildlife species. Species that would occur at the site would be those that are typically found in urban environments such as the domestic pigeon (*Columba livia*), American crow (*Corvus brachyrhynchos*), European starling (*Sturnus vulgaris*), common grackle (*Quiscalus* *quiscula*), house sparrow (*Passer domesticus*), Norway rat (*Rattus norvegicus*), and house mouse (*Mus musculus*).

Review of the National Wetlands Inventory (NWI) map and the NYSDEC Tidal Wetlands map reveals that there are no regulated wetlands on or adjacent to the Hexagon Laboratories Site. The absence of wetlands was confirmed during the site reconnaissance. The FEMA floodplain map indicates that the Hexagon Laboratories Site does not lie within the 100-year or 500-year floodplain.

The NYSDEC Significant Habitats Unit indicates that the site is near "a designated Significant Coastal Fish and Wildlife Habitat." It states that "this habitat is part of New York State's Coastal Management Program (CMP), which is administered by the New York State Department of State (NYSDOS). Projects which may impact the habitat are reviewed by NYSDOS for consistency with the CMP." While the designated area is not specifically identified by the Significant Habitats Unit, it is assumed here to be the nearby Hutchinson River (located approximately 700 feet northeast of the site at its nearest point).

Because of the highly developed nature of the site, and as a result, the negligible amounts of vegetation present at the site, there does not appear to be an impact on site vegetation by contamination present at the site. In addition, since the Hexagon Laboratories Site, itself, is essentially devoid of vegetation, and it does not feature wetlands or open water, there is insufficient natural habitat available to support any threatened or endangered species. Thus, the impact of site contamination on threatened or endangered species on site is considered to be negligible.

No environmental samples were collected off site as part of the RI and, therefore, the presence of site-related contamination off-site and an assessment of such site-related contamination on off-site biota would be inconclusive. However, it is important to note the highly developed, industrial nature of the Hexagon Laboratories Site and its immediate vicinity and the corresponding lack of significant vegetation.

8.0 DATA QUALITY AND USABILITY

This chapter provides an overall assessment of the data quality and its usability for the Hexagon Laboratories Site RI/FFS, including supplemental surface and subsurface soil samples collected in October 1998 as part of the Phase II RI. This assessment incorporates the formal data validation reports and integrates them into the overall sampling and analytical program, including field data. The usability assessment is a qualitative and quantitative summary of the data validation reports, with further input including the potential impact on data quality of non-laboratory criteria such as sampling procedures. Qualitative recommendations regarding the quality of the data for its intended uses are included.

Laboratory analyses were performed by Mitkem Corporation (Mitkem; Warwick, RI) in accordance with NYSDEC Analytical Services Protocol (ASP) Superfund Category procedures (Category B for non-CLP methods).

8.1 Data Validation

In addition to the laboratory's in-house review of the data, the data were validated by a subcontractor, Environmental Quality Associates, Inc. (EQA; Middletown, NY). Data validation was performed by following guidelines established in the USEPA Region 2 SOP No. HW-6, "CLP Organics Data Review" (Revision 8, January 1992) and SOP No. HW-2, "Evaluation of Metals Data for the Contract Laboratory Program (CLP)" (Revision 11, January 1992). These documents are designed to evaluate the degree of quality and compliance (measured against specific evaluation criteria) of CLP data packages. The data validation reports take into account the differences between USEPA CLP and NYSDEC requirements.

Validation reports consist of a narrative describing, in detail, the items reviewed and the results of the review. The data validator provided usability guidance for the data user for samples which were reanalyzed. The data validator also prepared a form presenting the sample results and precision (expressed as relative percent difference, or RPD) for field duplicate samples. The data validator then transferred the results of the data validation (*i.e.*, the data qualifiers such as "J" or "R" to a hard copy of the laboratory data reporting forms (*e.g.*, Form I and Form I-TIC for CLP organic data). The tabulated data for samples collected by TAMS (Trade-Winds sample data were not validated) and included in this report (Tables 4-3 through 4-22) reflect the qualifiers applied as a result of the validation process.

NYSDEC ASP CLP criteria additions or changes to the general EPA validation procedures were incorporated and data were assessed according to the specific requirements of NYSDEC, where appropriate. Specific differences between NYSDEC ASP and USEPA CLP requirements include the NYSDEC prohibition of preservation of samples for VOC analysis and the requirement of VOC analysis within seven days of verified time of sample receipt (VTSR), the NYSDEC ASP protocol requirement for the laboratory analysis of a matrix spike blank (MSB), and the NYSDEC ASP definition of a sample delivery group as being samples delivered over a maximum of seven days (as opposed to the 14 day period specified by USEPA CLP).

Superfund Category Target Compound List (TCL) organic and Target Analyte List (TAL) inorganic analyses, including Category B TCLP analyses, were subject to validation. Wet chemistry analyses (*i.e.*, total organic carbon, total petroleum hydrocarbons, total dissolved solids, total suspended solids) were not validated.

In addition to the analyses contracted by TAMS, additional data was generated by a subcontractor (Trade-Winds) during the IRM. These data were not validated. The use and usability of these data are also addressed in this section.

This chapter presents a review of the usability of the data by analytical fraction in the following sequence:

- Volatile organics
- Semivolatile organics
- Pesticides /PCBs
- Inorganics (metals and cyanide)
- Toxicity Characteristic (TCLP)
- Wet Chemistry (TOC, TPHC, TSS, TDS)
- Grain Size
- Field Data
- IRM (Demolition/Tank Excavation) Data

8.2 Analytical Methods

Chemical analytical methods used during this project were presented in the NYSDEC Analytical Services Protocol (ASP), 1995 revision.

8.2.1 ASP-CLP Methods

TCL organics and TAL inorganics methods for characterization of the nature and extent of contamination (including the supplemental soil sampling) utilized NYSDEC ASP CLP methods. The organics analyses methods include Volatile Organics (NYSDEC Method 95-1), Semivolatile Organics (NYSDEC Method 95-2), and Pesticides/PCBs (NYSDEC Method 95-3). Most of the TAL metals, including arsenic, lead, selenium, and thallium, were analyzed by ICP (Methods 200.7 CLP-M); mercury was analyzed by Method 245. Cyanide was analyzed by Method 335.

8.2.2 Waste Characterization Methods

A number of non-aqueous samples were extracted and analyzed by USEPA SW-846 methods to determine the likely disposal classification of soils and wastes from the Hexagon Laboratories Site. Methods for waste classification and characterization (Toxicity Characteristic Leaching Procedure [TCLP] and hazardous characteristics) include:

- TCLP Extraction- SW-846 Method 1311 (e)
- VOC analysis - SW-846 Method 8270
- SVOC analysis - SW-846 Method 8260
- Pesticide/herbicide analysis - SW-846 Methods 8080 and 8150
- Metals - SW-846 Method 6010 (ICP); except mercury by Method 7471

Since these analyses were performed in an effort to predict ultimate disposal options, the regulatory required QC (*i.e.*, that specified in SW-846, rather than that in the ASP) were applicable to the waste classification analyses.

8.2.3 Miscellaneous and Wet Chemistry Methods

Miscellaneous and wet chemistry analyses performed included TOC (EPA Method 9060) in soil and water samples, TPHC (EPA method 415) in soil samples, TDS (Non-Filterable Residue; EPA Method 160.2) in water samples, and TSS (Filterable Residue; EPA Method 160.1) in water samples.

Laboratory analysis for grain size (sieve and hydrometer; ASTM D422/423) was performed on five soil samples. These analyses were subcontracted by Mitkem to Law Engineering & Environmental Services, Inc. (Law Environmental; Pensacola, FL).

8.2.4 Field Measurements

Standard operating procedures for field measurements were included in Appendix D to the Field Activity Plan (submitted separately). These measurements included specific conductance, pH, temperature, and turbidity. Field screening for organic vapors was also conducted.

Field testing of groundwater was performed during monitoring well development and following purging of wells prior to sampling for laboratory samples.

Field geological classification of soil boring samples were also made and recorded by the field geologist.

8.2.5 Subcontractor IRM Analyses (Building Demolition and Tank Excavation)

Sampling and analysis of excavated materials was performed during the excavation of the USTs at the Hexagon Laboratories Site. The analytical laboratory, American Analytical Laboratories (AAL; Farmingdale, NY; NYSDOH Environmental Laboratory Approval Program [ELAP] ID #11418), was subcontracted by Trade-Winds. Analyses performed by AAL included VOCs (SW 846 Method 8260) and SVOCs (SW 846 Method 8270), pesticides and PCBs (SW 846 Method 8080) and priority pollutant metals (method not specified). One sample was also analyzed for toxicity (Toxicity Characteristic Leaching Procedure; TCLP [metals only]) by AAL. Since these data were generated solely for disposal purposes, and not for site characterization, QA/QC protocols were not as rigorous for sampling and analysis of these samples.

8.3 Quality Assurance Objectives

Data quality objectives (DQOs) have been established for measurement data in terms of precision, accuracy, representativeness, comparability, and completeness (PARCC), as well as sensitivity, so that the data collected are sufficient and of adequate quality for their intended uses.

8.3.1 Sensitivity

The sensitivity or detection limit desired for each analysis or compound is established by NYSDEC as part of the Analytical Services Protocol (ASP) Superfund Contract Laboratory Program (CLP); the contract-required quantitation limits for the target analytes are listed in Exhibit C, Section I of the ASP (revised 1995). These limits are achievable under optimal conditions; factors such as the presence of matrix interferences, necessity for sample dilution, available sample weight/volume, sample cleanup procedures, or (for soil samples) CRQL adjustment to a dry-weight basis will result in elevated sample-specific quantitation limits.

Reporting limits (the "Contract Required Quantitation Limit", or CRQL) for ASP organic methods are established by the methods and are set at the concentration of the lowest calibration standard analyzed. Laboratories can, and do, report estimated concentrations in the neighborhood of one order of magnitude lower than the CRQL. However, the actual CRQLs exceed regulatory limits or guidance values for a number of compounds. This is accentuated in samples which were diluted prior to analysis due to the high concentrations of some organics; detection (reporting) limits are elevated even further for non-detected analytes in such samples.

For the purpose of the human health risk assessment (Section 6 of this report), the detection limit, which is required to be known for statistical analysis of data sets which include non-detected values, is the reporting limit for that sample (*i.e.*, the "U" value). One-half of this value (the sample-specific quantitation limit) was used as the concentration for non-detected organic and inorganic analytes.

8.3.2 Accuracy

The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the applied analytical method on similar samples. Recovery criteria, established by NYSDEC as part of the ASP, and those determined from laboratory performance data, are used to evaluate accuracy in matrix spike and blank spike quality control samples. Matrix spike blanks, matrix spikes, and matrix spike duplicates were performed for every twenty samples analyzed for organics as specified in the ASP-CLP.

Accuracy measures the error in a measurement system; it is difficult to measure for the entire data collection activity. Accuracy is assessed through use of known QC samples (*e.g.*, spikes, laboratory control samples, calibration standards, and blanks).

Accuracy values can be presented in a variety of ways. Most commonly, accuracy is reported as percent recovery. Routine organic analytical protocol requires a surrogate spike in each sample. Percent recovery is defined as:

$$\% \text{ Recovery} = (R/S) \times 100$$

where: S = spike surrogate concentration; and
R = reported surrogate concentration

For matrix spike samples, in which the analyte spiked may be present in the environmental sample, the initial concentration (as determined by analysis of an unspiked aliquot of the same sample) is subtracted from both the "Spike" and "Recovery" concentrations, prior to calculating the percent recovery.

8.3.3 Precision

Precision measures the reproducibility of measurements under a given set of conditions. The overall precision of measurement data is a mixture of sampling and analytical factors. Analytical precision is much easier to control and quantify than sampling precision; sampling precision is unique to each site or project. Collection and analysis of field duplicate samples provides a measure of overall system precision (sampling and analytical). Analytical results from laboratory duplicate samples will provide data on analytical (measurement) precision.

The laboratory objective for precision is to equal or exceed the precision demonstrated for the applied analytical methods on similar samples. Precision is evaluated by the analyses of laboratory and field duplicates. Laboratory duplicate analyses were performed once for every 20 samples as specified in the NYSDEC ASP-CLP. Field duplicates were submitted a minimum frequency of once per 20 samples, or one per matrix per sampling event. Field duplicate sample pairs are listed below.

Soil Borings: HXB4S2 and HXB54
UST Excavations: SYTN-1 and SYTNX-1 (VOC duplicate only);
SYTC-1 and STTCX-1 (SVOCs, pesticides/PCBs, and inorganics)
Surface Soil - Phase I RI (December 1997): HXSS1 and HXSS51
Surface Soil - Phase II RI (October 1998): HXSS9 (HXSS9RE for SVOCs) and HXSS9D
Groundwater - Round 1 (January 1998): HXMW3 and HXMW53
Groundwater - Round 2 (March 1998): HXMW3 and HXMW53

Method- and analyte-specific relative percent difference (RPD) criteria are used to evaluate laboratory duplicate precision. A matrix spike duplicate was performed once for every twenty samples analyzed for organics. The precision objective for field duplicates is $\leq$50% RPD for both soil and groundwater; however, in accordance with USEPA Region II guidance, soil samples are not qualified as estimated (flagged "J") unless the RPD $\geq$ 100%, and the analyte was detected at a concentration at least two times the CRQL or CRDL.

Precision was determined from matrix (analytical) duplicate samples for metals analyses, and matrix spikes and matrix spike duplicates for organic analyses; and is expressed as the relative percent difference (%RPD):

$$\% \text{ RPD} = 100 \times 2(X_1 - X_2)/(X_1 + X_2)$$

where: X_1 and X_2 are reported concentrations for each duplicate sample and subtracted differences represent absolute values.

Precision (and to some extent, accuracy) is also assessed for inorganic analytes by comparison of total (unfiltered) and dissolved (filtered) analyte concentrations in groundwater. Due to the sequence and schedule of the analysis and validation, this factor was not reviewed by the subcontract data validator. However, TAMS reviewed the filtered/dissolved analyte data pairs and applied the USEPA Region II data validation criteria. Specifically, where the filtered sample value exceeded the non-filtered (total metal) result by more than 50%, both results were rejected. Where the filtered sample value exceeded the unfiltered sample value by more than 10% but did not exceed 50%, both results were qualified as estimated (flagged "J").

8.3.4 Representativeness

The representativeness of data is only as good as the representativeness of the samples collected. Sampling and handling procedures and laboratory practices are designed to provide a standard set of performance-driven criteria to provide data of the same quality as other analyses of similar matrices using the same methods under similar conditions.

Representativeness is evaluated by a comparison of the quality controls for these samples against data from similar samples analyzed at the same time.

Representativeness is also affected by site, matrix, and program variables. For the Hexagon Laboratories Site RI, the sampling program is biased toward suspected contaminated areas. Therefore, sample data generated from the RI cannot be considered representative of the average concentrations of contaminants at the site. Groundwater and other aqueous samples are typically better mixed (*i.e.*, more homogenous) than soil or sediment samples. Therefore, aqueous samples are often more representative of local environmental conditions than the same number of soil or sediment samples. Contaminant migration from off-site to the Hexagon Laboratories Site (such as may have occurred with the observation of a layer of floating product in an on-site production well as reported by Hexagon Laboratories employees in 1987) may also affect the degree to which a sample is representative of conditions at a particular site or location.

Collection and analysis of background samples can also assist in determining if contaminant concentrations detected in site samples are representative of local or regional conditions, or if the detected contamination is representative of contamination attributable to the site. Knowledge of background concentrations is required for determination of cleanup levels for some inorganics (as per NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4046 [revised January 1994], Appendix A, Table 4). The sampling program for the Hexagon Laboratories Site RI included analysis of three background soil samples (HXBK1, HXBK2, and HXBK3), discussed previously in Section 2.4.2. These background samples were analyzed to determine if local conditions (specifically, the potential for elevated local background contamination due to the historical commercial and industrial uses in the area) required modification to literature values for state and urban background concentrations.

8.3.5 Comparability

Comparability of analytical data among laboratories becomes more accurate and reliable when laboratories follow standardized procedures and share information for program enhancement. Some of these procedures include:

- Instrument standards traceable to National Institute of Standards and Technology (NIST), the USEPA, the New York State Department of Health (NYSDOH), or NYSDEC.
- Using standard methodologies.
- Reporting results for similar matrices in consistent units.
- Applying appropriate levels of quality control within the context of the laboratory quality assurance program.

- Participation in inter-laboratory studies to document laboratory performance.

By using traceable standards and standard methods, the analytical results can be compared to other laboratories operating similarly.

8.3.6 Completeness

The goal of completeness is to generate a complete set of valid data for each planned sample. The highest degree of completeness would be to find all data valid and appropriate for its intended use for each planned sample. Excessive failure to adhere to field and analytical plans and protocols or failure to meet established acceptance criteria and consequent rejection of data results in low levels of completeness. Site, matrix, or field conditions may also contribute to less than 100% completeness if some sampling locations are inaccessible, or subsurface geologic conditions are not as anticipated.

8.4 Parameter-Specific Data Usability Review

The usability of the environmental data generated for the Hexagon Laboratories Site RI/FFS is presented below. The data quality summary statistics are presented in Tables 8-1, 8-2, and 8-3.

8.4.1 Volatile Organics

A total of 53 environmental samples (41 soil and 12 groundwater samples) collected during the Phase I RI (through April 1998) were analyzed for volatile organic compounds (VOCs). The soil samples included 10 surface soil/miscellaneous samples, 13 subsurface soil boring samples, 3 background subsurface soil samples, and 15 UST subsurface soil samples. The 12 groundwater samples consisted of two rounds of sampling from each of the six monitoring wells. Additional samples collected by Trade-Winds during the IRM are not included in these totals but are discussed below (Section 8.4.8).

In the Phase II RI (October 1998), 10 additional environmental soil samples were analyzed for VOCs. These samples included five surface soil samples (SS-6 through SS-10) and five subsurface soil boring samples (B-17 through B-21). Although two of the subsurface soil boring samples (B-17 and B-18) were shallow and were used to characterize surface soil conditions, they are discussed below with the other subsurface soil boring samples.

<u>Sensitivity</u>

Due to high concentrations of VOCs in samples collected as part of the Phase I RI, a number of samples required dilution prior to analysis (or smaller than normal sample sizes were used), or were analyzed as medium level samples. This resulted in elevated reporting limits for non-detected analytes. The affected samples included 15 soil samples analyzed as medium level samples, with detection limits elevated by a factor of 100 to over 1,000, five soil samples analyzed as low level samples but with detection limits elevated by a factor of 5 to 10, and eight groundwater samples with detection limits elevated by a factor or 2.5 to 5,000. Since the affected samples had high concentrations of target and/or non-target VOCs, the elevated detection limits for non-detected analytes in these samples do not affect the usability of data from these analyses (*i.e.*, the data demonstrate the presence of contaminants in these samples).

All the soil samples collected as part of the Phase II RI were analyzed as low level samples; however, a reduced sample volume (1.0 or 2.0 grams, instead of 5.0 grams) was analyzed for a few of the samples, effectively increasing the detection limit for these samples by a factor of 2.5 or 5.

Accuracy

Much of the VOC data (69%) for samples collected as part of the Phase I RI were qualified as estimated (flagged "J") for various reasons, including analytes detected at concentrations less than the CRQL, continuing calibrations, surrogate/internal standard recoveries, and exceedance of the NYSDEC holding time of seven days from verified time of sample receipt (VTSR) to analysis. There is a potential low bias associated with samples analyzed past the 7-day holding time. However, due to the relatively small degree of exceedance of the holding time criterion (samples were analyzed within 8 to 10 days), as well as the lack of unanimity in the laboratory and regulatory community as to how long samples can be held for VOC analysis prior to appreciable degradation, it is considered unlikely that low bias associated with these samples is significant.

Detectable concentrations of a few VOCs not typically associated with blanks (toluene and xylene in a low level blank and toluene in a medium-level blank) were detected in method blanks, apparently due to carryover from high concentration samples. However, associated sample concentrations were greater than the blank action level (five times the adjusted blank concentration) and no action was required; the data are not considered affected.

Matrix spike (MS) recoveries were generally acceptable, although a few instances of spike recoveries exceeding established limits did occur.

Very low internal standard (IS) recoveries were noted in sample HX-OM1 (a sample of oily material from the floor of Hydrotherm No.1). Due to the low IS recoveries, non-detected VOC data for this sample were rejected, and detected analytes were flagged "J"; these detections may be biased low.

The Phase II RI soil sample VOC analyses exhibited few problems. None of the data were rejected, and only about 12% were qualified as estimated (flagged "J"). Of the estimated data, more than half were qualified as such due to the reported sample concentration being less than the CRQL. None of the Phase II RI soil samples were qualified for holding time exceedance.

Precision

Field duplicates were analyzed at a frequency exceeding the minimum requirements (one for each 20 environmental samples), as three soil duplicates and two groundwater duplicates (one for each sampling event) were analyzed as part of the Phase I RI. Field duplicate precision was generally quite good, meeting or exceeding the data quality objective of ≤100% RPD for soil and ≤50% RPD for aqueous (groundwater) samples. Soil duplicate precision was very good, with almost all detected analytes having RPDs of less than 40%, and higher RPDs almost always occurring in low concentration samples (detected values near or below the CRQL). Even at low concentrations, the highest soil RPD for any analyte in any sample was 66.7%. Groundwater duplicate precision was fair to good. In the duplicate associated with the first round of groundwater sampling, although a few analytes exceeded the RPD objective of ≤50% (tetrachloroethene at 60.5% RPD and trichloroethene at 54.5% RPD), most RPDs were ≤30% RPD. The groundwater duplicate associated with the second round of samples exhibited somewhat poorer precision, as five of the 18 detected analytes had RPDs >50, with a maximum RPD of 63.6% for 1,1-dichloroethane.

One field duplicate pair (SS9/SS9D) was analyzed for VOCs as part of the Phase II RI soil sampling effort. Precision criteria were met for all analytes for which the RPD was calculable, including low concentration (less than CRQL) detections for which the precision criteria are not required to be met.

Laboratory Duplicates (matrix spike duplicates, or MSDs) were performed at a frequency exceeding the minimum requirements (one for each 20 environmental samples), as three soil MSDs and two groundwater MSDs (one for each event) were analyzed. MSD precision was acceptable for both soil samples (including the Phase II RI soil samples) and groundwater samples.

Overall precision (taking into account both sampling and laboratory precision) is, therefore, considered to be good.

Comparability

Samples collected as part of the Phase I RI were analyzed for VOCs by consistent standard, agency-approved methods. The data are, therefore, internally comparable (*i.e.*, to other data generated for the RI) and comparable to literature data and data generated by others. The Phase II RI data were generated using the same methods and by the same laboratory as the Phase I RI data and are, therefore, fully comparable.

Completeness

In one Phase I RI miscellaneous matrix sample (HX-OM1; a sample of oily material collected from the floor of Hydrotherm No. 1), all non-detected results (23 data points) were rejected (detected analytes in this sample were qualified "J", estimated). Only one VOC soil data point was rejected; no groundwater VOC data were rejected. Although some data were qualified as estimated (flagged "J"), the usability of the data was not affected. As shown on Table 8-1, out of 1,749 data points (1,353 soil/miscellaneous and 396 groundwater), 24 were rejected. The completeness of the VOC data was therefore 98.6%.

No target compound VOC data were rejected in the Phase II RI; therefore, as shown on Table 8-2, the completeness for that event was 100%.

VOC Data Usability Summary

Other than as discussed above, Phase I RI VOC data were fully acceptable. The qualifications applied to the VOC data do not significantly affect the usability of the data for the RI. As noted above and shown on Table 8-1, over 98% completeness (*i.e.*, more than 98% of the VOC data generated were usable) was achieved for the VOCs. There were no field or sampling problems preventing planned samples from being collected or analyzed.

As noted above and as shown on Table 8-2, the VOC data generated during the Phase II RI were 100% usable. As shown on Table 8-3, overall data usability (including both the Phase I and Phase II RI data) exceeded 98%, with only 1.2% of the VOC data rejected.

8.4.2 Semivolatile Organics

A total of 50 environmental samples (38 soil/miscellaneous and 12 groundwater samples) were analyzed for SVOCs as part of the Phase I RI. The soil samples included 10 surface soil/miscellaneous samples, 13 subsurface soil borings, 3 background subsurface soil samples, and 12 UST subsurface soil samples. The 12 groundwater samples consisted of two rounds of sampling from each of the six monitoring wells. Additional samples collected by Trade-Winds during the IRM are not included in these totals but are discussed below (Section 8.4.8).

As part of the Phase II RI, 10 additional environmental soil samples were analyzed for SVOCs. These samples included five surface soil samples (SS-6 through SS-10) and five subsurface soil boring samples (B-17 through B-21). Although two of the subsurface soil boring samples (B-17 and B-18) were shallow and were used to characterize surface soil conditions, they are discussed below with the other subsurface soil boring samples.

Sensitivity

Due to high concentrations of SVOCs, a number of the Phase I RI samples required dilution prior to analysis which resulted in elevated reporting limits for non-detected analytes. Since the affected samples had high concentrations of target and/or non-target SVOCs, the elevated detection limits for non-detected analytes in these samples do not affect the usability of data from these analyses (*i.e.*, the data demonstrate the presence of contaminants in these samples).

Most of the samples analyzed for SVOCs from the Phase II RI were analyzed at initial dilution factors ranging from 2.0 to 5.0, with a corresponding increase in reporting limits for non-detected analytes. As with the earlier samples, these higher detection limits do not materially affect the usability of the data.

Accuracy

About one-third (34%) of the Phase I RI SVOC data was qualified as estimated (flagged "J") for various reasons, including due to extractions not being performed within the NYSDEC holding time of five days from VTSR. There is a potential low bias associated with samples extracted past the 5-day holding time. However, due to the relatively small degree of exceedance of the holding time criterion, it is considered unlikely that low bias associated with these samples is significant. Due to problems with Mitkem's GPC (gel permeation cleanup) instrument, some SVOC sample extracts were shipped to another laboratory, Law Environmental (ELAP #11424). This resulted in some samples being analyzed more than the allowable limit of 40 days after extraction. In most cases, the holding time exceedance was less than two weeks; these samples were qualified "J" (estimated). One sample was analyzed almost four weeks beyond the allowable holding time; non-detected data for that sample were rejected and detected analytes qualified as estimated. The potential for low bias is more likely to be significant for low concentration samples.

Detectable concentrations of a bis(2-ethylhexyl)phthalate (BEHP), a common SVOC blank contaminant, were detected in a few method blanks. As a result of this blank contamination, a few low concentration detections of BEHP reported by the laboratory (flagged "JB" by Mitkem) were negated by the validator (*i.e.*, changed to "UJ" with the detection limit increased to the sample-specific CRQL).

Matrix spike and laboratory control sample (LCS) recoveries were generally good, although a few analytes occasionally exceeded the specified control limits. Due to the relatively minor nature of the exceedances, no data were qualified on this basis.

The Phase II RI soil sample SVOC analyses exhibited few problems. About 2% of the target analyte SVOC data were rejected (all the rejected data were the acid-extractable fraction in one sample [HXB18]), and about 22% were qualified as estimated (flagged "J"). Of the estimated data, close to half were qualified as such due to the reported sample concentration being less than the CRQL.

Precision

Three soil field duplicate pairs were analyzed for SVOCs as part of the Phase I RI. The precision of the duplicate pairs was variable. The precision of the UST excavation duplicate was poor, with the RPDs for the seven detected analytes ranging from 95% to 152%, and exceeding 100% RPD for all but one analyte. Only two SVOC analytes were detected in the soil boring duplicate, with RPDs of 24% (4-methylphenol) and 116% (1,2-dichlorobenzene). The precision of the surface soil duplicate pair was very good, with the RPDs of all nine detected analytes ranging from 13% to 47%.

Two groundwater field duplicate pairs were analyzed for SVOCs, and precision was excellent. In the first round duplicate pair, the RPD was ≤13% for all analytes detected at the CRQL or greater. In the second round duplicate pair, the RPD for chrysene (51.3%) slightly exceeded the aqueous DQO of ≤50% RPD; but the RPDs for the other four detected analytes ranged from 2.7% to 16.7%.

One field duplicate pair (HXSS9RE/HXSS9D) was analyzed for SVOCs as part of the Phase II RI. Precision criteria were met for all analytes for which the RPD is applicable. However, a greater number of both target and non-target compounds, and higher concentrations of them, were reported in the field duplicate (HXSS9D) than in the environmental sample. This most likely is the result of sample inhomogeneity.

Precision was generally within the method-specific limits for laboratory duplicates (matrix spike duplicates).

Overall precision of the SVOC data was in general good; however, the high variability (high RPDs) for a few analytes does indicate a degree of uncertainty in the precision of any individual result, especially for soil samples.

Comparability

Samples collected for the Phase I RI were analyzed for SVOCs by consistent standard, agency-approved methods. The data are, therefore, internally comparable (*i.e.*, to other data generated for the RI) and comparable to literature data and data generated by others. The Phase II RI SVOC data were generated using the same methods and by the same laboratory as the initial data and are, therefore, fully comparable.

Due to a breakdown of Mitkem's GPC instrument, a number of Phase I RI samples were sent by Mitkem to Law Environmental for GPC cleanup; the samples were then shipped back to Mitkem for analysis. Although some of the non-standard GPC factors used by Law

Environmental made verification of sample concentrations difficult, detailed review of the GPC cleanup and the final data did not indicate a comparability problem (*i.e.*, sample data for which GPC cleanup was performed at Mitkem were comparable to those for which the GPC cleanup was performed by Law Environmental).

Completeness

As shown on Table 8-1, the Phase I RI SVOC data were 97% complete (3.0% of SVOC data were rejected). A total of 97 SVOC data points, out of a total of 3,200 (one or two analytes in two samples) were rejected. The most problems were with the surface soil/miscellaneous sample data (including sample HX-OM1), of which about 9% was rejected. Of the rejected surface soil sample data, much of the rejected data was due to critical problems with the acid extractable (AE) fraction (14 phenolic compounds) which was rejected in its entirety in two samples (HX-SS1 and HX-SS2). The AE fraction was also rejected in two subsurface boring samples, including one of the background samples (HXB3S2 and background sample HXBK1). There were very few problems with the groundwater SVOC data, as less than 1% were rejected and only 2% qualified as estimated. Overall, about 34% of the Phase I RI SVOC data (soil/miscellaneous and groundwater) were qualified as estimated (flagged "J"). However, the usability of the data is not significantly affected.

The completeness of the Phase II RI SVOC data is similar. As shown on Table 8-2, about 2.2% of the data were rejected (97.8% complete). About 22% of the SVOC data were qualified as estimated (flagged "J"), primarily for detected sample concentrations less than the CRQL. However, the usability of the data is not significantly affected.

SVOC Data Usability Summary

Other than as discussed above, SVOC data were fully acceptable. The qualifications applied to the SVOC data do not significantly affect the usability of the data for the RI. As noted above and shown on Table 8-1, 97% completeness (*i.e.*, 97.0% of the SVOC data generated were usable) was achieved for the SVOCs in the Phase I RI, and 97.8% in the Phase II RI. Overall, as shown on Table 8-3, the project completeness was over 97%.

8.4.3 Pesticides/PCBs

A total of 50 environmental samples (38 soil/miscellaneous and 12 groundwater samples) were analyzed for pesticides and PCBs as part of the Phase I RI. These samples included 10 surface soil/miscellaneous samples, 13 subsurface soil boring samples, 3 background subsurface soil samples, and 12 UST subsurface soil samples. The 12 groundwater samples consisted of two rounds of sampling from each of the six monitoring wells. Additional samples collected by Trade-Winds during the IRM are not included in these totals but are discussed below (Section 8.4.8).

In the Phase II RI, 10 additional environmental soil samples were analyzed for PCBs (but not for pesticides). These samples included five surface soil samples (SS-6 through SS-10) and five subsurface soil boring samples (B-17 through B-21). Although two of the subsurface soil boring samples (B-17 and B-18) were shallow and were used to characterize surface soil conditions, they are discussed below with the other subsurface soil boring samples. Due to the matrix problems and general unreliability of the pesticide data generated during the Phase I RI (as discussed below), it was determined that analysis of the Phase II RI soil samples for pesticides would not be useful.

Sensitivity

Due to high concentrations of various organic constituents in the Phase I RI samples, five soil samples required dilution prior to analysis, which resulted in elevated reporting limits (by a factor of 4.0 to 100) for non-detected analytes. The two samples with the greatest dilution factors (20 and 100 were both samples from the South Yard UST excavation (SYTC-1 and SYTEX-1). Since the affected samples had high concentrations of target pesticides or PCBs, the elevated detection limits for non-detected analytes in these samples do not affect the usability of data from these analyses (*i.e.*, the data demonstrate the presence of contaminants in these samples).

None of the soil samples collected during the Phase II RI required dilution prior to analysis for PCBs.

Accuracy

Pesticide/PCB data from several of the Phase I RI SDGs was extracted/analyzed beyond the allowable holding time due to instrument failure at the laboratory (Mitkem). Although the laboratory did take corrective action by sending the samples for processing at another ELAP-certified laboratory, the analytical process was not always completed within the limit of 40 days after extraction. Pesticide/PCB samples extracted more than five days after VTSR or analyzed more less than 40 days after extraction were qualified as estimated (flagged "J") due to exceedance of the NYSDEC holding time. There is a potential low bias associated with samples extracted/analyzed past the holding time.

It was noted that many of the surrogate spike recoveries were outside the established limits. In many cases this was due to the presence of numerous non-target peaks which interfered with the quantitation of the surrogates or to sample dilutions to overcome interferences which resulted in the surrogates being diluted out. Therefore, surrogate recovery as a measure of accuracy could not be fully evaluated and suggested potential problems with accurate quantitation where surrogate recovery data were available.

No detectable concentrations of pesticides or PCBs were detected in the Phase I RI field or laboratory blanks. Therefore, no qualification of sample data was necessary due to blank contamination.

Matrix spike recoveries were generally acceptable (although a blank spike, not subject to matrix interference, recovered poorly for endrin). However, many samples required dilution and, as a result, matrix spike recoveries could not always be evaluated. It is also noted that matrix spike compounds are all single-component pesticides; PCBs are not included in the suite of matrix spike compounds.

The Phase II RI PCB analyses exhibited few problems. As shown on Table 8-2, about 7% of the supplemental data were rejected, and another 7% were qualified as estimated (flagged "J"). All the rejected data were for Aroclor 1260. The data were rejected for excessive difference in the quantitation between the two analytical columns, indicating possible false positives and matrix interference. Although Aroclor 1260 has been detected in site samples, the analytical data does confirm substantial potential matrix interferences. However, based on the sample chromatograms as well as the results from other Hexagon samples, it is unlikely that high Aroclor 1260 concentrations were rejected.

Precision

Three soil and two groundwater field duplicates were analyzed for pesticides and PCBs as part of the Phase I RI. However, due to the limited number of detected compounds as well as the rejection of some data, only a few duplicate data pairs are available for review.

The precision of the first soil duplicate (SYTC-1) was good; two pesticides and one PCB (Aroclor 1248) were detected in both, and the RPDs ranged from 10.5% to 22%. In the surface soil field duplicate, three compounds were detected in both the sample and duplicate; precision was fair, ranging from about 55% to 76% RPD. Ten compounds were detected in the soil boring field duplicate pair; precision ranged from very good to poor in that sample (HXB4S2). Two compounds had RPDs greater than 150%, two others had RPDs between 100 and 150%, and six others (including Aroclor 1248) had RPDs between 8% and 95%.

Very little duplicate data is available for groundwater. Two pesticides were detected in the duplicate pair associated with first round of groundwater sampling, but the data for the duplicate were rejected so no precision assessment can be made. Only one pesticide compound was detected in the duplicate pair associated with the second round of sampling; the RPD was good (34%).

One field duplicate pair (SS9/SS9D) was analyzed for PCBs as part of the Phase II RI. No target PCBs were detected in either the sample or the duplicate; therefore, no conclusions regarding sampling or analytical precision can be drawn.

Laboratory duplicate (matrix spike duplicate) precision was acceptable in both the Phase I and Phase II RI sample data.

Overall precision of pesticide/PCB data was acceptable.

Comparability

Samples collected as part of the Phase I RI were analyzed for pesticides/PCBs by consistent standard, agency-approved methods. The data are, therefore, internally comparable (*i.e.*, to other data generated for the RI) and comparable to literature data and data generated by others. The Phase II RI PCB data were generated using the same methods and by the same laboratory as the initial data and are, therefore, fully comparable.

Completeness

As shown on Table 8-1, less than 10% of the pesticide data, and 4% of the PCB data were rejected for the Phase I RI samples. About 7% of the Phase II RI PCB data were rejected (as shown on Table 8-2), which brings the overall PCB data rejection rate for the Phase I and Phase II RI (as shown on Table 8-3) to about 4.5%. Although some data were qualified as estimated (flagged "J"), the usability of the data was not affected. The overall completeness of the data was, therefore, over 90% for pesticides and over 95% for PCBs. However, due to technical considerations, there are serious concerns regarding the usability of the pesticide data as discussed below (under "compound identification").

Compound Identification

Pesticides and PCBs are identified by dual-column gas chromatograph (GC) retention time matching. PCBs are also identified by peak pattern recognition by the analyst (and verified by the data validator). Sufficiently high concentrations of pesticides and PCBs can be confirmed by mass spectroscopy (MS) analysis of the sample extract.

Review of the Phase I RI chromatograms for pesticides shows the presence of numerous peaks, including many outside the retention time windows for target pesticide and PCB compounds, as well as "mounding" in some chromatograms. Despite the cleanup procedures used by the laboratory, adequate reduction of interfering compounds was not achieved. It was the data validator's opinion, concurred with by TAMS' Quality Assurance Officer, that "many of the reported compounds/ concentrations represent false positives; these results were qualified as "NJ", indicating presumptive presence of the compounds at estimated concentrations, with a significant amount of both qualitative and quantitative uncertainty present".

At the request of TAMS, Mitkem attempted mass spectrometer (MS) confirmation analysis of PCBs and pesticides in three sample extracts (HXB4S2, HXB8S4, and HXBK1) in which high concentrations of these analytes had been reported. The laboratory reported that "pesticide peaks were not confirmed by the GC/MS analysis. PCBs were present in all three samples". With this evidence supporting the judgment of TAMS and EQA data reviewers, it is believed that the reported detections of pesticides in samples from the Hexagon Laboratories Site are highly suspect and that detections of pesticides are possible or probable false positives due to matrix interference.

Pesticide/PCB Data Usability Summary

Except as noted above (*i.e.*, with regard to rejected data), the PCB data were of adequate quality and are usable for the purposes of the RI (*i.e.*, determining the extent of PCB contamination at the Hexagon Laboratories Site). Less than 10% of the pesticide data and about 7% of the PCB data were qualified as estimated ("J"). However, there are serious qualitative concerns with the pesticide data. Considering the evidence of interferences, the failure of MS to confirm the presence of pesticides, and the lack of evidence of production or use of pesticides at the site, most if not all of the reported pesticide (but not PCB) detections should be considered potentially false positives.

8.4.4 Inorganics

A total of 62 environmental samples (38 soil/miscellaneous and 24 groundwater samples) were analyzed for inorganics as part of the Phase I RI. The soil samples included 10 surface soil/ miscellaneous samples, 13 subsurface soil boring samples, 3 background subsurface soil samples, and 12 UST subsurface soil samples. The 12 groundwater samples consisted of two rounds of sampling from each of the six monitoring wells; filtered (dissolved metals) and unfiltered (total metals) analyses were performed on each of the groundwater samples. Additional soil samples collected by Trade-Winds during the IRM are not included in these totals but are discussed below (Section 8.4.8).

In the Phase II RI, 10 additional environmental soil samples were analyzed for TAL inorganics. These samples included five surface soil samples (SS-6 through SS-10) and five subsurface soil boring samples (B-17 through B-21). Although two of the subsurface soil boring samples (B-17 and B-18) were shallow and were used to characterize surface soil conditions, they are discussed below with the other subsurface soil boring samples.

Sensitivity

Instrument detection limits (IDLs) for inorganics were equal to or lower (better) than the contract-required detection limits (CRDLs) for the 23 TAL metals and cyanide. The CRDLs are lower than or equal to the applicable evaluation criteria (*e.g.*, NYSDEC Class GA groundwater standards and NYSDEC RSCOs), so the sensitivity of the analyses was sufficient for the project.

Accuracy

Except as noted below, all of the inorganic sample analyses were completed within the NYSDEC holding time (26 days from VTSR for analysis of mercury; 180 days from VTSR for all other metals; and 12 days from VTSR for cyanide). The decision to conduct the metals analysis of the filtered groundwater samples (from monitoring wells MW-1, MW-2, MW-3, MW-4, and MW-5) collected during the first groundwater sampling round was made about 60 days after VTSR; therefore, no mercury analysis was performed on those samples (cyanide is not subject to filtered sample analysis). Since the filtered sample from MW-6, collected during the first round of groundwater sampling, was still within the holding time, mercury analysis was performed.

The decision to analyze the filtered metals samples (from all six monitoring wells) collected during the second round of groundwater sampling was made after receipt of the corresponding unfiltered sample data, about 30 days after collection. Therefore, the filtered metal mercury data was analyzed 17 days beyond the allowable holding time. Other analyses were within the allowable holding time.

Detectable concentrations of a few metals were detected in field and laboratory blanks. As a result of this blank contamination, a few low concentration detections of these compounds (*e.g.*, selenium in filtered groundwater collected in the second sampling round) reported by the laboratory were negated by the validator (*i.e.*, changed to "U"). Selenium was also rejected in one soil sample (HXB6S1) due to selenium contamination in the associated field blank. Otherwise, blank contamination was not present or was within acceptable limits (not present at or above the CRDLs for each metal).

Analytical (matrix) spike recoveries were outside the prescribed recovery limits for several analytes in both soil and groundwater samples. Sample data associated with non-compliant spike recoveries are flagged "J" (estimated) on the Forms I and the data tables in this report. Low spike recoveries, indicating potential low bias in associated Phase I RI field samples, were noted for antimony and mercury (among others) in soil samples, and mercury in groundwater samples. High spike recoveries, indicating a potential positive bias in the sample data, were observed for nickel, copper, and chromium (among others) in the Phase I RI soil samples; exceedances of spike recovery limits for groundwater were not consistent (*i.e.*, the metals which exceeded limits varied; but included copper, manganese, and cadmium in at least one laboratory spike sample).

In the Phase II RI sample analysis, the recovery of silver was low in the CRDL check standards, indicating probable unreliability of the data for silver at low concentrations. In accordance with EPA guidelines, all silver data were rejected. Spike recoveries for antimony, cadmium, copper, lead, vanadium, and zinc were outside the control limits for the Phase II RI samples; therefore data for these analytes were qualified as estimated (flagged "J") as shown on the data tables.

Precision

Groundwater field duplicate precision was very good. For the sample collected in the first round of sampling, the RPD was less than 44% for all 16 metals detected. In the second round sample, the RPD was less than 25% for all metals detected at or above the CRDL. However, there were some anomalies in the comparison of the filtered and unfiltered data pairs, especially in the groundwater data for the first round of sampling. Based on the criteria discussed previously (Section 8.3.3, above), antimony results for samples collected from monitoring wells MW-1 (Round 1), MW-2 (Round 1), MW-3 (Round 1) and MW-4 (Rounds 1 and 2) were rejected, as were arsenic results in samples collected from monitoring wells MW-2, MW-3, and MW-5 (round 1 only) and zinc (MW2; both rounds; and MW5, round 2 only). Much of the silver data as well as individual sample pair data for zinc and potassium were also rejected due to the filtered sample concentration exceeding the unfiltered sample concentration by more than 50%. Several other data points, including some results for arsenic, calcium, magnesium, and sodium, were flagged "J" based on these criteria (filtered result exceeding unfiltered result by more than 10% but not more than 50%). However, for the most part, agreement was good between dissolved and total results for analytes expected to be in the dissolved phase (*i.e.*, calcium, potassium, and sodium).

For the Phase I RI, soil field duplicate precision was also generally very good. RPDs for the UST excavation duplicate ranged from 2.9% to just under 75% (for zinc); the RPDs for all but three of the inorganics were less than 50%. RPDs for all 20 metals detected in the surface soil field duplicate were less than 50%, ranging from 3.2% to 48%. Precision for magnesium in the soil boring duplicate was poor (142% RPD) but was less than 50% RPD for all other metals, and, with the exception of sodium (RPD about 45%), was less than 15%.

Laboratory (analytical) duplicate precision was outside the control limits for several inorganics in the laboratory duplicates analyzed as part of the Phase I RI sample analysis, although no single metal consistently exceeded the control limits. No direction of bias is suggested by laboratory duplicates outside of the prescribed limits. Samples associated with non-compliant analytical duplicates were flagged "J" on the Forms I and in the tabulated data included in this report.

For the Phase II RI, both field and laboratory duplicate precision was within the established control limits, and no data were qualified based on duplicate precision criteria. Field duplicate RPDs were 40% or less for all metals, and less than 10% for 15 of the 22 metals for which the RPD was calculable.

Overall precision for all inorganics (Phase I RI and Phase II RI) is considered to be good for both the soil/miscellaneous and groundwater samples.

Comparability

Samples collected for the Phase I RI were analyzed for inorganics by consistent standard, agency-approved methods. The data are, therefore, internally comparable (*i.e.*, to other data generated for the RI) and comparable to literature data and data generated by others. The Phase II RI inorganics data were generated using the same methods and by the same laboratory as the initial data and are, therefore, fully comparable.

Completeness

Data for arsenic, antimony, silver, potassium, selenium, mercury, zinc, and cyanide were rejected in some of the Phase I RI samples. As shown on Table 8-1, rejected data amounted to about 4% of the total analyses performed. Although some (about 32%) of the data were qualified as estimated (flagged "J"), the usability of the data was not affected. The completeness of the data was therefore about 96%.

Data for silver were rejected in the Phase II RI samples. Overall, data completeness for the Phase II inorganics samples was similar (as shown on Table 8-2) to that of the Phase I RI samples, with about 4% of the inorganic data rejected (consisting of all the data for silver, but no other inorganics). About 40% of the Phase II RI inorganic data were qualified as estimated (flagged "J"), however the usability of the data was not affected.

Inorganics Data Usability Summary

Other than as discussed above, inorganics data were fully acceptable. As shown on Table 8-1, about 64% of the inorganics data from the Phase I RI were useable without qualification, and another 32% were useable but qualified as estimated. Approximately 56 % of the inorganics data from the Phase II RI were useable without qualification, and another 40 % were useable but qualified as estimated. The qualifications applied to the inorganics data do not significantly affect the usability of the data for the RI. The overall completeness (*i.e.*, percent of the data generated considered usable from both the Phase I and Phase II RI), as shown on Table 8-3, was 96.1% for inorganics.

8.4.5 Toxicity Characteristic Leaching Procedure (TCLP) Data

Seven soil samples collected as part of the Phase I RI were analyzed for full TCLP (all fractions) to predict likely disposal classification (*i.e.*, hazardous or non-hazardous) of site soils in the event that off-site disposal options are considered during the FFS. Although some problems with these analyses were noted during validation, the TCLP data are considered useable for their intended purpose.

The two most significant problems associated with the TCLP data were the detection of target (regulated) VOCs in method blanks associated with the TCLP analyses and the rejection of selenium in TCLP extracts. Despite the detection of chlorinated organics (trichloroethene, tetrachloroethene, and 1,2-dichloroethane) in blanks and extracts, TCLP extract concentrations were less than the regulatory limit. Therefore, although the true TCLP extract concentration of these constituents is not known, the data are usable for determining that the sample extract concentrations of these constituents are less than the regulatory limit.

The rejection of the selenium data in the three of the eight extracts precludes drawing any conclusions from the TCLP analyses for this constituent in those samples. However, based on TCLP results for the other five samples, total selenium concentrations in site samples, as well as the fact that site history does not suggest that selenium is a contaminant of concern at the site, the absence of the selenium data in three TCLP samples is not considered significant.

8.4.6 Wet Chemistry and Miscellaneous Data

Wet chemistry analyses included TPHC and TOC in a limited number of Phase I and Phase II RI soil/miscellaneous samples (six for TPHC and 22 for TOC); and TOC (Round 1 only), total dissolved solids (TDS) and total suspended solids (TSS) in the Phase I RI groundwater samples. In accordance with the project plans (PMP and QAPP), these analyses were not planned for validation. However, the second sampling round groundwater TDS and TSS analyses were validated. A brief qualitative assessment of these analyses is provided below.

No blank contamination was detected for any of the wet chemistry parameters. No field duplicate samples were analyzed for TPHC. One soil (Phase I RI) and one groundwater duplicate pair were analyzed for TOC; the precision of the soil duplicate was very good (RPD about 7%) but anomalously poor for the one groundwater duplicate (TOC concentrations of 2720 mg/L in the sample and 78 mg/L in the duplicate, for an RPD of 189%). Two groundwater duplicates were analyzed for both TDS and TSS; precision was good, as all RPDs were less than 15%.

The TDS and TSS data are considered fully useable. TOC quantitation in groundwater may be uncertain; as a minimum, the TOC concentration in the sample collected from monitoring well MW-3 may be anywhere between 78 and 2,720 mg/L. The potential for similar uncertainty in other groundwater TOC values is unknown. Based on the one soil TOC duplicate, similar uncertainties do not appear to be associated with the soil TOC data.

Grain size analyses (sieve and hydrometer) were performed on five soil samples by Law Environmental (subcontractor to Mitkem). The laboratory grain size data were reviewed by TAMS' project geologist and were found to be reasonable and consistent with the field classifications. The laboratory grain size data are, therefore, considered to be fully useable.

8.4.7 Field Data

Field data generated consisted of volatile organic screening data of soil (split spoon) samples to aid in the selection of samples to be submitted for laboratory analysis. Other field data included pH, turbidity, and conductivity measurements on groundwater samples during development, purging, and sampling. Field QA/QC control limits, established to monitor and maintain field data quality, for pH, specific conductance (conductivity), and turbidity were specified in the project plans and are not repeated here.

Field geological classifications were also performed by a qualified geologist on soil samples. As noted above, the field classifications were consistent with the laboratory grain size analyses and are, therefore, considered fully useable.

8.4.8 IRM (Demolition/Tank Excavation) Data

The Trade-Winds-generated data consisted of nine IRM UST excavated soil samples collected between October 8 and December 22, 1997, as shown on Tables 4-23 through 4-26, and six floor slab samples collected on December 11, 1997. The samples were analyzed by AAL (ELAP ID #11418) using SW-846 methods. Of the 15 total samples, 14 were analyzed for an extended list of VOCs by SW-846 Method 8260, 10 samples (four UST excavation and all six floor slab samples) were analyzed for SVOCs by SW-846 Method 8270, one sample was analyzed for pesticides, five samples were analyzed for PCBs by SW-846 Method 8080, four samples were analyzed for 13 priority pollutant metals (assumed to be by SW-846 Method 6010, except mercury by SW-846 Method 7471; however, the AAL data reports did not specify the inorganic method), and one sample was analyzed for TCLP metals.

Although the Trade-Winds samples were from similar areas as RI samples collected by TAMS, the data are not considered comparable. The samples collected by Trade-Winds were of contaminated material excavated during UST removal; these data characterize material which has since been removed and disposed. These sample most likely represent higher levels of contamination than TAMS' samples from the same areas, which were post-excavation samples and are likely to be less contaminated than the excavated material. The one exception is TAMS' sample SYTEX-1, which was from excavated material from the South Yard tank excavation; that sample would be expected to be comparable to IRM South Yard samples (*i.e.*, samples identified as LD1-2-3; #1-2-3; SYS1, SYS2, and SYS3 on Tables 4-23 through 4-26). These IRM samples were grabs taken from different piles of excavated material and at different times and exhibit a substantial degree of variability in contaminant concentrations. However, TAMS' sample SYTEX-1 agrees well with the contaminants detected, and the contaminant concentrations reported in SYTEX-1 are comparable to those in the somewhat less-contaminated IRM samples SYS1, SYS2, and #1-2-3.

The VOC analysis conducted on samples collected by Trade-Winds included an extended analyte list and included some analytes (*e.g.*, naphthalene and 1,2-dichlorobenzene) also reported as SVOCs. The agreement (precision) is not very good for these analytes on samples for which both a VOC result and SVOC result is reported. The discrepancy between the two results is likely due to differences in the methods. In the VOC (Method 8260) analysis, the sample is heated (purged) to remove the volatile analytes, which are then trapped and analyzed. On the other hand, analytes are removed from the soil by solvent extraction in the SVOC (Method 8270) analysis. For consistency and comparability with the RI data, only the SVOC data for naphthalene and 1,2-dichlorobenzene are discussed for samples collected by Trade-Winds.

9.0 SUMMARY AND CONCLUSIONS

A remedial investigation (RI) of the Hexagon Laboratories Site, located in the Eastchester Section of Bronx County, New York, was performed for the New York State Department of Environmental Conservation (NYSDEC) by TAMS Consultants, Inc. The purposes of the investigation were as follows: (a) to determine the physical characteristics of the site; (b) to evaluate the nature and extent of contamination; (c) to evaluate the fate and transport characteristics of the contamination; (d) to characterize the potential human health risk associated with site surface soils; and (e) to perform a qualitative ecological assessment of the site. This chapter presents a summary of the findings of the RI, and overall conclusions are presented as well as recommended considerations in developing remedial action objectives.

9.1 Summary

9.1.1 Site History

Hexagon Laboratories operated under several different owners as a manufacturer of various medicinals, pharmaceuticals, and industrial organic chemicals from 1946 until the plant closed in May 1988. The site functioned primarily as a contractor facility, where the chemicals manufactured depended on client requests. However, pharmaceuticals and pharmaceutical intermediates appear to have been the primary focus of the Hexagon Laboratories manufacturing work. On-site manufacturing processes included reaction, separation, and purification processes such as hydrogenation, chlorination, distillation, crystallization, centrifugation, grinding, and drying. Products were manufactured primarily in batch quantities, using batch reactors and distillation units.

The facility consisted of three main buildings and several smaller structures. The Old Plant was built in 1948; the New Plant was built in 1956; and the Office/Warehouse was built in 1970 (1969 according to Sanborn maps). The Old Plant, New Plant, and two smaller structures (Hydrotherm No. 2 and Cylinder House) were demolished as part of the Interim Remedial Measure (IRM); the Office/Warehouse and Hydrotherm No. 1 still remain on site.

NYSDEC and the New York City Department of Environmental Protection (NYCDEP) inspected this site several times as early as the 1980s as a result of complaints about dumping by Hexagon Laboratories. A site inspection report prepared in 1988 included a "NFRAP" (no further remedial action planned) recommendation. The hazard ranking system (HRS) scoring for the site was 3.48; a score of 28.5 is the minimum for a site to be listed on the federal National Priorities List (*i.e.*, as a Superfund site).

In 1990, the New York City Police Department Bomb Squad removed a number of explosives and reactives from the site, and in 1992, the United States Environmental Protection Agency (USEPA) initiated an emergency removal action. The removal action, completed in April 1993, included removal of hazardous wastes and substances from drums and tanks (including process vessels and fuel oil tanks), as well as smaller containers (pails and laboratory chemicals) and obvious waste piles on the floors of buildings. USEPA also attempted to pump out (drain) the sumps, but they were apparently being recharged and could not be emptied.

In 1996, TAMS was tasked by NYSDEC to perform a RI/FFS of the Hexagon Laboratories Site. As a preliminary step in the RI, TAMS conducted a structural evaluation of the on-site Hexagon Laboratories buildings. The results of this evaluation suggested that, for safety-related reasons, several of the buildings should be demolished prior to initiating the planned intrusive investigative activities in and around these buildings. The RI/FFS tasks were put on hold and an IRM, consisting of demolition of four of the seven buildings on site (Old Plant, New Plant, Hydrotherm No. 2, and Cylinder House), asbestos abatement of these structures and the yard areas, removal of 47 above ground storage tanks/reactor vessels, and removal of 30 USTs, was performed by Trade-Winds Environmental Restoration, Inc. (Trade-Winds). This IRM began in July 1997 and was completed in January 1998.

Phase I RI field activities were initiated in November 1997 and were completed in April 1998. The following Phase I RI activities were conducted: topographic survey; geophysical survey; collection of surface soil and miscellaneous (oily material) samples; drilling of exploratory borings and collection of subsurface soil samples; collection of UST excavation sidewall samples; installation and sampling of groundwater monitoring wells; and an ecological investigation. A Phase II RI, consisting of additional surface and subsurface soil sampling in the East Yard, was performed in October 1998 to supplement the earlier sampling effort.

9.1.2 Physical Characteristics

The Hexagon Laboratories Site is located in the northeast corner of Bronx County, New York approximately 700 feet southwest of the Hutchinson River. The eastern two-thirds of Bronx County, including the Hexagon Laboratories Site, is underlain by the Manhattan Schist, a dark-green to black, micaceous metamorphic rock. The geologic structure of the Manhattan Schist is complex. The formation is intensely folded and metamorphosed, with well-developed foliation.

Depth to bedrock is very shallow across most of the site. Bedrock is closest to the surface near the Office/Warehouse building at MW-6 where it was encountered at a depth of 1 foot bgs. Depth to bedrock along Peartree Avenue appears to be approximately 5 to 6 feet bgs. The bedrock surface beneath the North Yard and the Old Plant appears to rise to the north towards Tufo's Wholesale Dairy to a depth of 2 to 3 feet bgs. However, in the East Yard, the bedrock surface appears to drop off steeply. Given the close proximity of the Hutchinson River to the site, it is possible that the steep drop-off in bedrock surface could be attributed to incision from a former paleochannel of the river.

Based on the topography of the site, it appears that surface water runoff from the site is diverted to the combined sanitary/storm sewers which extend along Hollers Avenue and Boston Post Road. The combined sewers transport storm water runoff to a wastewater treatment plant during periods of low flow. However, during high flow storm events, the combined storm water/sanitary sewers discharge directly to the Hutchinson River.

Groundwater elevation data collected as part of the hydrogeologic investigation indicate that horizontal groundwater flow is generally in an easterly direction across the site. However, the groundwater elevation data also indicate groundwater flow to the northwest at the northern end of the site, suggesting the possible presence of a groundwater divide in the vicinity of monitoring well MW-5 separating groundwater flow at the site. The presence of a groundwater divide cannot be confirmed based on the limited number of sampling points. Comparison of groundwater elevations in the co-located shallow (overburden) and deep (bedrock) monitoring wells located in the East Yard indicates that groundwater within the bedrock is hydraulically connected to the overburden aquifer.

9.1.3 Nature of Contamination

Surface Soil

Surface soil contamination consists primarily of semivolatile organics (SVOCs), in particular polycyclic aromatic hydrocarbons (PAHs). Chrysene is the most pervasive of the PAHs, being detected in nine of the 16 surface and shallow subsurface soil samples at concentrations greater than the NYSDEC recommended soil cleanup objectives (RSCOs). The highest concentrations of PAHs were observed in a shallow subsurface soil sample collected beneath the floor slab of Hydrotherm No. 1 in the vicinity of an apparent oil spill. Phenolic compounds were detected in one of the 16 samples at concentrations greater than NYSDEC RSCOs. Volatile organics (VOCs) were also detected, and, in one sample, toluene, ethylbenzene, and xylenes (BTEX compounds), trichloroethene, tetrachloroethene, acetone and chlorobenzene exceeded NYSDEC RSCOs. Acetone was also detected at a concentration greater than the NYSDEC RSCO in one other shallow subsurface soil sample. Significant concentrations of unidentified VOCs and SVOCs (*i.e.*, TICs) were also reported.

One pesticide, aldrin, was detected in two of the nine surface and shallow subsurface soil samples analyzed for pesticides at concentrations greater than the NYSDEC RSCO (Phase II RI soil samples were not analyzed for pesticides). However, as discussed in Section 8 - Data Quality and Usability, due to matrix interference and analytical problems, there is a high probability that the detected pesticides are false positives and do not accurately represent site conditions. PCBs were detected in one surface soil sample and in one shallow subsurface soil sample at concentrations greater than the NYSDEC RSCO.

Various metals were detected at concentrations greater than the evaluation criteria (*i.e.*, the greater of the applicable background concentration and NYSDEC RSCOs). Nickel appears to be the most pervasive of the metals with exceedances in seven of the 16 surface and shallow subsurface soil samples. Both antimony and nickel appear to be pervasive in the East Yard with exceedances detected in four of the six surface and shallow subsurface soil samples collected in the East Yard.

Total organic carbon (TOC) concentrations vary significantly in the nine surface and shallow subsurface soil samples ranging from approximately 0.33% to 5.1% TOC. Total petroleum hydrocarbon (TPHC) concentrations also vary significantly ranging from 0.03% to 2.8% TPHC. The 2.8% TPHC detection corresponds to a shallow subsurface soil sample collected beneath the floor slab of Hydrotherm No. 1 in the vicinity of the apparent oil spill.

Subsurface Soil

Subsurface soil contaminants consist predominantly of VOCs, primarily BTEX compounds (especially toluene), chlorinated aliphatics, and chlorobenzene, although other VOCs were also detected. SVOCs, primarily PAHs, were also detected in subsurface soil samples at varying concentrations. PAHs were detected at lower frequency and generally at lower concentrations than detected in the surface soil samples. Phenolic compounds were detected in 11 of the 27 subsurface soil samples analyzed for SVOCs (excluding three off-site subsurface soil background samples). Phthalates were detected in one subsurface soil sample at concentrations greater than the corresponding NYSDEC RSCOs. Other SVOCs, including 4-chloroaniline, 1,2-dichlorobenzene, dibenzofuran, and carbazole, were detected sporadically. Significant concentrations of VOC and SVOC TICs were also reported. Both VOCs and SVOCs exceed applicable NYSDEC RSCOs in many samples.

Pesticides were reported as detected in many samples. Concentrations were generally low but still exceeded NYSDEC RSCOs in seven of the 24 on-site subsurface soil samples analyzed for pesticides. However, due to matrix interference and analytical problems, there is a high probability that the detected pesticides are false positives and do not accurately represent site conditions. PCBs were detected in several samples but were, with one exception, less than the applicable NYSDEC RSCO.

Various metals were detected at concentrations greater than the evaluation criteria. Cadmium was detected at concentrations above background in six of the 27 on-site subsurface soil samples, and chromium and nickel were each detected at concentrations above background in five of the 27 on-site subsurface soil samples.

TOC concentrations were generally low, ranging from approximately 0.05% to 2.6% TOC, and the data suggest a trend of decreasing TOC with depth. A TPHC concentration of 0.12% was detected in the one on-site subsurface soil sample analyzed for this parameter.

Groundwater

Groundwater contaminants detected at the site are similar to those detected in the surface and subsurface soils. VOC contamination consists primarily of BTEX compounds, chlorinated aliphatics, acetone, and chlorobenzene. While the presence of SVOCs is less significant in the groundwater as compared to the surface and subsurface soils, several SVOCs (primarily phenolic compounds and 1,2-dichlorobenzene) were detected at concentrations greater than the NYSDEC Class GA groundwater standards. Pesticides were detected sporadically and at low concentrations, although exceeding NYSDEC Class GA groundwater standards in seven of the 12 groundwater samples. However, as noted previously, there is a high probability that the detected pesticides are false positives and do not accurately represent site conditions. PCBs were detected in two of the 12 groundwater samples at concentrations well above the NYSDEC Class GA groundwater standard.

Various metals in the total metals samples were detected at concentrations greater than the NYSDEC Class GA groundwater standards. However, most were less than the NYSDEC Class GA groundwater standards in the corresponding filtered samples. Metals, including antimony, beryllium, chromium, copper, lead, thallium, and zinc, were detected at elevated concentrations in eight of the 12 total metals samples. However, in the filtered samples, only antimony (one of 12 samples), chromium (four of 12 samples) and zinc (one of 12 samples) were detected at concentrations greater than the NYSDEC Class GA groundwater standards.

TOC concentrations vary greatly, ranging from 16.6 mg/L (approximately 0.0017% TOC) to 2,720 mg/L (approximately 0.27% TOC). Concentrations of total suspended solids (TSS) and total dissolved solids (TDS) also vary greatly, ranging from 26 mg/L to 1,200 mg/L and 440 mg/L to 1,500 mg/L, respectively.

Miscellaneous Samples

Oily Material

Excluding PAHs, no VOCs or SVOCs were detected at concentrations greater than the NYSDEC RSCOs in oily material sample OM-1. Note that while the NYSDEC criteria are not applicable to the oily material sample, they do provide a frame of reference in evaluating contaminant concentrations. PAHs (acenapthene, fluorene, phenanthrene, and chrysene) were detected at concentrations greater than the NYSDEC RSCOs as is expected for an oil-based sample. All pesticide and PCB data were rejected during data validation due to poor surrogate recovery. Several metals observed at elevated concentrations in soil samples were also detected at concentrations above the soil evaluation criteria in the oily material sample. These metals include antimony, cadmium, chromium, copper, lead, and nickel. Iron and magnesium were also detected at elevated concentration in the oily material sample. TOC and TPHC concentrations were detected as 64.7% TOC and 28% TPHC, respectively.

Concrete Floor Slabs

Relatively high concentrations of BTEX compounds and 1,2-dichloroethane were detected in floor slab sample OP1, collected near the oil/water separator in the former Old Plant. Lower concentrations of these compounds were detected in the other floor slab samples. Excluding PAHs, sporadic detections of SVOCs were reported for these samples. Chrysene, a PAH, was reported at relatively low concentrations in each of the floor slab samples. These samples were not analyzed for pesticides, PCBs, or inorganics.

9.1.4 Extent of Contamination

Surface Soil

Significant VOC and SVOC contamination, excluding PAHs, was detected in only one sample, collected immediately adjacent to the South Yard UST excavation. It is likely that the South Yard USTs are the source of the contamination in this sample. PAHs were detected at concentrations in excess of NYSDEC RSCOs in 10 of the 16 surface and shallow subsurface soils across the site. The pervasive presence of the PAH contamination across the site is expected due to the proximity of the site to three major highways (US Route 1, Interstate 95, and the New York State Thruway). Particularly high concentrations of PAHs in the sample collected beneath the floor slab in Hydrotherm No. 1 are also expected due to the presence of an oil spill in the immediate vicinity of the soil sampling location.

Pesticides were detected sporadically; these detections are considered suspect due to significant matrix interference. PCBs were detected in one sample from the South Yard and one sample from the East Yard at concentrations greater than the NYSDEC RSCO. The source of the PCB contamination is unknown; PCBs may have been a component of the heat transfer oil used in manufacturing processes at the site. Metals were detected across the site at concentrations in excess of the evaluation criteria. The most exceedances (*e.g.*, antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium, thallium, and zinc) were reported for a surface soil sample collected within the footprint of the former New Plant and a shallow subsurface soil sample collected in the central portion of the East Yard. The fewest exceedances were observed in a sample collected from beneath the floor slab of Hydrotherm No. 1.

Subsurface Soil

High levels of VOC contamination, in particular BTEX compounds, chlorinated aliphatics, acetone, and chlorobenzene, were detected in subsurface soil boring samples collected beneath the floor slabs of the former Old Plant and New Plant as well as in samples collected in the East Yard and South Yard and from the sidewalls of the South Yard and New Plant UST excavations. PAHs were detected in samples collected from all parts of the site but at less frequency and generally lower concentrations than observed in the surface soils. Various other SVOCs, including phenolic compounds, were detected at concentrations greater than NYSDEC RSCOs in samples collected beneath the floor slabs of the former Old Plant and New Plant as well as in subsurface soil samples collected in the East Yard and in sidewall samples collected from the South Yard and New Plant UST excavations. In general, relatively low concentrations of VOCs and SVOCs were detected in samples collected from the East Yard, South Yard (excluding the UST excavation), and North Yard.

Pesticides were detected sporadically; these detections are considered suspect due to significant matrix interference. PCBs were detected in one sample, collected from beneath the floor slab of the former New Plant, at a concentration greater than the NYSDEC RSCO. As noted previously, the source of the PCB contamination is unknown; PCBs may have been a component of the heat transfer oil used in manufacturing processes at the site.

Metals were detected across the site at concentrations in excess of the evaluation criteria. Frequent exceedances were reported for samples collected from beneath the floor slab of the former Old Plant as well as in the East Yard and North Yard.

Groundwater

VOCs were detected at concentrations greater than the NYSDEC Class GA groundwater standards in all six of the monitoring wells. However, highest concentrations were observed in monitoring well MW-3 (South Yard), monitoring well MW-4 (New Plant), and monitoring well MW-5 (Old Plant). Concentrations of VOCs detected in deep monitoring well MW-2, located in the East Yard, are generally either greater than or comparable to VOC concentrations detected in the co-located shallow monitoring well MW-1. Relatively low concentrations of VOCs were detected in presumed upgradient monitoring well MW-6. As with VOCs, the highest concentrations of SVOC contamination were observed in monitoring wells MW-3, MW-4, and MW-5. Relatively low levels of SVOCs were detected in monitoring wells MW-1, MW-2, and MW-6.

Pesticides were detected sporadically; these detections are considered suspect due to significant matrix interference. PCBs were detected in both samples collected from New Plant monitoring well MW-4 at concentrations well above the NYSDEC Class GA groundwater standard.

Metals were detected in the total metals samples from each monitoring well at concentrations in excess of NYSDEC Class GA groundwater standards. However, in the dissolved metals samples, only antimony, chromium and zinc were detected at concentrations greater than the NYSDEC Class GA groundwater standards. Antimony was detected at an elevated concentration in one filtered sample collected from monitoring well MW-5 (Old Plant), and zinc was detected at an elevated concentration in one filtered sample collected from monitoring well MW-1 (East Yard). Chromium was detected at elevated concentrations in the filtered samples collected during both sampling rounds from monitoring well MW-4 (New Plant) and monitoring well MW-5 (Old Plant).

There is no significant difference in the TDS concentrations measured in deep well MW-2 as compared to the co-located shallow monitoring well MW-1. However, the TSS concentrations appear to be consistently lower in the deep well than in the shallow well.

Miscellaneous Samples

Oily Material

The oily material sample OM-1 was scraped from the floor slab of Hydrotherm No. 1. This oily material appeared to cover approximately one-third of the floor slab surface. This material was not observed at any other location on site.

Concrete Floor Slabs

The highest concentrations of VOC and SVOC contamination were detected in the two floor slab samples collected near the oil/water separator in the former Old Plant. Relatively low levels of contaminants were detected in the former New Plant floor slab samples As part of the IRM, NYSDEC directed Trade-Winds to encapsulate the most contaminated portion of the Old Plant floor slab (*i.e.*, the floor slab in the vicinity of the oil/water separator) using masonry paint as a concrete sealant. This work was performed as part of the IRM.

9.1.5 Contaminant Fate and Transport

Observed contamination at the Hexagon Laboratories Site consists primarily of BTEX compounds, chlorinated VOCs, phenolic compounds, PAHs, and PCBs. Elevated concentrations of some metals including antimony, arsenic, cadmium, chromium, copper, mercury, nickel, selenium, thallium, and zinc were also observed. Cyanide was also detected at an elevated concentration in groundwater samples collected from one monitoring well.

Contaminants in each of the environmental media studied (surface soil, subsurface soil, and groundwater) have the potential for off-site migration via physical transport and leaching of contaminants. Subsurface soils do not have the potential for migration by physical transport unless exposed by excavation.

The mobility of organic contaminants in the environment, other than by physical processes such as erosion and deposition, is controlled primarily by four chemical characteristics: vapor pressure; Henry's Law Constant; aqueous solubility; and the organic carbon - water partition coefficient (K_{oc}).

The principal mechanism for the removal of VOCs is through volatilization, as indicated by high vapor pressures and Henry's Law Constants. Based on moderate aqueous solubility and low to moderate K_{oc} values, BTEX compounds are fairly mobile in soil. However, the environmental half-life of the BTEX compounds is fairly short in soil. Any BTEX compounds reaching the groundwater would be expected to be fairly persistent and mobile. The chlorinated VOCs would exhibit a fate and transport pattern similar to the BTEX compounds. The environmental half-life of chlorinated VOCs is longer, however, indicating less rapid natural attenuation of these substances in soil and groundwater. Therefore, the chlorinated VOCs are expected to be fairly persistent, especially in groundwater.

Phenolic compounds are similar to BTEX compounds in that they are moderately soluble in water and have low to moderate K_{oc} values. As a result, phenolic compounds are relatively mobile in soil and subject to leaching to groundwater. However, the environmental half-life of the phenolic compounds is fairly short in both soil and groundwater. Therefore, fairly rapid natural attenuation of these compounds is expected.

PAHs are persistent in the environment due to their low aqueous solubility, low volatility, and high K_{oc} values; PAHs tend to stay adsorbed to soils and are fairly immobile. The mobility of the PAHs is inversely related to molecular weight; low molecular weight PAHs, such as naphthalene, are more mobile and sorb less strongly to soil than higher molecular weight PAHs. This is consistent with site data in that only naphthalene was detected in groundwater at a concentration greater than the corresponding NYSDEC Class GA groundwater standard. Because PAHs tend to be fairly immobile, off-site transport of PAHs via leaching from site soils into groundwater is not expected to be significant.

PCBs tend to sorb strongly to soil, are not subject to volatilization, and leaching and biodegradation occur slowly or not at all. PCBs have very low solubility in water; however, PCBs can exist in water at concentrations exceeding health-based criteria. PCBs are persistent in soils and significant reductions in concentrations are not expected. Ordinarily, PCBs would not be expected at significant concentrations in groundwater. However, PCBs were detected at a maximum concentration of 17 µg/L in monitoring well MW-4. The detected concentrations of PCBs in MW-4 may be a result of co-solvency (*i.e.*, the PCBs are dissolved in and transported or leached with other solvents (BTEX, chlorinated aliphatics) which were also detected in MW-4).

The presence of several metals were detected at concentrations greater than the regulatory criteria. Many metals have an affinity for soils (particularly clay particles and organic matter in soils) which reduce their mobility. However, under low pH conditions, most metals can be rendered mobile. Significant leaching of metals from site soils did not occur under TCLP test conditions and, therefore, off-site migration of metals contamination from soils is not expected to be significant.

Without historic data with which to compare (and evaluate trends), the future behavior of contaminants at the site is difficult to predict. However, based on knowledge of site conditions and site history, current conditions, and the physical properties of the contaminants at the site, a few general observations can be made.

1. Overland Transport - Overland transport is not expected to be a significant transport route. SVOCs, which are present in the site surface soils at significant concentrations, may be subject to entrainment and subsequent off-site transport during rain events. This runoff would be collected in the local combined sewer (sanitary and storm), treated, and subsequently discharged to the Hutchinson River. The limited amount of contaminated sediment transported from the site to the sewer system is unlikely to be a problem for the wastewater treatment plant. However, during significant storms (*i.e.*, when the treatment plant is allowed to let some of the combined storm water/sanitary flow bypass treatment), the sediments (along with untreated wastes from other sources) would be discharged directly to the Hutchinson River.

2. Groundwater Transport - Groundwater transport is likely to be the most significant pathway for off-site migration of contaminants from the site. Contamination migrating by this pathway is expected to be primarily VOCs. SVOCs and PCBs are expected to stay adsorbed to site soils. The small of amounts of the SVOCs and PCBs which enter the groundwater will migrate slowly in the overburden and more rapidly in bedrock.

3. Volatilization - Volatilization is no longer expected to be significant at the site unless VOC-contaminated subsurface soils are exposed to the ambient air. It is likely that volatilization played a significant role in the past, reducing the concentration of VOCs in the surface soil.

9.1.6 Summary of the Human Health Risk Assessment

The limited human health risk assessment for the Hexagon Laboratories Site examined current and future exposure scenarios to determine if contaminants present in the surface soil at the site pose unacceptable carcinogenic or noncarcinogenic risks to potentially exposed populations. Ingestion of and dermal exposure to the two identified compounds of concern (lead and benzo(a)pyrene) were examined. Three populations (trespassers, site workers, and construction workers) were considered to have complete exposure pathways. Trespassers were evaluated for current- and future-use exposure while site workers and construction workers were evaluated for future-use exposure only.

Carcinogenic risks were determined to exceed target risk levels for the high end, future-use exposure scenarios examined for site workers due to the presence of benzo(a)pyrene in the surface soil. Noncarcinogenic risks were not calculated due to the lack of quantitative toxicity values for the contaminants of concern. However, for nonresidential lead risks, the

USEPA-recommended methodology relating soil lead uptake to blood lead concentrations in women of childbearing age to derive risk-based remediation goals (RBRG) was used (USEPA, 1996). The 95% upper confidence limit concentration of lead in the surface soil exceeded the RBRG for construction workers (95 mg/kg). The average concentration of lead in the soil also exceeded the RBRG for construction workers.

SVOC TICs may also contribute to human health risks, but were not quantitatively evaluated due to the lack of quantitative toxicity values for TICs.

Only surface soil exposure was evaluated in this limited human health risk assessment, although other media (*e.g.*, subsurface soil and groundwater) at the Hexagon Laboratories Site are also known to be contaminated. The limited scope of this risk assessment may result in an underestimation of the potential risks to receptors at the Hexagon Laboratories Site.

9.1.7 Summary of the Ecological Assessment

The primary objective of the ecological assessment was to evaluate the adverse ecological impacts of contaminants at the Hexagon Laboratories Site on site biota. The potential impact of site contamination on off-site biota was not evaluated as part of this limited ecological assessment. As part of the ecological assessment, an evaluation of the existing ecological conditions at the Hexagon Laboratories Site was conducted through review of available background information and a field reconnaissance.

Because of the highly developed nature of the site, and as a result, the negligible amounts of vegetation present at the site, there does not appear to be an impact on site vegetation by contamination present at the site. In addition, since the Hexagon Laboratories Site, itself, is essentially devoid of vegetation, and it does not feature wetlands or open water, there is insufficient natural habitat available to support any threatened or endangered species. Thus, the impact of site contamination on threatened or endangered species on site is considered to be negligible.

No environmental samples were collected off site as part of the remedial investigation and, therefore, the presence of site-related contamination off-site and an assessment of such site-related contamination on off-site biota would be inconclusive. However, it is important to note the highly developed, industrial nature of the Hexagon Laboratories Site and its immediate vicinity and the corresponding lack of significant vegetation.

9.2 Conclusions

Results of the RI indicate the presence of site-related contamination in the surface soil, subsurface soil, and groundwater. Primary contaminants include BTEX compounds, chlorinated VOCs, phenolic compounds, PAHs, and PCBs. In addition, unidentified VOC and SVOC compounds (*i.e.*, TICs) comprise a significant portion of the total contamination measured on site. Elevated concentrations of metals including antimony, arsenic, cadmium, chromium, copper, mercury, nickel, selenium, thallium, and zinc were also observed. Cyanide was also detected at an elevated concentration in groundwater samples collected from one monitoring well.

There does appear to be off-site migration of contaminants, in particular BTEX compounds, as evidenced by the presence of significant concentrations of BTEX contamination in downgradient monitoring wells MW-1 and MW-2. Further, the BTEX concentrations in the deep well (MW-2) are about the same as those in the co-located shallow well (MW-1), indicating no attenuation of contamination with depth.

Based on the limited human health risk assessment performed, the site does not pose significant carcinogenic risk under current- and future-use exposure scenarios with respect to ingestion of and dermal contact with surface soils. Noncarcinogenic risks were not calculated due to the lack of quantitative toxicity values for the contaminants of concern. However, maximum and average concentrations of lead in the surface soil exceed the RBRG for construction workers (95 mg/kg). The impact of site contamination on site biota is considered to be negligible.

9.2.1 Recommendations for Future Work

The Hexagon Laboratories Site was investigated extensively, using a number of surface and subsurface techniques and including chemical sampling of various media. The sampling program was targeted towards presumed source areas both within the buildings and in the yard areas. It is believed that, for the most part, these areas have been sufficiently characterized for conduct of the focused feasibility study. However, in order provide a more comprehensive evaluation of contamination at the Hexagon Laboratories Site, the following recommendations for future work are provided:

1. Install one shallow well upgradient of the site to better characterize groundwater quality flowing onto the site. Groundwater elevation data will be used to refine horizontal flow directions and gradients.

2. Install one deep monitoring well (approximately 150 feet deep or to next major fracture zone) in a downgradient location (co-located with monitoring wells MW-1 and MW-2) to better assess the vertical extent of the groundwater contamination; contaminant concentrations in deep well MW-2 were generally comparable to concentrations in the co-located shallow monitoring well MW-1, indicating no attenuation of contamination with depth.

3. Install a new shallow monitoring well between monitoring wells MW-5 and MW-6 to better characterize the groundwater flow pattern at the northern end of the site.

4. Install downgradient off-site monitoring wells to define the extent of horizontal migration of site-related contamination from the site.

5. Perform a comprehensive human health risk assessment which includes evaluation of exposure (ingestion, inhalation, and dermal contact) to subsurface soil and groundwater. This would supplement the limited human health risk assessment of surface soil exposure (ingestion and dermal contact) performed as part of this RI, and would allow for better assessment of the human health risk associated with existing levels of contamination at the site.

9.2.2 Recommended Remedial Action Objective Considerations

Significant levels of site-related contamination were detected in surface soil, subsurface soil, and groundwater at the Hexagon Laboratories Site. It is possible that contamination levels detected in the soil and groundwater represent unacceptable risks should exposure pathways to these media be complete. Therefore, in developing remedial action objectives (RAOs), the following should be considered:

1. RAOs should prevent exposures to surface and subsurface soil which exceed risk-based levels.

2. RAOs should prevent exposures to groundwater which exceed risk-based levels.

3. RAOs should take into consideration potential future uses of the site (*e.g.*, redevelopment of the property for commercial or industrial use).

4. RAOs should address mitigation of actual or potential off-site migration of contaminants which result in unacceptable risks or environmental degradation.

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TABLE 1-1
HEXAGON LABORATORIES RI/FFS
UNDERGROUND AND ABOVE GROUND STORAGE TANK INVENTORY (1)

Tank ID	Location	Capacity (gal.)	Contents	Material of Construction	Year Installed	Comments
UNDERGROUND STORAGE TANKS						
1	South Yard	1,080	Unknown	Carbon Steel	1956	Failed Leak Test in 1977; Taken Out of Service.
2	South Yard	1,080	Acetone	Carbon Steel	1956	
3	South Yard	1,080	Isopropyl Alcohol	Carbon Steel	1956	
4	South Yard	1,080	Methanol	Carbon Steel	1956	
5	South Yard	1,080	Unknown	Carbon Steel	1956	Failed Leak Test in 1977; Taken Out of Service.
6	South Yard	550	Toluene	Stainless Steel	1956	
7	South Yard	550	Unknown	Stainless Steel	1956	Failed Leak Test in 1977; Taken Out of Service.
8	South Yard	550	Unknown	Stainless Steel	1956	Failed Leak Test in 1977; Taken Out of Service.
9	South Yard	550	Unknown	Stainless Steel	1956	Failed Leak Test in 1977; Taken Out of Service.
10	South Yard	550	Unknown	Stainless Steel	1956	Failed Leak Test in 1977; Taken Out of Service.
11	South Yard	550	Toluene	Carbon Steel	1956	
12	South Yard	550	Unknown	Carbon Steel	1956	Failed Leak Test in 1977; Taken Out of Service.
13	South Yard	550	Ethylene Dichloride	Carbon Steel	1956	
14	South Yard	550	Ethylene Dichloride	Carbon Steel	1956	
15	South Yard	550	Toluene	Stainless Steel	1956	
16	South Yard	550	Toluene	Stainless Steel	1956	
17	South Yard	550	Methylene Chloride	Stainless Steel	1956	
18	North Yard	1,500	Acetone	Carbon Steel	1968	
19	North Yard	1,500	Isopropyl Alcohol	Carbon Steel	1968	
20	North Yard	1,500	Toluene	Carbon Steel	1968	
21	North Yard	1,500	Xylene	Carbon Steel	1968	
22	North Yard	1,500	Methanol	Carbon Steel	1968	
23	North Yard	1,500	Isopropyl Alcohol	Carbon Steel	1968	
FOT	North Yard	5,000	Fuel Oil	Carbon Steel	1968	
34	East Yard	2,000	Diethyl Ketone	Stainless Steel	1975	
35	East Yard	2,000	Diethyl Ketone	Stainless Steel	1975	
36	East Yard	3,000	Diethyl Ketone	Carbon Steel	1975	
37	East Yard	3,000	Diethyl Ketone	Carbon Steel	1975	
FOT	Maint. Yard	5,000	Fuel Oil	Carbon Steel	1975	
ABOVE GROUND STORAGE TANKS						
24	Old Plant	2,800	Sulfuric Acid (H_2SO_4)	--	--	
25	Old Plant	2,800	25% Caustic Soda	--	--	
26	New Plant	1,400	25% Caustic Soda	--	--	
27	New Plant	1,400	50% Caustic Soda	--	--	
28	South Yard	20,000 lbs.	Nitrogen Gas	--	--	
29	South Yard	2,800	25% Caustic Soda	--	--	
30	South Yard	8,000	Muriatic Acid (HCl)	--	--	
31	South Yard	2,000	Muriatic Acid (HCl)	--	--	
32	South Yard	6,500	Mixed Acid	--	--	
33	South Yard	6,500	Propionic Acid	--	--	
38	East Yard	6,500	Propionic Acid	--	--	
39	South Yard	5,000	Propiophenone	--	--	

Notes:

1. Tank inventory is based on information provided to NYSDEC by Hexagon Laboratories, Inc. in October 1987.
2. Hexagon Laboratories, Inc. indicated in the October 1987 correspondence to NYSDEC that other materials previously stored in the underground tanks include naptha, benzene, hexane, ethanol, and ethyl acetate.
3. A total of 48 aboveground storage tanks/reactor vessels and 31 underground storage tanks, including the above-listed tanks, were removed from the Hexagon Laboratories Facility as part of the interim remedial measure performed at the site in 1997.

TABLE 2-1
HEXAGON LABORATORIES RI/FFS
ANALYTICAL PARAMETERS - SURFACE SOIL

Sample ID	Sample Location	Analytical Parameters				
		TCL	TAL + CN	Pest/PCBs	TPHC	TOC
HX-SS1	SS-1	X	X	X	--	X
HX-SS51	Duplicate of HX-SS1	X	X	X	--	X
HX-SS2	SS-2	X	X	X	X	X
HX-SS3	SS-3	X	X	X	X	X
HX-SS4	SS-4	X	X	X	--	X
HX-SS5	SS-5	X	X	X	--	X
HX-SS6	SS-6	X	X	X (PCBs Only)	--	--
HX-SS7	SS-7	X	X	X (PCBs Only)	--	--
HX-SS8	SS-8	X	X	X (PCBs Only)	--	--
HX-SS9	SS-9	X	X	X (PCBs Only)	--	X
HX-SS9D	Duplicate of HX-SS9	X	X	X (PCBs Only)	--	--
HX-SS10	SS-10	X	X	X (PCBs Only)	--	--

Notes:

1. X = Parameter Analyzed
2. TCL = Target Compound List
3. TAL + CN = Target Analyte List and Cyanide
4. Pest./PCBs = Pesticides and PCBs
5. TPHC = Total Petroleum Hydrocarbons
6. TOC = Total Organic Carbon
7. Surface soil samples HX-SS6 through HX-SS10 were collected as part of the Phase II Remedial Investigation.

TABLE 2-2
HEXAGON LABORATORIES RI/FFS
ANALYTICAL PARAMETERS - SUBSURFACE SOIL
Page 1 of 2

Sample ID	Sample Location	Sample Depth (ft bgs)	Analytical Parameters						
			TCL	TAL + CN	Pest/PCBs	TPHC	TCLP	TOC	GS
Soil Borings									
HXBK1	BK-1	2.5 - 4.5	X	X	X	--	--	X	X
HXBK2	BK-2	2.5 - 4.5	X	X	X	--	--	X	--
HXBK3	BK-3	2.5 - 4.5	X	X	X	X	--	X	--
HXB1S3	MW-1	4 - 6	X	X	X	--	X	X	--
HXB1S7	MW-1	11 - 13	X	X	X	--	X	X	--
HXB3S2	MW-3	2 - 4	X	X	X	--	--	--	--
HXB4S2	MW-4	2 - 4	X	X	X	--	--	X	--
HXB54	Duplicate of HXB4S2	2 - 4	X	X	X	--	--	X	--
HXB5S2	MW-5	2 - 4	X	X	X	--	X	X	X
HXB6S1	MW-6	1 - 2	X	X	X	--	--	X	X
HXB7S2	B-7	2 - 4	X	X	X	--	--	--	--
HXB7S4	B-7	6 - 8	X	X	X	--	--	--	X
HXB8S3	B-8	4 - 6	--	--	--	--	--	--	X
HXB8S4	B-8	6 - 7	X	X	X	--	--	--	--
HXB9S3	B-9	4 - 6	X	X	X	--	--	--	--
HXB9S5	B-9	8 - 10	X	X	X	--	--	--	--
HXB10S1	B-10	0 - 2	X	X	X	--	X	X	--
HXB11S2	B-11	4 - 5	X	X	X	--	--	X	--
HXB12S2	B-12	2 - 4	X	X	X	X	X	--	--
HXB13S1	B-13	0 - 2	X	X	X	X	X	--	--
HXB15S1	B-15	2.5 -4.5	X	X	X	--	--	--	--
HXB16S1	B-16	0 - 2	X	X	X	--	--	--	--
HXB17	B-17	2 - 2.5	X	X	X (PCBs Only)	--	--	--	--
HXB18	B-18	1.6 - 1.9	X	X	X (PCBs Only)	--	--	--	--
HXB19	B-19	1.3 - 1.7	X	X	X (PCBs Only)	--	--	--	--
HXB20	B-20	2.2 - 2.3	X	X	X (PCBs Only)	--	--	X	--
HXB21	B-21	2 - 2.5	X	X	X (PCBs Only)	--	--	--	--

TABLE 2-2
HEXAGON LABORATORIES RI/FFS
ANALYTICAL PARAMETERS - SUBSURFACE SOIL
Page 2 of 2

Sample ID	Sample Location	Sample Depth (ft bgs)	Analytical Parameters						
			TCL	TAL + CN	Pest/PCBs	TPHC	TCLP	TOC	GS
Underground Storage Tank Removal									
EYT34	East Yard	0 - 6	X	X	X	--	--	--	--
EYT35	East Yard	0 - 6	X	X	X	--	--	--	--
EYT36	East Yard	0 - 6	X	X	X	--	--	--	--
EYT37	East Yard	0 - 6	X	X	X	--	--	--	--
NYT-1	North Yard	5.5 - 6	X	X	X	--	--	X	--
NYT-2	North Yard	5.5 - 6	X	X	X	--	--	--	--
SYTN-1	South Yard	2.5 - 4.5	X (VOCs Only)	--	--	--	--	--	--
SYTNX-1	Duplicate of SYTN-1	2.5 - 4.5	X (VOCs Only)	--	--	--	--	--	--
SYTS-1	South Yard	2.5 - 4.5	X (VOCs Only)	--	--	--	--	--	--
SYTE-1	South Yard	2.5 - 4.5	X (VOCs Only)	--	--	--	--	--	--
SYTW-1	South Yard	2.5 - 4.5	X (VOCs Only)	--	--	--	--	--	--
SYTC-1	South Yard	2.5 - 4.5	X (SVOCs Only)	X	X	--	--	--	--
SYTCX-1	Duplicate of SYTC-1	2.5 - 4.5	X (SVOCs Only)	X	X	--	--	--	--
SYTEX-1	South Yard	0 - 6	X	X	X	--	--	X	--
NPT-1	New Plant	3 - 3.5	X	X	X	--	--	X	--
NPT-2	New Plant	3 - 3.5	X	X	X	--	--	--	--
NPT-3	New Plant	3 - 3.5	X	X	X	--	--	--	--
NPT-4	New Plant	3 - 3.5	X	X	X	--	--	--	--

Notes:

1. X = Parameter Analyzed
2. Sample depth referenced to ground surface.
3. TCL = Target Compound List
4. TAL + CN = Target Analyte List and Cyanide
5. Pest./PCBs = Pesticides and PCBs
6. TPHC = Total Petroleum Hydrocarbons
7. TOC = Total Organic Carbon
8. TCLP = Toxicity Characteristic Leaching Procedure (for VOCs, SVOCs, Pesticides, Herbicides, and Metals)
9. GS = Grain Size
10. Subsurface soil samples HXB17 through HXB21 were collected as part of the Phase II Remedial Investigation.

TABLE 2-3
HEXAGON LABORATORIES RI/FFS
ANALYTICAL PARAMETERS - GROUNDWATER

Sample ID	Sample Location	Analytical Parameters					
		TCL	TAL + CN	Pest/PCBs	TOC	TSS	TDS
HX-MW1	MW-1	X	X	X	X	X	X
HX-MW2	MW-2	X	X	X	X	X	X
HX-MW3	MW-3	X	X	X	X	X	X
HX-MW53	Duplicate of HX-MW3	X	X	X	X	X	X
HX-MW4	MW-4	X	X	X	X	X	X
HX-MW5	MW-5	X	X	X	X	X	X
HX-MW6	MW-6	X	X	X	--	X	X

Notes:

1. X = Parameter Analyzed
2. TCL = Target Compound List
3. TAL + CN = Target Analyte List and Cyanide
4. Pest./PCBs = Pesticides and PCBs
5. TOC = Total Organic Carbon
6. TSS = Total Suspended Solids
7. TDS = Total Dissolved Solids

TABLE 2-4
HEXAGON LABORATORIES RI/FFS
ANALYTICAL PARAMETERS - MISCELLANEOUS SAMPLES

Sample ID	Sample Location	Analytical Parameters					
		TCL	TAL + CN	Pest/PCBs	TPHC	TOC	TCLP
Oily Material							
HX-OM1	OM-1	X	X	X	X	X	X

Notes:
1. X = Parameter Analyzed
2. TCL = Target Compound List
3. TAL + CN = Target Analyte List and Cyanide
4. Pest./PCBs = Pesticides and PCBs
5. TPHC = Total Petroleum Hydrocarbons
6. TOC = Total Organic Carbon
7. TCLP = Toxicity Characteristic Leaching Procedure (for VOCs, SVOCs, Pesticides, Herbicides, and Metals)

TABLE 2-5
HEXAGON LABORATORIES RI/FFS
ANALYTICAL PARAMETERS - MISCELLANEOUS SAMPLING DURING IRM

Sample ID	Sample Location	Sample Depth (ft bgs)	Analytical Parameters			
			VOCs/SVOCs	INORGANICS	Pest/PCBs	TCLP
Underground Storage Tank Removal - Subsurface Soil						
LD1-2-3	South Yard	0 - 3	X	X (13 RCRA Metals Only)	X	--
FOT#1	New Plant	0 - 6	X	X (8 RCRA Metals Only)	X	--
FOT#2	New Plant	0 - 6	X	X (8 RCRA Metals Only)	X	--
SYA	South Yard	0 - 6	--	--	--	X (Metals Only)
#1-2-3	South Yard	0 - 6	X	X (13 RCRA Metals Only)	X (PCBs Only)	--
FO1	New Plant	0 - 6	X (VOCs Only)	--	--	--
FO2	New Plant	0 - 6	X (VOCs Only)	--	--	--
SYS1	South Yard	0 - 6	X (VOCs Only)	--	--	--
SYS2	South Yard	0 - 6	X (VOCs Only)	--	--	--
SYS3	South Yard	0 - 6	--	--	X (PCBs Only)	--
Concrete Floor Slab						
OP1	Old Plant	0 - 0.1"	X	--	--	--
OP2	Old Plant	0 - 0.1"	X	--	--	--
OP3	Old Plant	0 - 0.1"	X	--	--	--
NP4	New Plant	0 - 0.1"	X	--	--	--
NP5	New Plant	0 - 0.1"	X	--	--	--
NP6	New Plant	0 - 0.1"	X	--	--	--

Notes:

1. Samples collected by Trade-Winds as part of IRM.
2. Sample depth referenced to ground surface.
3. X = Parameter Analyzed
4. VOCs/SVOCs = Volatile Organics and Semivolatile Organics; Samples analyzed using USEPA Methods 8260 and 8270.
5. Pest./PCBs = Pesticides and PCBs - Samples analyzed using USEPA Method 8080.
6. TCLP = Toxicity Characteristic Leaching Procedure (for Metals)

TABLE 3-1
HEXAGON LABORATORIES RI/FFS
GROUNDWATER ELEVATION MEASUREMENTS

Well Number	Reference Elevation	Date	Time	Depth to Water (ft)	Elevation (ft, NGVD)	Comments
MW-1	27.15	11/19/97				Well installed
		12/5/97	10:00	8.99	18.16	
		12/15/97	9:20	9.36	17.79	Well development
		1/2/98	7:55	8.56	18.59	Round 1 groundwater sampling
		2/18/98	12:40	7.90	19.25	Very heavy rain overnight
		3/5/98	8:15	7.60	19.55	Round 2 groundwater sampling
MW-2	27.06	12/8/97				Well installed
(deep)		12/15/97	8:15	10.56	16.50	Well Development
		1/2/98	8:15	9.61	17.45	Round 1 groundwater sampling
		2/18/98	12:45	8.25	18.81	Very heavy rain overnight
		3/5/98	8:17	8.18	18.88	Round 2 groundwater sampling
MW-3	37.46	11/14/97				Well installed
		12/5/97	10:05	4.05	33.41	
		12/15/97	13:02	3.85	33.61	Well Development
		1/2/98	8:30	3.07	34.39	Round 1 groundwater sampling
		2/18/98	12:50	2.00	35.46	Very heavy rain overnight
		3/5/98	8:45	3.32	34.14	Round 2 groundwater sampling
MW-4	36.80	12/8/97				Well installed
		12/15/97	10:00	3.08	33.72	Well Development
		1/2/98	9:25	2.30	34.50	Round 1 groundwater sampling
		2/18/98	12:55	1.11	35.69	Very heavy rain overnight; cap not tight, water in casing
		3/5/98	8:51	2.07	34.73	Round 2 groundwater sampling
MW-5	38.06	11/17/97				Well installed
		12/5/97	10:35	2.72	35.34	
		12/15/97	12:15	2.04	36.02	Well Development
		1/2/98	9:35	1.82	36.24	Round 1 groundwater sampling
		2/18/98	13:00	0.82	37.24	Very heavy rain overnight; foam on water, chemical odor
		3/5/98	8:55	1.57	36.49	Round 2 groundwater sampling
MW-6	33.76	1/6/98				Well installed
		1/21/98	7:45	6.30	27.46	Well Development
		2/18/98	10:50	5.79	27.97	Very heavy rain overnight; sample well - Round 1
		3/5/98	13:45	5.92	27.84	Round 2 groundwater sampling

Notes:

1. All measurements taken from top of PVC well casing.

TABLE 4-1
HEXAGON LABORATORIES SITE RI/FFS
SAMPLE EVALUATION CRITERIA
Page 1 of 3

Analytical Group Chemical Name	Groundwater	Soil		TCLP Hazardous Characteristic Limit	
	New York State Class GA (1) (ug/L)	Federal (ug/kg)	New York State (2) (ug/kg)	Federal (3) (ug/L)	New York State (4) (ug/L)
VOLATILE ORGANICS (11)					
Aromatics					
Benzene	0.7		60	500	500
Toluene	5		1500	NC	NC
Ethylbenzene	5		5500	NC	NC
Xylenes (Total)	5 (5)		1200	NC	NC
Styrene	5		NC	NC	NC
Halogenated Aliphatics					
Chloromethane	NC		NC	NC	NC
Bromomethane	5		NC	NC	NC
Vinyl Chloride	2		200	200	200
Chloroethane	5		1900	NC	NC
Methylene Chloride	5		100	NC	NC
1,1-Dichloroethylene	5		400	700	700
1,1-Dichloroethane	5		200	NC	NC
cis-1,2-Dichloroethylene	5		NC	NC	NC
trans-1,2-Dichloroethylene	5		300	NC	NC
Chloroform	7		300	6000	6000
1,2-Dichloroethane	5		100	500	500
1,1,1-Trichloroethane	5		800	NC	NC
1,2-Dichloropropane	5		NC	NC	NC
Trichloroethylene	5		700	500	500
Tetrachloroethylene	5		1400	700	700
Ketones					
Acetone	50 (G)		200	NC	NC
2-Butanone	NC		300	NC	NC
4-Methyl-2-pentanone	NC		1000	NC	NC
2-Hexanone	50 (G)		NC	NC	NC
Other/Miscellaneous VOCs					
Chlorobenzene	5		1700	100000	100000
SEMIVOLATILE ORGANICS (12)					
Phenols/Acid Extractables					
Phenol	1 (6)		30	NC	NC
2-Chlorophenol	1 (6)		800	NC	NC
Cresol (Total)	1 (6)		NC	200000 (14)	200000 (14)
2-Methylphenol (o-cresol)	1 (6)		100	200000	200000
4-Methylphenol (p-cresol)	1 (6)		900	200000	200000
2,4-Dimethylphenol	1 (6)		NC	NC	NC
Pentachlorophenol	1 (6)		1000	100000	100000
Polycyclic Aromatic Hydrocarbons (PAHs)					
Naphthalene	10 (G)		13000	NC	NC
2-Methylnaphthalene	NC		36400	NC	NC
Acenaphthylene	NC		41000	NC	NC
Acenaphthene	20 (G)		50000	NC	NC
Fluorene	50 (G)		50000	NC	NC
Phenanthrene	50 (G)		50000	NC	NC
Anthracene	50 (G)		50000	NC	NC
Fluoranthene	50 (G)		50000	NC	NC
Pyrene	50 (G)		50000	NC	NC
Benzo(a)anthracene	0.002 (G)		224	NC	NC
Chrysene	0.002 (G)		400	NC	NC
Benzo(b)fluoranthene	0.002 (G)		1100	NC	NC
Benzo(k)fluoranthene	0.002 (G)		1100	NC	NC
Benzo(a)pyrene	ND		61	NC	NC
Indeno(123-cd)pyrene	0.002 (G)		3200	NC	NC
Dibenzo(a,h)anthracene	NC		14	NC	NC
Benzo(g,h,i)perylene	NC		50000	NC	NC

TABLE 4-1
HEXAGON LABORATORIES SITE RI/FFS
SAMPLE EVALUATION CRITERIA
Page 2 of 3

	Groundwater	Soil		TCLP Hazardous Characteristic Limit	
Analytical Group Chemical Name	New York State Class GA (1) (ug/L)	Federal (ug/kg)	New York State (2) (ug/kg)	Federal (3) (ug/L)	New York State (4) (ug/L)
Aniline Compounds					
4-Chloroaniline	NC		220	NC	NC
4-Nitroaniline	NC		NC	NC	NC
Benzenes/Aromatics					
1,3-Dichlorobenzene	5		1600	NC	NC
1,4-Dichlorobenzene	4.7 (7)		8500	7500	7500
1,2-Dichlorobenzene	4.7 (7)		7900	NC	NC
Nitrobenzene	5		200	2000	2000
Phthalates					
Dimethylphthalate	50 (G)		2000	NC	NC
Diethylphthalate	50 (G)		7100	NC	NC
Di-n-butyl phthalate	50		8100	NC	NC
Butyl benzyl phthalate	50 (G)		50000	NC	NC
bis(2-Ethylhexyl)phthalate	50		50000	NC	NC
Di-n-octyl phthalate	50 (G)		50000	NC	NC
Other/Miscellaneous SVOCs					
Carbazole	NC		NC	NC	NC
Dibenzofuran	NC		6200	NC	NC
PESTICIDES/PCBs					
Pesticides (13)					
Alpha-BHC	NC		110	NC	NC
Beta-BHC	NC		200	NC	NC
Delta-BHC	NC		300	NC	NC
Gamma-BHC (Lindane)	NC		60	400	400
Heptachlor	ND		100	8	8
Aldrin	ND		41	NC	NC
Heptachlor Epoxide	ND		20	8	8
Endosulfan I	NC		900	NC	NC
Dieldrin	ND		44	NC	NC
4,4'-DDE	ND		2100	NC	NC
Endrin	ND		100	20	20
Endosulfan II	NC		900	NC	NC
4,4'-DDD	ND		2900	NC	NC
Endosulfan Sulfate	NC		1000	NC	NC
4,4'-DDT	ND		2100	NC	NC
Methoxychlor	35		NC	10000	10000
Endrin Ketone	NC		NC	NC	NC
Endrin Aldehyde	NC		NC	NC	NC
Chlordane	0.1		540	30	30
PCBs					
PCBs (Total)	0.1	10000 (9)	1000 (Suface) 10000 (Subsurface)	NC	NC
INORGANICS		(mg/kg)	(mg/kg)		
Aluminum	NC		BKGD	NC	NC
Antimony	3 (G)		BKGD	NC	NC
Arsenic	25		7.5 or BKGD	5000	5000
Barium	1000		300 or BKGD	100000	100000
Beryllium	3 (G)		0.16 or BKGD	NC	NC
Cadmium	10		1 or BKGD	1000	1000
Calcium	NC		BKGD	NC	NC
Chromium	50		10 or BKGD	5000	5000
Cobalt	NC		30 or BKGD	NC	NC
Copper	200		25 or BKGD	NC	NC
Iron	300 (8)		2000 or BKGD	NC	NC
Lead	25	400 (10)	BKGD	5000	5000
Magnesium	35000 (G)		BKGD	NC	NC
Manganese	300 (8)		BKGD	NC	NC

TABLE 4-1
HEXAGON LABORATORIES SITE RI/FFS
SAMPLE EVALUATION CRITERIA
Page 3 of 3

	Groundwater	Soil		TCLP Hazardous Characteristic Limit	
Analytical Group Chemical Name	New York State Class GA (1) (ug/L)	Federal (ug/kg)	New York State (2) (ug/kg)	Federal (3) (ug/L)	New York State (4) (ug/L)
Mercury	2		0.1 or BKGD	200	200
Nickel	NC		13 or BKGD	NC	NC
Potassium	NC		BKGD	NC	NC
Selenium	10		2 or BKGD	1000	1000
Silver	50		BKGD	5000	5000
Sodium	20000		BKGD	NC	NC
Thallium	4 (G)		BKGD	NC	NC
Vanadium	NC		150 or BKGD	NC	NC
Zinc	300		20 or BKGD	NC	NC
Cyanide	100		NC	NC	NC

Notes:

1. Class GA groundwater standards obtained from NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1.
2. Recommended cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
3. Criteria for Identifying the Characteristics of Hazardous Waste and for Listing Hazardous Waste (40 CFR 261 Subpart B)
4. Characteristics of Hazardous Waste (6 NYCRR 371.3)
5. Class GA groundwater standard applies to each Xylene isomer (1,2-, 1,3-, and 1,4-) individually.
6. Class GA groundwater standard for total phenols.
7. Class GA groundwater standard for the sum of 1,2-Dichlorobenzene and 1,4-Dichlorobenzene.
8. Class GA groundwater standard for total iron and manganese is 300 ug/L.
9. Unrestricted site access; PCB Spill Cleanup Policy (40 CFR 761.125(c)).
10. A preliminary remediation goal of 400 mg/kg has been set for lead based on Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, OSWER Directive #9355.4-12, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, DC, July 14, 1994.
11. As per TAGM #4046, soil cleanup objective for total VOCs is less than 10 ppm (10,000 ug/kg)
12. As per TAGM #4046, soil cleanup objective for total SVOCs is less than 500 ppm (500,000 ug/kg)
13. As per TAGM #4046, soil cleanup objective for total pesticides is less than 10 ppm (10,000 ug/kg).
14. Regulatory level for total Cresol is 200 mg/L unless individual isomers (o-, m-, and p-Cresol) can be differentiated.
15. NC = No criterion; ND = Non detect; G = Guidance value; BKGD = Site background concentration;

TABLE 4-2
HEXAGON LABORATORIES RI/FFS
SUMMARY OF BACKGROUND METALS CONCENTRATIONS (ppm)

Element	New York Soils	New Jersey Soils(2)	Eastern U.S. Soils	U.S. Soils			
	NYSDEC(1)	NJDEPE(3)	Shacklette and Boerngen(4)	McClanahan(5)	Dragun(6)	Kabata-Pendias & Pendias(7)	
						Clay Soils	Sandy Soils
Aluminum	1,000 - 25,000 (8)		7,000 - 100,000	10,000 - 300,000	10,000 - 300,000		
Antimony		0.69		0.2 - 150	< 1 - 500		
Arsenic	3 - 12	48.9	< 0.1 - 73	0.1 - 194	5 - 15	1.7 - 27	0.1 - 30
Barium	15 - 600		10 - 1,500	100 - 3,000	100 - 3,500	150 - 1,500	20 - 1,500
Beryllium	0 - 1.75	4.09	< 1 - 7	0.01 - 40	< 1 - 7	1 - 15	1 - 3
Cadmium		2.36		0.01 - 7	0.01 - 7		
Calcium	130 - 35,000		100 - 280,000	< 150 - 500,000	100 - 400,000		
Chromium	1.5 - 40	24.6	1 - 1,000	5 - 3,000	10 - 80	20 - 100	3 - 200
Cobalt	2.5 - 60		< 0.3 - 70	0.05 - 5	< 3 - 70	3 - 30	0.4 - 20
Copper	<1 - 15(8)	143	< 1 - 700	2 - 250	2 - 100	7 - 70	1 - 70
Iron	17,500 - 25,000(8)		100 - 100,000	100 - 550,000	7,000 - 550,000		
Lead	1 - 12.5(8)	617	< 10 - 300	< 1 - 888	3 - 30	10 - 70	< 10 - 70
Magnesium	1,700 - 6,000(8)		50 - 50,000	400 - 9,000	600 - 6,000		
Manganese	50 - 5,000	952	< 2 - 7,000	20 - 18,300	100 - 4,000	50 - 2,000	7 - 2,000
Mercury	0.042 - 0.066(8)	2.71	0.01 - 3.4	0.01 - 4.6	0.2 - 0.6	0.01 - 0.90	0.01 - 0.54
Nickel	0.5 - 25	53.8	< 5 - 700	0.1 - 1,530	4 - 30	5 - 50	5 - 70
Potassium	8,500 - 43,000		50 - 37,000	80 - 37,000	400 - 30,000		
Selenium	<0.1 - 0.125(8)	0.15	< 0.1 - 3.9	0.1 - 38	0.1 - 2.0	0.1 - 1.9	0.005 - 3.5
Silver		1.53		0.01 - 8	0.1 - 5.0		
Sodium	6,000 - 8,000(8)		500 - 50,000	150 - 25,000	750 - 7,500		
Thallium		0.46					
Vanadium	25 - 60(8)	46.1	< 7 - 300	3 - 500	20 - 500	20 - 150	7 - 150
Zinc		789	< 5 - 2,900	1 - 2,000	10 - 300	20 - 220	< 15 - 164

Notes:

1. McGovern, E.C. New York State Department of Environmental Conservation (NYSDEC). "Background Concentrations of 20 Elements in Soils with Special Regard for New York State".
2. *Maximum concentrations listed for a total of 19 urban sites throughout New Jersey.*
3. New Jersey Department of Environmental Protection & Energy (NJDEPE). 1993. "A Summary of Selected Soil Constituents and Contaminants at Background Locations in New Jersey".
4. Shacklette, H.T. and Boerngen, J.G. 1984. "Elemental Concentrations in Soils and Other Surficial Materials of the Conterminous United States".
   U.S. Geological Survey Professional Paper 1270. Reported in "Background Concentrations of 20 Elements in Soils with Special Regard for New York State Soils".
   E. Carol McGovern. New York State Department of Environmental Conservation.
5. McClanahan. 1986. Median Elemental Composition of Soils. Agency for Toxic Substances and Disease Registry (ATSDR)
6. Dragun, J. 1988. The Soil Chemistry of Hazardous Materials. The Hazardous Materials Control Research Institute. Silver Springs, Maryland.
7. Kabata-Pendias, A. and Pendias, H. 1984. Trace Elements in Soils and Plants. CRC Press. Boca Raton, Florida.
8. Albany, New York area.

TABLE 4-3
HEXAGON LABORATORIES RI/FFS
SURFACE SOIL AND MISCELLANEOUS SAMPLE ANALYTICAL DATA SUMMARY - VOLATILE ORGANICS (ug/kg)
Page 1 of 2

Sample Location	EAST YARD								
Field Sample ID	HX-SS1	HX-SS2	HX-SS6	HX-SS7	HX-SS8	HX-SS9	HX-SS10	HXB18	HXB19
Sample Interval (feet bgs)	0 - 0.5	0 - 0.5	0.25 - 0.5	0.25 - 0.5	0.25 - 0.5	0.9 - 1	0.25 - 0.5	1.6 -1.9	1.3 - 1.7
Date Sampled	12/18/97	12/18/97	10/1/98	10/1/98	10/1/98	10/2/98	10/2/98	10/2/98	10/1/98
Aromatics									
Benzene	11 UJ	11 UJ	10 U	11 U	11 U	11 U	11 U	11 U	11 J
Toluene	45 J	11 UJ	10 U	11 U	11 U	2 J	1 J	2 J	9 J
Ethylbenzene	1 J	11 UJ	10 U	11 U	11 U	11 U	11 U	4 J	14 J
Xylene(total)	10 J	11 UJ	10 U	11 U	11 U	11 U	11 U	18	38 J
Styrene	11 UJ	11 UJ	10 U	11 U	11 U	11 U	11 U	11 U	29 UJ
Halogenated Aliphatics									
Chloromethane	11 UJ	11 UJ	10 U	11 U	11 U	11 U	11 U	11 U	29 U
Bromomethane	2 JN	11 UJ	10 U	11 U	11 U	11 U	11 U	11 U	29 U
Vinyl Chloride	11 UJ	11 UJ	10 U	11 U	11 U	11 U	11 U	11 U	29 U
Chloroethane	11 UJ	11 UJ	10 U	11 U	11 U	11 U	11 U	11 U	29 U
Methylene Chloride	11 UJ	11 UJ	3 J	4 J	11	5 J	2 J	1 J	32
1,1-Dichloroethene	11 UJ	11 UJ	10 U	11 U	11 U	11 U	11 U	11 U	29 U
1,1-Dichloroethane	11 UJ	11 UJ	10 U	11 U	11 U	11 U	11 U	11 U	29 U
1,2-Dichloroethene (total)	11 UJ	11 UJ	10 U	11 U	11 U	11 U	11 U	11 U	29 U
Chloroform	11 UJ	11 UJ	10 U	11 U	11 U	11 U	11 U	11 U	29 U
1,2-Dichloroethane	19 J	8 J	10 U	11 U	11 U	11 U	11 U	11 U	29 U
1,1,1-Trichloroethane	11 UJ	11 UJ	10 U	11 U	11 U	11 U	11 U	11 U	29 U
1,2-Dichloropropane	11 UJ	11 UJ	10 U	11 U	11 U	11 U	11 U	11 U	29 U
Trichloroethene	2 J	11 UJ	10 U	11 U	11 U	11 U	11 U	11 U	29 U
Tetrachloroethene	4 J	2 J	2 J	11 U	11 U	5 J	37	9 J	29 UJ
Ketones									
Acetone	24 J	11 UJ	2 J	11 U	11 U	20	11 U	140	210
2-Butanone	3 J	11 UJ	10 U	11 U	11 U	4 J	11 U	21	39
4-Methyl-2-pentanone	11 UJ	11 UJ	10 U	11 U	11 U	11 U	11 U	11 UJ	29 UJ
2-Hexanone	11 UJ	11 UJ	10 U	11 U	11 U	11 U	11 U	11 U	29 UJ
Other/Miscellaneous VOCs									
Carbon disulfide	11 UJ	11 UJ	10 U	11 U	11 U	11 U	11 U	2 J	11 J
Chlorobenzene	11 UJ	11 UJ	10 U	11 U	11 U	11 U	11 U	11 U	29 UJ
Total Target VOCs	110 J	10 J	7 J	4 J	11	36 J	40 J	197 J	364 J
Number of VOC TICs	0	0	0	0	0	5	2	29	30
Total VOC TIC Concentration						62 J	12 J	719 J	4908 J

Notes:
1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, Total VOCs must be less than 10 ppm (10,000 ug/kg).
3. Recommended soil cleanup level corresponds to trans 1,2-dichloroethene.
4. U = Not detected; J = Estimated value; R = Rejected value; NC = No criterion.
5. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-3
HEXAGON LABORATORIES RI/FFS
SURFACE SOIL AND MISCELLANEOUS SAMPLE ANALYTICAL DATA SUMMARY - VOLATILE ORGANICS (ug/kg)
Page 2 of 2

Sample Location	SOUTH YARD	OLD PLANT	NEW PLANT		BOS. POST RD.	OFFICE/WARE	HYDROTHERM 1		
Field Sample ID	HX-SS3	HX-SS5	HX-SS4	HXB10S1	HXB6S1	HXB16S1	HXB13S1	HX-OM1	
Sample Interval (feet bgs)	0 - 0.5	0 - 0.5	0 - 0.5	0 - 2	1 - 2	0 - 2	0 - 2	Surface Scrape	NYSDEC
Date Sampled	12/18/97	12/18/97	12/18/97	11/12/97	1/16/98	12/9/97	12/9/97	12/18/97	TAGM Levels [(1)] [(2)]
Aromatics									
Benzene	58 UJ	11 UJ	71 UJ	13000 UJ	11 UJ	11 UJ	110 UJ	3 J	60
Toluene	230 J	35 J	260 J	610000 DJ	11 UJ	2 J	110 UJ	51 J	1500
Ethylbenzene	41 J	2 J	14 J	98000 J	2 J	11 UJ	110 UJ	6 J	5500
Xylene(total)	160 J	12 J	150 J	590000 DJ	17 J	0.9 J	110 UJ	31 J	1200
Styrene	58 UJ	11 UJ	71 UJ	13000 UJ	11 UJ	11 UJ	110 UJ	14 JN	NC
Halogenated Aliphatics									
Chloromethane	58 UJ	11 UJ	71 UJ	13000 UJ	11 UJ	11 UJ	110 UJ	12 J	NC
Bromomethane	58 UJ	11 UJ	71 UJ	13000 UJ	11 UJ	11 UJ	110 UJ	R	NC
Vinyl Chloride	58 UJ	11 UJ	71 UJ	13000 UJ	11 UJ	11 UJ	110 UJ	R	200
Chloroethane	58 UJ	11 UJ	71 UJ	13000 UJ	R	11 UJ	110 UJ	R	1900
Methylene Chloride	58 UJ	11 UJ	71 UJ	13000 UJ	11 UJ	11 UJ	110 UJ	2 J	100
1,1-Dichloroethene	58 UJ	11 UJ	71 UJ	13000 UJ	11 UJ	11 UJ	110 UJ	R	400
1,1-Dichloroethane	58 UJ	11 UJ	71 UJ	13000 UJ	11 UJ	11 UJ	110 UJ	R	200
1,2-Dichloroethene (total)	58 UJ	11 UJ	71 UJ	13000 UJ	11 UJ	11 UJ	110 UJ	R	300 [(3)]
Chloroform	58 UJ	11 UJ	71 UJ	13000 UJ	11 UJ	11 UJ	110 UJ	R	300
1,2-Dichloroethane	29 J	12 J	44 J	13000 UJ	11 UJ	11 UJ	110 UJ	6 J	100
1,1,1-Trichloroethane	58 UJ	11 UJ	71 UJ	13000 UJ	11 UJ	11 UJ	110 UJ	R	800
1,2-Dichloropropane	58 UJ	11 UJ	71 UJ	13000 UJ	11 UJ	11 UJ	110 UJ	R	NC
Trichloroethene	6 J	1 J	71 UJ	2900 J	11 UJ	11 UJ	110 UJ	R	700
Tetrachloroethene	29 J	4 J	71 UJ	13000 J	11 UJ	0.6 J	110 UJ	5 J	1400
Ketones									
Acetone	11 J	4 J	11 J	6100 J	15 J	20 J	34 J	97 J	200
2-Butanone	58 UJ	11 UJ	71 UJ	13000 UJ	11 UJ	11 UJ	110 UJ	R	300
4-Methyl-2-pentanone	58 UJ	11 UJ	71 UJ	13000 UJ	11 UJ	11 UJ	110 UJ	R	1000
2-Hexanone	58 UJ	11 UJ	71 UJ	13000 UJ	11 UJ	11 UJ	110 UJ	R	NC
Other/Miscellaneous VOCs									
Carbon disulfide	58 UJ	11 UJ	71 UJ	13000 UJ	11 UJ	11 UJ	110 UJ	R	2700
Chlorobenzene	*110 J*	*11 UJ*	*71 UJ*	24000 J	*11 UJ*	*11 UJ*	*110 UJ*	R	1700
Total Target VOCs	616 J	70 J	479 J	1344000 J	34 J	23.5 J	34 J	227 J	
Number of VOC TICs	12	2	0	6	30	1	27	3	
Total VOC TIC Concentration	1400 J	21 J		189000 J	4529 J	8 J	12098 J	47 J	

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, Total VOCs must be less than 10 ppm (10,000 ug/kg).
3. Recommended soil cleanup level corresponds to trans 1,2-dichloroethene.
4. U = Not detected; J = Estimated value; R = Rejected value; NC = No criterion.
5. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-4
HEXAGON LABORATORIES RI/FFS
SURFACE SOIL AND MISCELLANEOUS SAMPLE ANALYTICAL DATA SUMMARY - SEMIVOLATILE ORGANICS (ug/kg)
Page 1 of 2

Sample Location	EAST YARD								
Field Sample ID	HX-SS1	HX-SS2	HX-SS6	HX-SS7	HX-SS8	HX-SS9	HX-SS10	HXB18	HXB19
Sample Interval (feet bgs)	0 - 0.5	0 - 0.5	0.25 - 0.5	0.25 - 0.5	0.25 - 0.5	0.9 - 1	0.25 - 0.5	1.6 -1.9	1.3 - 1.7
Date Sampled	12/18/97	12/18/97	10/1/98	10/1/98	10/1/98	10/2/98	10/2/98	10/2/98	10/1/98
Phenols/Acid Extractables									
Phenol	R	R	1700 U	1100 U	1100 U	370 U	350 U	R	730 U
2-Chlorophenol	R	R	1700 U	1100 U	1100 U	370 U	350 U	R	730 U
2-Methylphenol (o-cresol)	R	R	1700 U	1100 U	1100 U	370 U	350 U	R	730 U
4- Methylphenol	R	R	1700 U	1100 U	1100 U	370 U	350 U	R	730 U
2,4-Dimethylphenol	R	R	1700 U	1100 U	1100 U	370 U	350 U	R	730 U
Pentachlorophenol	R	R	1700 UJ	1100 UJ	1100 UJ	370 UJ	350 UJ	R	730 UJ
Polycyclic Aromatic Hydrocarbons (PAHs)									
Naphthalene	370 U	390 U	1700 U	1100 U	1100 U	370 U	350 U	64 J	490 J
2-Methylnaphthalene	42 J	37 J	1700 U	1100 U	1100 U	41 J	350 U	190 J	590 J
Acenaphthylene	370 U	24 J	1700 U	1100 U	1100 U	370 UJ	350 U	350 U	730 U
Acenaphthene	68 J	390 U	1700 U	1100 U	1100 U	370 UJ	350 U	350 U	730 U
Fluorene	130 J	24 J	1700 U	1100 U	1100 U	370 UJ	350 U	350 U	85 J
Phenanthrene	1300	80 J	1700 U	1100 U	1100 U	370 U	350 U	120 J	530 J
Anthracene	150 J	22 JN	1700 U	1100 U	1100 U	370 U	350 U	350 U	97 J
Fluoranthene	1200	390 U	1700 U	1100 U	1100 U	370 U	350 U	75 J	400 J
Pyrene	1800	180 J	1700 U	1100 U	1100 U	370 U	350 U	240 J	1100 J
Benzo(a)anthracene	630	390 U	1700 U	1100 U	1100 U	370 U	350 U	350 U	280 J
Chrysene	1400 JN	2000 JN	1700 U	1100 U	560 J	370 U	130 J	110 J	510 J
Benzo(b)fluoranthene	1200 J	530 JN	1700 U	1100 U	1100 U	39 J	43 J	84 J	520 J
Benzo(k)fluoranthene	560 J	260 JN	1700 U	1100 U	1100 U	370 U	350 U	350 U	150 J
Benzo(a)pyrene	480 J	80 JN	1700 U	1100 U	1100 U	370 U	350 U	350 U	300 J
Indeno(1,2,3-cd)pyrene	270 J	170 J	1700 U	1100 U	1100 U	370 U	350 U	50 J	250 J
Dibenz(a,h)anthracene	94 J	R	1700 U	1100 U	1100 U	370 U	350 U	350 U	730 U
Benzo(g,h,i)perylene	250 J	210 J	1700 U	1100 U	1100 U	52 J	350 U	78 J	400 J
Aniline Compounds									
4-Chloroaniline	370 UJ	390 U	1700 U	1100 U	1100 U	370 U	350 U	350 U	730 U
4-Nitroaniline	940 U	970 U	1700 U	1100 U	1100 U	370 UJ	350 U	350 U	730 U
Benzenes/Aromatics									
1,3-Dichlorobenzene	370 U	390 U	1700 U	1100 U	1100 U	370 U	350 U	350 UJ	730 U
1,4-Dichlorobenzene	370 U	390 U	1700 U	1100 U	1100 U	370 U	350 U	350 UJ	730 U
1,2-Dichlorobenzene	370 U	390 U	1700 U	1100 U	1100 U	370 U	350 U	350 UJ	730 U
Phthalates									
Dimethylphthalate	370 U	390 U	1700 U	1100 U	1100 U	370 UJ	350 U	350 U	730 U
Diethylphthalate	370 U	390 U	1700 U	1100 U	1100 U	370 UJ	350 U	20 J	93 J
Di-n-butyl phthalate	370 U	390 U	1700 U	1100 U	1100 U	370 U	350 U	350 U	490 J
Butylbenzyl phthalate	47 J	33 J	1700 UJ	1100 UJ	1100 UJ	370 UJ	350 UJ	100 J	510 J
bis(2-Ethylhexyl)phthalate	170 JN	140 JN	1700 U	1100 U	130 J	370 U	180 J	98 J	2600 J
Di-n-octyl phthalate	R	R	1700 UJ	1100 UJ	1100 UJ	370 UJ	42 J	350 UJ	730 UJ
Other/Miscellaneous SVOCs									
Carbazole	130 JN	390 U	1700 U	1100 U	1100 U	370 U	350 U	350 U	730 U
Dibenzofuran	65 J	390 U	1700 U	1100 U	1100 U	370 UJ	350 U	350 U	730 U
Total Target SVOCs	9,986 J	3,790 J	0	0	690 J	132 J	395 J	1,229 J	9,395 J
Number of SVOC TICs	9	28	5	19	19	7	19	20	19
Total SVOC TIC Concentration	139,220 J	40,880 J	20,560 J	30,360 J	33,230 J	2,803 J	17,850 J	26,420 J	11,980 J

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, Total SVOCs must be less than 500 ppm (500,000 ug/kg).
3. U = Not detected; J = Estimated value; R = Rejected value; N = Presumptive evidence of presence; D = Diluted sample; NC = No criterion.
4. *Shading indicates exceedance of NYSDEC TAGM Levels.*

TABLE 4-4
HEXAGON LABORATORIES RI/FFS
SURFACE SOIL AND MISCELLANEOUS SAMPLE ANALYTICAL DATA SUMMARY - SEMIVOLATILE ORGANICS (ug/kg)
Page 2 of 2

Sample Location	SOUTH YARD	OLD PLANT	NEW PLANT		BOS. POST RD.	OFFICE/WARE	HYDROTHERM I		NYSDEC TAGM Levels (1)(2)
Field Sample ID	HX-SS3	HX-SS5	HX-SS4	HXB10S1	HXB6S1	HXB16S1	HXB13S1	HX-OM1	
Sample Interval (feet bgs)	0 - 0.5	0 - 0.5	0 - 0.5	0 - 2	1 - 2	0 - 2	0 - 2	Surface Scrape	
Date Sampled	12/18/97	12/18/97	12/18/97	11/12/97	1/16/98	12/9/97	12/9/97	12/18/97	
Phenols/Acid Extractables									
Phenol	390 U	R	R	180 JN	370 U	480 U	4900 U	950000 U	30
2-Chlorophenol	390 U	370 U	380 U	390 U	370 U	480 U	4900 U	950000 U	800
2-Methylphenol (o-cresol)	390 U	370 U	380 U	1100	370 U	480 U	4900 U	950000 U	100
4- Methylphenol	390 U	R	380 U	1800	370 U	480 U	4900 U	950000 U	900
2,4-Dimethylphenol	390 UJ	370 UJ	380 UJ	390 U	370 U	480 U	4900 U	950000 U	NC
Pentachlorophenol	970 U	940 U	960 U	980 U	940 U	1200 UJ	12000 UJ	2400000 U	1000
Polycyclic Aromatic Hydrocarbons (PAHs)									
Naphthalene	640	340 J	70 J	460	370 U	480 U	4900 U	950000 U	13000
2-Methylnaphthalene	1600	370 U	80 J	2000	89 J	480 U	520 J	950000 U	36400
Acenaphthylene	390 U	370 U	380 U	390 U	23 J	480 U	4900 U	950000 U	41000
Acenaphthene	300 JN	R	380 U	390 U	35 J	480 U	R	120000 JN	50000
Fluorene	660	370 U	230 J	120 J	41 J	480 U	3000 JN	380000 JN	50000
Phenanthrene	1300	300 JN	490 JN	360 J	440	81 J	15000 J	660000 J	50000
Anthracene	140 JN	370 U	380 U	390 U	120 J	480 UJ	4900 UJ	950000 U	50000
Fluoranthene	390 U	370 U	380 U	160 J	860	170 J	4900 UJ	950000 U	50000
Pyrene	390 UJ	370 UJ	R	93 J	820	120 J	4900 U	950000 U	50000
Benzo(a)anthracene	390 UJ	370 UJ	R	70 J	490	75 J	4900 U	950000 U	224
Chrysene	7400 DJN	4000 DJN	4400 DJN	130 J	490	130 J	300000 D	7200000	400
Benzo(b)fluoranthene	1200 J	R	R	100 J	700	110 J	1400 J	950000 UJ	1100
Benzo(k)fluoranthene	460 J	R	R	52 J	340 J	480 U	4900 UJ	950000 UJ	1100
Benzo(a)pyrene	630 J	R	R	63 J	440	50 J	3200 J	R	61
Indeno(1,2,3-cd)pyrene	230 J	R	R	390 U	260 J	480 U	4900 UJ	950000 UJ	3200
Dibenz(a,h)anthracene	R	R	R	390 U	88 J	480 U	4900 UJ	950000 UJ	14
Benzo(g,h,i)perylene	R	R	R	390 U	130 J	480 U	4900 UJ	950000 UJ	50000
Aniline Compounds									
4-Chloroaniline	390 UJ	370 UJ	380 UJ	390 U	370 UJ	480 UJ	4900 UJ	950000 U	220
4-Nitroaniline	970 U	940 U	• 960 U	980 U	940 U	1200 U	12000 U	2400000 U	NC
Benzenes/Aromatics									
1,3-Dichlorobenzene	390 U	320 J	380 U	75 J	370 U	480 U	4900 U	950000 U	1600
1,4-Dichlorobenzene	390 U	370 U	380 U	390 U	370 U	480 U	4900 U	950000 U	8500
1,2-Dichlorobenzene	740	150 J	500	83 J	370 U	480 U	4900 U	950000 U	7900
Phthalates									
Dimethylphthalate	180 JN	500	150 J	390 U	370 U	480 U	4900 U	950000 U	2000
Diethylphthalate	390 U	370 U	380 U	5000 D	370 U	480 U	4900 U	950000 U	7100
Di-n-butyl phthalate	390 U	2300	2900 JN	390 U	370 U	150 J	4900 UJ	950000 U	8100
Butylbenzyl phthalate	390 UJ	370 UJ	R	390 U	370 U	480 UJ	4900 U	950000 U	50000
bis(2-Ethylhexyl)phthalate	630 J	R	3800 DJN	810	89 J	6100 DJ	4900 U	950000 U	50000
Di-n-octyl phthalate	R	R	540 J	390 U	370 U	480 UJ	4900 UJ	950000 UJ	50000
Other/Miscellaneous SVOCs									
Carbazole	390 U	370 U	380 U	390 U	28 J	480 UJ	4900 UJ	950000 U	NC
Dibenzofuran	390 U	370 U	380 U	100 J	21 J	480 U	4900 U	950000 U	6200
Total Target SVOCs	16,110 J	7,910 J	13,160 J	12,756 J	5,504 J	6,986 J	323,120 J	8,360,000 J	
Number of SVOC TICs	18	15	26	28	30	28	39	27	
Total SVOC TIC Concentration	11,540 J	8,460 J	27,800 J	214,400 J	8,675 J	18,800 J	2,572,600 J	126,000,000 J	

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, Total SVOCs must be less than 500 ppm (500,000 ug/kg).
3. U = Not detected; J = Estimated value; R = Rejected value; N = Presumptive evidence of presence; D = Diluted sample; NC = No criterion.
4. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-5
HEXAGON LABORATORIES RI/FFS
SURFACE SOIL AND MISCELLANEOUS SAMPLE ANALYTICAL DATA SUMMARY - PESTICIDES/PCBs (ug/kg)
Page 1 of 2

Sample Location	EAST YARD								
Field Sample ID	HX-SS1	HX-SS2	HX-SS6	HX-SS7	HX-SS8	HX-SS9	HX-SS10	HXB18	HXB19
Sample Interval (feet bgs)	0 - 0.5	0 - 0.5	0.25 - 0.5	0.25 - 0.5	0.25 - 0.5	0.9 - 1	0.25 - 0.5	1.6 - 1.9	1.3 - 1.7
Date Sampled	12/18/97	12/18/97	10/1/98	10/1/98	10/1/98	10/2/98	10/2/98	10/2/98	10/1/98
Pesticides									
alpha-BHC	1.9 U	2.0 U	NA	NA	NA	NA	NA	NA	NA
beta-BHC	1.9 U	2.0 U	NA	NA	NA	NA	NA	NA	NA
delta-BHC	R	2.0 U	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	1.9 U	2.0 U	NA	NA	NA	NA	NA	NA	NA
Heptachlor	6.4 J	2.0 U	NA	NA	NA	NA	NA	NA	NA
Aldrin	8.5 J	▨ 67 DJN	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	2.7 JN	2.0 U	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	1.9 U	2.0 U	NA	NA	NA	NA	NA	NA	NA
Dieldrin	R	3.8 U	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	R	21	NA	NA	NA	NA	NA	NA	NA
Endrin	5.6 JN	R	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	3.7 U	5.1 JN	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	R	3.8 U	NA	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	3.7 U	3.8 U	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	R	R	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	19 UJ	20 UJ	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	3.7 U	3.8 U	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	3.7 U	4.0 JN	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	R	2.0 U	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	29	5.2 JN	NA	NA	NA	NA	NA	NA	NA
PCBs									
Aroclor-1242	37 U	38 U	35 U	36 U	35 U	37 U	35 U	35 U	▨ 1200 J
Aroclor-1248	37 U	640	35 U	36 U	35 U	37 U	35 U	500 JN	37 U
Aroclor-1254	37 U	38 U	35 U	36 U	35 U	37 U	140 J	35 U	37 U
Aroclor-1260	37 U	38 U	35 U	R	R	37 U	140	200 JN	R

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, total pesticide concentration shall be less than 10 ppm (10,000 ug/kg).
3. Soil cleanup objective for Chlordane does not specify isomer.
4. Recommended soil cleanup level corresponds to total PCBs in surface soil.
5. U = Not detected; J = Estimated value; R = Rejected value; N = Presumptive evidence of presence; D = Diluted sample; NC = No criterion; NA = Not analyzed.
6. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-5
HEXAGON LABORATORIES RI/FFS
SURFACE SOIL AND MISCELLANEOUS SAMPLE ANALYTICAL DATA SUMMARY - PESTICIDES/PCBs (ug/kg)
Page 2 of 2

Sample Location	SOUTH YARD	OLD PLANT	NEW PLANT		BOS. POST RD.	OFFICE/WARE	HYDROTHERM 1		
Field Sample ID	HX-SS3	HX-SS5	HX-SS4	HXB10S1	HXB6S1	HXB16S1	HXB13S1	HX-OM1	
Sample Interval (feet bgs)	0 - 0.5	0 - 0.5	0 - 0.5	0 - 2	1 - 2	0 - 2	0 - 2	Surface Scrape	NYSDEC
Date Sampled	12/18/97	12/18/97	12/18/97	11/12/97	1/16/98	12/9/97	12/9/97	12/18/97	TAGM Levels $^{(1)(2)}$
Pesticides									
alpha-BHC	2.0 U	1.9 U	2.0 U	8.0 U	1.9 U	0.49 U	0.50 U	R	110
beta-BHC	2.0 U	1.9 U	2.0 U	13 JN	1.9 U	0.49 U	0.50 U	R	200
delta-BHC	2.0 U	R	2.0 U	8.0 U	11	0.49 U	R	R	300
gamma-BHC (Lindane)	2.0 U	1.9 U	2.0 U	8.0 U	1.9 U	0.49 U	0.50 U	R	60
Heptachlor	2.0 U	R	R	8.0 U	1.9 U	0.49 U	0.50 U	R	100
Aldrin	180 DJN	1.9 U	22 JN	8.0 U	3.5 J	R	0.50 U	R	41
Heptachlor Epoxide	2.0 U	1.9 U	2.0 U	8.0 U	1.9 U	0.49 U	0.50 U	R	20
Endosulfan I	2.0 U	R	R	8.0 U	1.9 U	0.49 U	0.50 U	R	900
Dieldrin	R	R	3.8 U	16 U	3.7 U	R	0.96 U	R	44
4,4'-DDE	3.8 U	3.7 U	3.8 U	160 JN	3.7 U	0.95 U	R	R	2100
Endrin	R	R	3.8 U	96 JN	3.7 U	4.9 JN	36 DJ	R	100
Endosulfan II	3.8 U	R	3.8 U	16 U	3.7 U	0.95 U	R	R	900
4,4'-DDD	R	R	R	16 U	3.7 U	0.95 U	11 JN	R	2900
Endosulfan Sulfate	3.8 U	3.7 U	3.8 U	24 JN	3.7 U	0.95 U	0.96 U	R	1000
4,4'-DDT	R	R	R	58 JN	R	R	0.96 U	R	2100
Methoxychlor	20 UJ	19 UJ	20 UJ	80 U	19 U	4.9 U	39 J	R	NC
Endrin ketone	3.8 U	R	3.8 U	16 U	3.7 U	0.95 U	0.96 U	R	NC
Endrin aldehyde	R	3.7 U	R	24 JN	R	0.95 U	0.96 U	R	NC
alpha-Chlordane	2.0 U	1.9 U	2.0 U	71	1.9 U	0.49 U	0.50 U	R	540 $^{(3)}$
gamma-Chlordane	R	1.9 U	2.0 U	71 JN	3.9	2.1 J	0.50 U	R	540 $^{(3)}$
PCBs									
Aroclor-1242	38 U	37 U	38 U	160 U	37 U	9.5 U	9.6 U	R	1000 $^{(4)}$
Aroclor-1248	1500	37 U	320 J	740	37 U	9.5 U	9.6 U	R	1000 $^{(4)}$
Aroclor-1254	38 U	37 U	38 U	160 U	90 JN	9.5 U	9.6 U	R	1000 $^{(4)}$
Aroclor-1260	38 U	37 U	38 U	160 U	37 U	9.5 U	9.6 U	R	1000 $^{(4)}$

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. *As per TAGM #4046, total pesticide concentration shall be less than 10 ppm (10,000 ug/kg).*
3. Soil cleanup objective for Chlordane does not specify isomer.
4. Recommended soil cleanup level corresponds to total PCBs in surface soil.
5. U = Not detected; J = Estimated value; R = Rejected value; N = Presumptive evidence of presence; D = Diluted sample; NC = No criterion; NA = Not analyzed.
6. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-6
HEXAGON LABORATORIES RI/FFS
SURFACE SOIL AND MISCELLANEOUS SAMPLE ANALYTICAL DATA SUMMARY - INORGANICS (mg/kg)
Page 1 of 2

Sample Location	EAST YARD									SOUTH YARD
Field Sample ID	HX-SS1	HX-SS2	HX-SS6	HX-SS7	HX-SS8	HX-SS9	HX-SS10	HXB18	HXB19	HX-SS3
Sample Interval (feet bgs)	0 - 0.5	0 - 0.5	0.25 - 0.5	0.25 - 0.5	0.25 - 0.5	0.9 - 1	0.25 - 0.5	1.6 - 1.9	1.3 - 1.7	0 - 0.5
Date Sampled	12/18/97	12/18/97	10/1/98	10/1/98	10/1/98	10/2/98	10/2/98	10/2/98	10/1/98	12/18/97
Aluminum	4190	8010	10300	7360	7830	10400	12200	7230	10600	10400
Antimony	0.60 UJ	0.48 UJ	0.79 U	1.0 U	11.8 J	3.4 J	2.5 J	0.83 U	24.3 J	0.83 J
Arsenic	4.9	3.9	2.5	3.2	6.5 J	5.7 J	3.9	5.1 J	27.5 J	9.5
Barium	47.0 J	151 J	94.4	84.5	646	588	114	123	1840	194 J
Beryllium	0.20 U	0.35	0.24	0.19	0.20	0.35	0.14	0.27	0.22	0.42
Cadmium	0.22	1.6	0.62 J	0.90 J	7.7 J	7.2 J	0.79 J	1.1 J	31.5 J	2.1
Calcium	42800 J	5700 J	5750	11700	19000	19500	7920	76700	32100	29100 J
Chromium	14.8 J	55.1 J	24.4 J	18.9 J	37.2 J	54.5 J	9.8 J	33.3 J	123 J	133 J
Cobalt	2.8	11.0	11.2	9.7	11.7	10.9	13.7	13.3	14.0	12.2
Copper	14.4 J	57.9 J	49.6 J	73.4 J	266 J	380 J	75.1 J	65.4 J	3720 J	95.1 J
Iron	6490	20700	22800	17300	24600	31800	23500	15400	42000	29300
Lead	32.8 J	144 J	52.0 J	111 J	856 J	928 J	286 J	99.9 J	1400 J	206 J
Magnesium	4760 J	3530 J	5230	3660	8330	5810	4370	10500	5610	6860 J
Manganese	123 J	222 J	279	867	713	219	750	223	452	327 J
Mercury	0.09 J	0.58 J	0.10 U	0.10 U	0.56	0.21	0.10 U	0.17	1.1	7.3 J
Nickel	11.2	60.1	14.2 J	101 J	115 J	217 J	19.5 J	0.10 U	140 J	97.0
Potassium	950	2380 J	4110 J	2450 J	1350 J	4800 J	464 J	3580 J	2610 J	4420 J
Selenium	3.5 J	0.87 UJ	0.85	1.0 U	0.96 U	1.3	0.96 U	0.8 U	8.6	3.0 J
Silver	0.40 UJ	0.32 UJ	R	R	R	R	R	R	R	0.41 UJ
Sodium	184	154	711	567	4260	9000	1410	545	20900	282
Thallium	0.41	0.55	2.2	0.84 U	0.77 U	2.7	0.77 U	0.66 U	0.73 U	0.79
Vanadium	21.2	28.3	64.9 J	39.1 J	74.0 J	31.0 J	85.9 J	28.7 J	64.5 J	34.9
Zinc	64.8	545	269 J	296 J	3020 J	6890 J	381 J	265 J	8100 J	482
Cyanide	R	R	0.05 U	0.05 U	1.8 J	0.13 J	0.05 U	0.05 U	3.2 J	R

Notes:
1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. Except as noted, background concentrations represent the maximum background concentration for New York State soils as reported by E.C. McGovern, NYSDEC, in "Background Concentrations of 20 Elements in Soils with Special Regard for New York State", undated.
3. Maximum concentration listed for urban New Jersey soils as reported by NJDEPE in "A Summary of Selected Soil Constituents and Contaminants at Background Locations in New Jersey", 1993.
4. Maximum concentration detected in site-specific background sample.
5. As indicated in NYSDEC TAGM HWR-94-4046, average background levels of lead in metropolitan or suburban areas or near highways typically range as high as 500 ppm.
6. Background concentrations for cyanide were not reported in literature sources reviewed. Cyanide was not detected in the three site-specific background samples and, therefore, the background concentration for cyanide is assumed to be non detect.
7. U = Not detected; J = Estimated value; R = Rejected value; BKGD = Site background concentration; NC = No criterion; ND = Non detect.
8. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-6
HEXAGON LABORATORIES RI/FFS
SURFACE SOIL AND MISCELLANEOUS SAMPLE ANALYTICAL DATA SUMMARY - INORGANICS (mg/kg)
Page 2 of 2

Sample Location	OLD PLANT	NEW PLANT		BOS. POST RD.	OFFICE/WARE	HYDROTHERM 1			
Field Sample ID	HX-SS5	HX-SS4	HXB10S1	HXB6S1	HXB16S1	HXB13S1	HX-OM1	NYSDEC TAGM Levels (1)	Background Concentrations (2)
Sample Interval (feet bgs)	0 - 0.5	0 - 0.5	0 - 2	1 - 2	0 - 2	0 - 2	Surface Scrape		
Date Sampled	12/18/97	12/18/97	11/12/97	1/16/98	12/9/97	12/9/97	12/18/97		
Aluminum	3420	2500	14600	15200	17600 J	21700 J	1560	BKGD	25000
Antimony	0.54 UJ	0.62 UJ	0.55 U	0.61 UJ	0.51 UJ	0.53 UJ	9.5 J	BKGD	0.69 (3)
Arsenic	4.2	63.8	1.3	3.2	4.8 J	5.6 J	7.0	7.5 or BKGD	12
Barium	145 J	812 J	142	203	212 J	367 J	115 J	300 or BKGD	600
Beryllium	0.18 U	0.21 U	0.63	0.47	0.66	0.62	0.18 U	0.16 or BKGD	1.75
Cadmium	1.9	11.7	0.29	2.5	0.5	0.26	6.5	1 or BKGD	2.36 (3)
Calcium	65500 J	18500 J	2950	33200 J	27800 J	6620 J	23400 J	BKGD	35000
Chromium	57.9 J	257 J	123	229 J	54.7 J	52.9 J	318 J	10 or BKGD	64.5 (4)
Cobalt	4.9	28.2	15.5	16.6	23.6 J	24.7 J	43.2	30 or BKGD	60
Copper	80.1 J	1050 J	61.6	57.7 J	75.5 J	53.7 J	293 J	25 or BKGD	196 (4)
Iron	31200	246000	22100	23800	25500 J	33400 J	69300	2000 or BKGD	57900 (4)
Lead	185 J	1040 J	8.8	53.3 J	90.3	54.5	1190 J	BKGD	500 (5)
Magnesium	13200 J	1540 J	7380	8770	17400 J	11800 J	15200 J	BKGD	8570 (4)
Manganese	400 J	1890 J	320	319 J	451 J	421 J	528 J	BKGD	5000
Mercury	3.7 J	6.7 J	0.16	1.1 J	0.33 J	2.3 J	0.43 J	0.1 or BKGD	2.71 (3)
Nickel	28.5	265	63.5	40.9	85.0 J	37.6 J	110	13 or BKGD	72.3 (4)
Potassium	234 U	409	7470 J	8860	10700	13600	234 U	BKGD	43000
Selenium	2.4 J	0.96 UJ	0.91 U	R	0.85 UJ	0.89 UJ	1.1 UJ	2 or BKGD	0.125
Silver	0.36 UJ	0.41 UJ	0.36 UJ	0.40 U	0.34 UJ	0.35 UJ	1.5 J	BKGD	1.53 (3)
Sodium	228	350	320	66.6	229	112	1690	BKGD	8000
Thallium	0.73	2.8	0.38	4.0	1.6	1.3	0.83	BKGD	1.5 (4)
Vanadium	16.4	19.0	42.0	50.4	58.8	69.0	18.3	150 or BKGD	60
Zinc	327	1270	87.7 J	166 J	225 J	162 J	1090	20 or BKGD	1100 (4)
Cyanide	R	R	0.87 U	0.83 U	1.1 U	1.0 U	R	NC	ND(6)

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. Except as noted, background concentrations represent the maximum background concentration for New York State soils as reported by E.C. McGovern, NYSDEC, in "Background Concentrations of 20 Elements in Soils with Special Regard for New York State", undated.
3. Maximum concentration listed for urban New Jersey soils as reported by NJDEPE in "A Summary of Selected Soil Constituents and Contaminants at Background Locations in New Jersey", 1993.
4. Maximum concentration detected in site-specific background sample.
5. As indicated in NYSDEC TAGM HWR-94-4046, average background levels of lead in metropolitan or suburban areas or near highways typically range as high as 500 ppm.
6. Background concentrations for cyanide were not reported in literature sources reviewed. Cyanide was not detected in the three site-specific background samples and, therefore, the background concentration for cyanide is assumed to be non detect.
7. U = Not detected; J = Estimated value; R = Rejected value; BKGD = Site background concentration; NC = No criterion; ND = Non detect.
8. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-7
HEXAGON LABORATORIES RI/FFS
SURFACE SOIL AND MISCELLANEOUS SAMPLE ANALYTICAL DATA SUMMARY - TOTAL ORGANIC CARBON AND TOTAL PETROLEUM HYDROCARBONS (mg/kg)

Sample Location	EAST YARD			SOUTH YARD	OLD PLANT	NEW PLANT		BOS. POST RD.	HYDROTHERM 1	
Field Sample ID	HX-SS1	HX-SS2	HX-SS9	HX-SS3	HX-SS5	HX-SS4	HXB10S1	HXB6S1	HXB13S1	HX-OM1
Sample Interval (feet bgs)	0 - 0.5	0 - 0.5	0.9 - 1.0	0 - 0.5	0 - 0.5	0 - 0.5	0 - 2	1 - 2	0 - 2	Surface Scrape
Date Sampled	12/18/97	12/18/97	10/2/98	12/18/97	12/18/97	12/18/97	11/12/97	1/16/98	12/9/97	12/18/97
TOC	22400	6630	13400	21800	25900	50800	3260	5360	NA	647000
TPHC	NA	330	NA	1500	NA	NA	NA	NA	28000	280000

Notes:
1. NA = Not analyzed.

TABLE 4-8
HEXAGON LABORATORIES RI/FFS
SUBSURFACE BORING ANALYTICAL DATA SUMMARY - VOLATILE ORGANICS (ug/kg)
Page 1 of 2

Sample Location	EAST YARD							SOUTH YARD		
Field Sample ID	HXB1S3	HXB1S7	HXB7S2	HXB7S4	HXB17	HXB20	HXB21	HXB3S2	HXB8S4	HXB9S3
Sample Interval (feet bgs)	4 - 6	11 - 13	2 - 4	6 - 8	2 - 2.5	2.2 - 2.3	2 - 2.5	2 - 4	6 - 7	4 - 6
Date Sampled	11/19/97	11/19/97	11/11/97	11/11/97	10/1/98	10/2/98	10/2/98	11/11/97	11/17/97	11/11/97
Aromatics										
Benzene	2 J	11 U	110 UJ	1 J	330	2 J	22	11 UJ	11 UJ	30 J
Toluene	130	11 U	360 J	78 J	10 J	4 J	54	88 J	11 UJ	75 J
Ethylbenzene	3 J	11 U	390 J	2 J	380	2 J	26	11 J	41 J	650 J
Xylene(total)	22	11 U	2400 J	12 J	130	6 J	200	99 J	240 J	880 J
Styrene	12 U	11 U	110 UJ	11 UJ	56 U	12 U	12 U	11 UJ	11 UJ	120 UJ
Halogenated Aliphatics										
Chloromethane	12 U	11 U	110 UJ	11 UJ	56 U	12 U	12 U	11 UJ	11 UJ	120 UJ
Bromomethane	12 UJ	11 UJ	110 UJ	11 UJ	56 U	12 U	12 U	11 UJ	11 UJ	120 UJ
Vinyl Chloride	12 U	11 U	110 UJ	11 UJ	56 U	12 U	12 U	11 UJ	11 UJ	120 UJ
Chloroethane	12 U	11 U	110 UJ	11 UJ	56 U	12 U	12 U	11 UJ	11 UJ	120 UJ
Methylene Chloride	0.8 J	6 J	110 UJ	1 J	12 J	2 J	2 J	1 J	11 UJ	120 UJ
1,1-Dichloroethene	12 U	11 U	110 UJ	11 UJ	56 U	12 U	12 U	11 UJ	11 UJ	120 UJ
1,1-Dichloroethane	12 U	11 U	110 UJ	11 UJ	56 U	12 U	12 U	11 UJ	11 UJ	120 UJ
1,2-Dichloroethene (total)	12 U	11 U	110 UJ	11 UJ	56 U	12 U	12 U	11 J	11 UJ	120 UJ
Chloroform	12 U	11 U	110 UJ	11 UJ	56 U	12 U	12 U	11 UJ	11 UJ	120 UJ
1,2-Dichloroethane	34	24	65 J	34 J	56 U	12 U	12 U	30 J	11 UJ	36 J
1,1,1-Trichloroethane	12 U	11 U	110 UJ	1 J	56 U	12 U	12 U	11 UJ	11 UJ	120 UJ
1,2-Dichloropropane	12 U	11 U	110 UJ	11 UJ	56 U	12 U	12 U	11 UJ	11 UJ	120 UJ
Trichloroethene	4 J	0.9 J	12 J	9 J	56 U	12 U	12 U	19 J	11 UJ	120 UJ
Tetrachloroethene	6 J	11 U	110 UJ	5 J	56 U	18	12 J	51 J	11 UJ	120 UJ
Ketones										
Acetone	12 J	30	200 J	30 J	240	36	140	38 J	11 UJ	250 J
2-Butanone	4 J	3 J	110 UJ	5 J	61	5 J	24	30 J	11 UJ	120 UJ
4-Methyl-2-pentanone	12 U	11 U	110 UJ	11 UJ	56 UJ	12 UJ	12 UJ	11 UJ	11 UJ	120 UJ
2-Hexanone	12 U	11 U	110 UJ	11 UJ	56 U	12 U	12 U	11 UJ	11 UJ	120 UJ
Other/Miscellaneous VOCs										
Carbon disulfide	12 U	11 U	110 UJ	11 UJ	56 U	2 J	5 J	11 UJ	11 UJ	120 UJ
Chlorobenzene	12 U	3 J	12 J	2 J	84	12 U	12 U	11 UJ	25 J	34 J
TOTAL TARGET VOCs	218 J	67 J	3439 J	180 J	1247 J	77 J	485 J	378 J	306 J	1955 J
Number of VOA TICs	2	2	30	0	30	30	30	2	30	30
Total VOA TIC Concentration	24 J	44 J	13270 J		11590 J	461 J	2947 J	43 J	1568 J	71500 J

Notes:
1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, Total VOCs must be less than 10 ppm (10,000 ug/kg).
3. Recommended soil cleanup level corresponds to trans 1,2-dichloroethene.
4. U = Not detected; J = Estimated value; R = Rejected value; N = Presumptive evidence of presence; D = Diluted sample; NC = No criterion.
5. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-8
HEXAGON LABORATORIES RI/FFS
SUBSURFACE BORING ANALYTICAL DATA SUMMARY - VOLATILE ORGANICS (ug/kg)
Page 2 of 2

Sample Location	SOUTH YARD	NORTH YARD	OLD PLANT			NEW PLANT	TUFO'S	HOLLERS AVE.	PEARTREE AVE.	NYSDEC TAGM Levels $^{(1)(2)}$
Field Sample ID	HXB9S5	HXB15S1	HXB5S2	HXB11S2	HXB12S2	HXB4S2	HXBK1	HXBK2	HXBK3	
Sample Interval (feet bgs)	8 - 10	2.5 - 4.5	2 - 4	4 - 5	2 - 4	2 - 4	2.5 - 4.5	2.5 - 4.5	2.5 - 4.5	
Date Sampled	11/11/97	11/19/97	11/14/97	11/12/97	11/12/97	11/18/97	11/17/97	11/17/97	11/17/97	
Aromatics										
Benzene	1400 UJ	0.6 J	5600 U	28000 JN	6900 UJ	140000 U	12 UJ	11 UJ	11 UJ	60
Toluene	1400 UJ	28	340000 D	21000000 DJ	150000 DJ	3200000 D	9 J	11 UJ	11 UJ	1500
Ethylbenzene	2200 J	0.9 J	47000	770000 J	7700 J	490000	12 UJ	11 UJ	11 UJ	5500
Xylene(total)	3000 J	6 J	220000	3400000 DJ	48000 J	3300000	12 UJ	11 UJ	11 UJ	1200
Styrene	1400 UJ	10 U	5600 U	69000 UJ	6900 UJ	140000 U	12 UJ	11 UJ	11 UJ	NC
Halogenated Aliphatics										
Chloromethane	1400 UJ	10 U	5600 U	69000 UJ	6900 UJ	140000 U	12 UJ	11 UJ	11 UJ	NC
Bromomethane	1400 UJ	10 U	5600 U	69000 UJ	6900 UJ	140000 U	12 UJ	11 UJ	11 UJ	NC
Vinyl Chloride	1400 UJ	10 U	5600 U	69000 UJ	6900 UJ	140000 U	12 UJ	11 UJ	11 UJ	200
Chloroethane	1400 UJ	10 U	5600 U	69000 UJ	6900 UJ	140000 U	12 UJ	11 UJ	11 UJ	1900
Methylene Chloride	570 J	0.6 J	5600 U	26000 J	6900 UJ	140000 U	12 UJ	11 UJ	11 UJ	100
1,1-Dichloroethene	1400 UJ	10 U	5600 U	69000 UJ	6900 UJ	140000 U	12 UJ	11 UJ	11 UJ	400
1,1-Dichloroethane	1400 UJ	10 U	5600 U	27000 J	6900 UJ	140000 U	12 UJ	11 UJ	11 UJ	200
1,2-Dichloroethene (total)	1400 UJ	10 U	5600 U	69000 UJ	6900 UJ	140000 U	12 UJ	11 UJ	11 UJ	300 $^{(3)}$
Chloroform	1400 UJ	10 U	5600 U	69000 UJ	6900 UJ	140000 U	12 UJ	11 UJ	11 UJ	300
1,2-Dichloroethane	1400 UJ	36	5600 U	5100000 DJN	6900 UJ	68000 J	12 UJ	11 UJ	11 UJ	100
1,1,1-Trichloroethane	1400 UJ	10 U	5600 U	570000 J	6900 UJ	15000 J	12 UJ	11 UJ	11 UJ	800
1,2-Dichloropropane	1400 UJ	10 U	5600 U	69000 UJ	6900 UJ	140000 J	12 UJ	11 UJ	11 UJ	NC
Trichloroethene	1400 UJ	0.9 J	410 J	880000 J	840 J	150000	9 J	11 UJ	11 UJ	700
Tetrachloroethene	1400 UJ	1 J	5600 U	310000 J	5100 J	1100000	2 J	11 UJ	11 UJ	1400
Ketones										
Acetone	1400 UJ	4 J	4700 J	69000 UJ	6900 UJ	140000 U	89 J	2 J	4 J	200
2-Butanone	1400 UJ	10 U	5600 U	69000 UJ	6900 UJ	140000 U	21 J	11 UJ	11 UJ	300
4-Methyl-2-pentanone	1400 UJ	10 U	5600 U •	69000 UJ	6900 UJ	140000 U	12 UJ	11 UJ	11 UJ	1000
2-Hexanone	1400 UJ	10 U	5600 U	69000 UJ	6900 UJ	140000 U	12 UJ	11 UJ	11 UJ	NC
Other/Miscellaneous VOCs										
Carbon disulfide	1400 UJ	10 U	5600 U	69000 UJ	6900 UJ	140000 U	12 UJ	11 UJ	11 UJ	2700
Chlorobenzene	400 J	10 U	5600 U	200000 J	2900 J	140000 U	12 UJ	11 UJ	11 UJ	1700
TOTAL TARGET VOCs	6170 J	78 J	612110 J	32311000 J	214540 J	8463000 J	130 J	2 J	4 J	
Number of VOA TICs	30	2	4	6	`8	1	30	0	0	
Total VOA TIC Concentration	266300 J	21 J	29000 J	919000 J	73600 J	83000 J	4169 J			

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, Total VOCs must be less than 10 ppm (10,000 ug/kg).
3. Recommended soil cleanup level corresponds to trans 1,2-dichloroethene.
4. U = Not detected; J = Estimated value; R = Rejected value; N = Presumptive evidence of presence; D = Diluted sample; NC = No criterion.
5. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-9
HEXAGON LABORATORIES RI/FFS
SUBSURFACE BORING ANALYTICAL DATA SUMMARY - SEMIVOLATILE ORGANICS (ug/kg)
Page 1 of 2

Sample Location	EAST YARD							SOUTH YARD		
Field Sample ID	HXB1S3	HXB1S7	HXB7S2	HXB7S4	HXB17	HXB20	HXB21	HXB3S2	HXB8S4	HXB9S3
Sample Interval (feet bgs)	4 - 6	11 - 13	2 - 4	6 - 8	2 - 2.5	2.2 - 2.3	2 - 2.5	2 - 4	6 - 7	4 - 6
Date Sampled	11/19/97	11/19/97	11/11/97	11/11/97	10/1/98	10/2/98	10/2/98	11/11/97	11/17/97	11/11/97
Phenols/Acid Extractables										
Phenol	550 UJ	530 UJ	740 UJ	380 U	1100 U	760 U	160 J	R	1500 UJ	750 UJ
2-Chlorophenol	550 UJ	530 UJ	740 UJ	380 U	1100 U	760 U	780 U	R	1500 UJ	750 UJ
2-Methylphenol (o-cresol)	550 UJ	530 UJ	740 UJ	380 U	1100 U	760 U	140 J	R	1500 UJ	750 UJ
4- Methylphenol	550 UJ	530 UJ	740 UJ	380 U	1100 U	760 U	800	R	1500 UJ	750 UJ
2,4-Dimethylphenol	550 UJ	530 UJ	740 UJ	380 U	1100 U	760 U	780 U	R	1500 UJ	750 UJ
Pentachlorophenol	1400 UJ	1300 UJ	1800 UJ	960 U	1100 UJ	760 UJ	780 UJ	R	3700 UJ	1900 UJ
Polycyclic Aromatic Hydrocarbons (PAHs)										
Naphthalene	56 J	530 UJ	600 J	380 U	760 J	270 J	1200	380 U	600 J	1800
2-Methylnaphthalene	56 J	530 UJ	840	380 U	1100	300 J	1600	380 U	2400 J	12000 D
Acenaphthylene	550 UJ	530 UJ	740 U	380 U	1100 U	760 U	120 J	380 U	1500 UJ	750 U
Acenaphthene	550 UJ	530 UJ	740 U	380 U	1100 U	760 U	780 U	380 U	300 J	1100
Fluorene	550 UJ	530 UJ	51 J	380 U	1100 U	83 J	140 J	380 U	280 J	1600
Phenanthrene	360 J	530 UJ	310 J	380 U	430 J	550 J	1000	380 U	480 J	3300
Anthracene	68 J	530 UJ	740 U	380 U	1100 U	120 J	270 J	380 U	1500 UJ	750 U
Fluoranthene	480 J	530 UJ	230 J	380 U	430 J	730 J	970	380 U	1500 UJ	200 J
Pyrene	460 J	530 UJ	510 J	380 U	1000 J	1300	2100	380 U	1500 UJ	510 J
Benzo(a)anthracene	230 J	530 UJ	140 JN	380 U	220 J	440 J	690 J	380 U	1500 UJ	750 U
Chrysene	290 J	530 UJ	250 J	380 U	460 J	760	1200	380 U	1500 UJ	150 J
Benzo(b)fluoranthene	340 J	530 UJ	260 JN	380 U	410 J	600 J	1100	380 U	1500 UJ	750 U
Benzo(k)fluoranthene	120 J	530 UJ	80 JN	380 U	120 J	260 J	360 J	380 U	1500 UJ	750 U
Benzo(a)pyrene	190 J	530 UJ	210 J	380 U	210 J	340 J	720 J	380 U	1500 UJ	750 U
Indeno(1,2,3-cd)pyrene	75 J	530 UJ	83 J	380 U	190 J	300 J	590 J	380 U	1500 UJ	750 U
Dibenz(a,h)anthracene	550 UJ	530 UJ	740 UJ	380 U	1100 U	760 U	780 U	380 U	1500 UJ	750 U
Benzo(g,h,i)perylene	81 J	530 UJ	740 UJ	380 U	280 J	410 J	840	380 U	1500 UJ	750 U
Aniline Compounds										
4-Chloroaniline	550 UJ	530 UJ	740 U	380 U	1100 U	760 U	780 U	380 U	1500 UJ	750 U
4-Nitroaniline	1400 UJ	1300 UJ	1800 U	960 U	1100 U	760 U	780 U	950 U	3700 UJ	1900 U
Benzenes/Aromatics										
1,3-Dichlorobenzene	550 UJ	530 UJ	740 U	380 U	1100 U	760 U	780 U	380 U	1500 UJ	750 U
1,4-Dichlorobenzene	550 UJ	530 UJ	740 U	380 U	1100 U	760 U	780 U	380 U	1500 UJ	750 U
1,2-Dichlorobenzene	550 UJ	530 UJ	740 U	380 U	1100 U	760 U	780 U	380 U	1500 UJ	750 U
Phthalates										
Dimethylphthalate	550 UJ	530 UJ	740 U	380 U	1100 U	760 U	150 J	380 U	1500 UJ	750 U
Diethylphthalate	550 UJ	530 UJ	740 U	380 U	1100 U	760 U	140 J	380 U	1500 UJ	750 U
Di-n-butyl phthalate	120 J	530 UJ	97 J	380 U	110 J	760 U	680 J	380 U	1500 UJ	750 U
Butylbenzyl phthalate	550 UJ	530 UJ	740 U	380 U	490 J	760 UJ	780 UJ	380 U	1500 UJ	750 U
bis(2-Ethylhexyl)phthalate	260 J	64 J	750	380 U	15000 D	410 J	1000	73 J	1500 UJ	790
Di-n-octyl phthalate	550 UJ	530 UJ	740 UJ	380 U	1100 UJ	760 UJ	780 UJ	380 U	1500 UJ	750 U
Other/Miscellaneous SVOCs										
Carbazole	60 J	530 UJ	740 U	380 U	1100 U	760 U	780 U	380 U	1500 UJ	750 U
Dibenzofuran	550 UJ	530 UJ	740 U	380 U	1100 U	760 U	780 U	380 U	190 J	680 J
Total Target SVOCs	3,246 J	64 J	4,411 J	0 J	21,210 J	6,873 J	15,970 J	73 J	4,250 J	22,130 J
Number of SVOA TICs	25	4	4	0	19	19	19	18	37	37
Total SVOA TIC Concentration	42,650 J	2,030 J	8,300 J		30,900 J	16,300 J	42,520 J	3,319 J	51,690 J	125,400 J

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, Total SVOCs must be less than 500 ppm (500,000 ug/kg).
3. U = Not detected; J = Estimated value; R = Rejected value; N = Presumptive evidence of presence; D = Diluted sample; NC = No criterion.
4. Shading indicates exceedance of NYSDEC TAGM Levels

TABLE 4-9
HEXAGON LABORATORIES RI/FFS
SUBSURFACE BORING ANALYTICAL DATA SUMMARY - SEMIVOLATILE ORGANICS (ug/kg)
Page 2 of 2

Sample Location	SOUTH YARD	NORTH YARD	OLD PLANT			NEW PLANT	TUFO'S	HOLLERS AVE.	PEARTREE AVE.	NYSDEC TAGM Levels (1)(2)
Field Sample ID	HXB9S5	HXB15S1	HXB5S2	HXB11S2	HXB12S2	HXB4S2	HXBK1	HXBK2	HXBK3	
Sample Interval (feet bgs)	8 - 10	2.5 - 4.5	2 - 4	4 - 5	2 - 4	2 - 4	2.5 - 4.5	2.5 - 4.5	2.5 - 4.5	
Date Sampled	11/11/97	11/19/97	11/14/97	11/12/97	11/12/97	11/18/97	11/17/97	11/17/97	11/17/97	
Phenols/Acid Extractables										
Phenol	720 UJ	490 UJ	370 U	5100 DJN	360 JN	1500 UJ	R	1500 UJ	1400 UJ	30
2-Chlorophenol	720 UJ	490 UJ	370 U	1800 U	370 U	1500 UJ	R	1500 UJ	1400 UJ	800
2-Methylphenol (o-cresol)	720 UJ	490 UJ	820	4600 DJN	55 JN	1500 UJ	R	1500 UJ	1400 UJ	100
4- Methylphenol	720 UJ	490 UJ	480	1000 DJ	350 J	1400 J	R	1500 UJ	1400 UJ	900
2,4-Dimethylphenol	720 UJ	490 UJ	370 U	1800 U	370 U	1500 UJ	R	1500 UJ	1400 UJ	NC
Pentachlorophenol	1800 UJ	1200 UJ	940 U	4600 U	920 UJ	3700 UJ	R	3700 UJ	3600 UJ	1000
Polycyclic Aromatic Hydrocarbons (PAHs)										
Naphthalene	4000	490 UJ	370 U	14000 DJN	370 U	1500 UJ	1600 UJ	1500 UJ	1400 UJ	13000
2-Methylnaphthalene	15000 D	490 UJ	370 U	1800 U	370 U	1500 UJ	1600 UJ	1500 UJ	1400 UJ	36400
Acenaphthylene	720 U	490 UJ	370 U	1800 U	370 U	1500 UJ	1600 UJ	1500 UJ	1400 UJ	41000
Acenaphthene	970	490 UJ	370 U	1800 U	370 U	1500 UJ	960 J	1500 UJ	1400 UJ	50000
Fluorene	1400	490 UJ	370 U	1800 U	370 U	1500 UJ	1100 J	1500 UJ	1400 UJ	50000
Phenanthrene	3300	490 UJ	70 J	1800 U	360 JN	1500 UJ	12000 J	1500 UJ	1400 UJ	50000
Anthracene	720 U	490 UJ	370 U	1800 U	370 UJ	1500 UJ	1200 J	1500 UJ	1400 UJ	50000
Fluoranthene	160 J	490 UJ	370 U	1800 U	400 J	1500 UJ	9600 J	1500 UJ	160 J	50000
Pyrene	500 J	490 UJ	370 U	1800 U	130 J	1500 UJ	14000 DJ	1500 UJ	190 J	50000
Benzo(a)anthracene	64 J	490 UJ	370 U	1800 U	88 JN	1500 UJ	4900 J	1500 UJ	1400 UJ	224
Chrysene	720 U	490 UJ	60 J	1800 U	190 J	1500 UJ	6600 J	1500 UJ	1400 UJ	400
Benzo(b)fluoranthene	720 U	490 UJ	370 U	1800 U	170 J	1500 UJ	3900 J	1500 UJ	160 J	1100
Benzo(k)fluoranthene	720 U	490 UJ	370 U	1800 U	62 J	1500 UJ	1800 J	1500 UJ	1400 UJ	1100
Benzo(a)pyrene	720 U	490 UJ	370 U	1800 U	120 JN	1500 UJ	1500 J	1500 UJ	1400 UJ	61
Indeno(1,2,3-cd)pyrene	720 U	490 UJ	370 U	1800 U	370 U	1500 UJ	1000 J	1500 UJ	1400 UJ	3200
Dibenz(a,h)anthracene	720 U	490 UJ	370 U	1800 U	370 U	1500 UJ	480 J	1500 UJ	1400 UJ	14
Benzo(g,h,i)perylene	720 U	490 UJ	370 U	1800 U	370 U	1500 UJ	1200 J	1500 UJ	1400 UJ	50000
Aniline Compounds										
4-Chloroaniline	720 U	490 UJ	370 U	1800 U	660	1500 UJ	1600 UJ	1500 UJ	1400 UJ	220
4-Nitroaniline	1800 U	1200 UJ	940 U	4600 U	920 U	3700 UJ	4000 UJ	3700 UJ	3600 UJ	NC
Benzenes/Aromatics										
1,3-Dichlorobenzene	720 U	490 UJ	370 U	1800 U	370 U	1500 UJ	1600 UJ	1500 UJ	1400 UJ	1600
1,4-Dichlorobenzene	720 U	490 UJ	370 U	1800 U	370 U	1500 UJ	1600 UJ	1500 UJ	1400 UJ	8500
1,2-Dichlorobenzene	720 U	490 UJ	180 J	1800 U	130 J	9400 J	1600 UJ	1500 UJ	1400 UJ	7900
Phthalates										
Dimethylphthalate	720 U	490 UJ	370 U	6500	370 U	1500 UJ	1600 UJ	1500 UJ	1400 UJ	2000
Diethylphthalate	720 U	490 UJ	53 J	38000 D	56 J	1500 UJ	1600 UJ	1500 UJ	1400 UJ	7100
Di-n-butyl phthalate	720 U	490 UJ	230 J	3900	210 J	1500 UJ	1600 UJ	1500 UJ	1400 UJ	8100
Butylbenzyl phthalate	720 U	490 UJ	370 U	350 J	370 U	1500 UJ	1600 UJ	1500 UJ	1400 UJ	50000
bis(2-Ethylhexyl)phthalate	720 U	55 J	1300	2500	520	1500 UJ	1600 UJ	1500 UJ	1400 UJ	50000
Di-n-octyl phthalate	720 U	490 UJ	370 U	1800 U	370 U	1500 UJ	1600 UJ	1500 UJ	1400 UJ	50000
Other/Miscellaneous SVOCs										
Carbazole	720 U	490 UJ	370 U	1800 U	370 UJ	1500 UJ	330 J	1500 UJ	1400 UJ	NC
Dibenzofuran	620 J	490 UJ	370 U	370 JN	39 J	1500 UJ	250 J	1500 UJ	1400 UJ	6200
Total Target SVOCs	26,014 J	55 J	3,193 J	76,320 J	3,900 J	10,800 J	60,820 J	0 J	510 J	
Number of SVOA TICs	37	8	34	29	30	28	30	1	2	
Total SVOA TIC Concentration	134,200 J	2,820 J	62,390 J	845,800 J	105,600 J	1,018,800 J	56,880 J	400 J	730 J	

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, Total SVOCs must be less than 500 ppm (500,000 ug/kg).
3. U = Not detected; J = Estimated value; R = Rejected value; N = Presumptive evidence of presence; D = Diluted sample; NC = No criterion.
4. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-10
HEXAGON LABORATORIES RI/FFS
SUBSURFACE BORING ANALYTICAL DATA SUMMARY - PESTICIDES/PCBs (ug/kg)
Page 1 of 2

Sample Location	EAST YARD							SOUTH YARD		
Field Sample ID	HXB1S3	HXB1S7	HXB7S2	HXB7S4	HXB17	HXB20	HXB21	HXB3S2	HXB8S4	HXB9S3
Sample Interval (feet bgs)	4 - 6	11 - 13	2 - 4	6 - 8	2 - 2.5	2.2 - 2.3	2 - 2.5	2 - 4	6 - 7	4 - 6
Date Sampled	11/19/97	11/19/97	11/11/97	11/11/97	10/1/98	10/2/98	10/2/98	11/11/97	11/17/97	11/11/97
Pesticides										
alpha-BHC	0.56 U	0.54 U	2.4 JN	2.0 U	NA	NA	NA	1.9 U	2.6 U	1.9 U
beta-BHC	0.56 U	0.54 U	1.9 U	2.0 U	NA	NA	NA	1.9 U	2.6 U	1.9 U
delta-BHC	3.9 JN	0.54 U	1.9 U	2.0 U	NA	NA	NA	4.6	2.6 U	6.4 JN
gamma-BHC (Lindane)	0.67 JN	0.54 U	1.9 U	2.0 U	NA	NA	NA	1.9 U	2.6 U	1.9 U
Heptachlor	0.56 U	0.54 U	1.9 U	2.0 U	NA	NA	NA	1.9 U	2.6 U	1.9 U
Aldrin	0.56 U	0.54 U	6.8 JN	2.0 U	NA	NA	NA	1.9 U	220 DJN	1.9 U
Heptachlor Epoxide	0.56 U	0.54 U	1.9 U	2.0 U	NA	NA	NA	1.9 U	2.6 U	1.9 U
Endosulfan I	0.56 U	0.54 U	1.9 U	2.0 U	NA	NA	NA	1.9 U	2.6 U	1.9 U
Dieldrin	1.1 U	1.0 U	3.7 U	3.8 U	NA	NA	NA	3.8 U	5.0 U	3.7 U
4,4'-DDE	5.1	1.0 U	3.7 U	3.8 U	NA	NA	NA	3.8 U	5.0 U	3.7 U
Endrin	2.2 JN	1.0 U	11 J	3.8 U	NA	NA	NA	3.8 U	5.0 U	3.7 U
Endosulfan II	1.1 U	1.0 U	3.7 U	3.8 U	NA	NA	NA	3.8 U	5.0 U	3.7 U
4,4'-DDD	4.2 JN	1.0 U	6.1	3.8 U	NA	NA	NA	3.8 U	5.0 U	3.7 U
Endosulfan Sulfate	1.1 U	1.0 U	3.7 U	3.8 U	NA	NA	NA	6.1 JN	5.0 U	3.7 U
4,4'-DDT	1.4 JN	1.0 U	3.7 JN	3.8 U	NA	NA	NA	3.8 U	5.0 U	3.7 U
Methoxychlor	5.6 U	5.4 U	19 U	20 U	NA	NA	NA	19 U	26 U	19 U
Endrin ketone	1.1 U	1.0 U	3.7 U	3.8 U	NA	NA	NA	3.8 U	5.0 U	3.7 U
Endrin aldehyde	1.1 U	1.0 U	5.5 JN	3.8 U	NA	NA	NA	3.8 U	5.0 U	3.7 U
alpha-Chlordane	0.56 U	0.54 U	6.6	2.0 U	NA	NA	NA	2.0	2.6 U	3.5
gamma-Chlordane	2.5 JN	0.54 U	3.2 JN	2.0 U	NA	NA	NA	1.9 U	2.6 U	2.2 JN
PCBs										
Aroclor-1242	36 JN	10 U	74	38 U	36 U	38 U	39 U	38 U	50 U	37 U
Aroclor-1248	11 U	10 U	37 U	38 U	1000 J	38 U	39 U	38 U	4800 DJ	44
Aroclor-1254	11 U	10 U	37 U	38 U	36 U	38 U	39 U	38 U	50 U	37 U
Aroclor-1260	11 U	10 U	37 U	38 U	R	38 U	R	38 U	50 U	37 U

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, total pesticide concentration shall be less than 10 ppm (10,000 ug/kg).
3. Soil cleanup objective for Chlordane does not specify isomer.
4. Recommended soil cleanup level corresponds to total PCBs in subsurface soil.
5. U = Not detected; J = Estimated value; R = Rejected value; N = Presumptive evidence of presence; D = Diluted sample; NC = No criterion; NA = Not analyzed.
6. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-10
HEXAGON LABORATORIES RI/FFS
SUBSURFACE BORING ANALYTICAL DATA SUMMARY - PESTICIDES/PCBs (ug/kg)
Page 2 of 2

Sample Location	SOUTH YARD	NORTH YARD	OLD PLANT			NEW PLANT	TUFO'S	HOLLERS AVE.	PEARTREE AVE.	NYSDEC TAGM Levels (1) (2)
Field Sample ID	HXB9S5	HXB15S1	HXB5S2	HXB11S2	HXB12S2	HXB4S2	HXBK1	HXBK2	HXBK3	
Sample Interval (feet bgs)	8 - 10	2.5 - 4.5	2 - 4	4 - 5	2 - 4	2 - 4	2.5 - 4.5	2.5 - 4.5	2.5 - 4.5	
Date Sampled	11/11/97	11/19/97	11/14/97	11/12/97	11/12/97	11/18/97	11/17/97	11/17/97	11/17/97	
Pesticides										
alpha-BHC	1.8 U	0.50 U	3.0 J	9.3 U	7.5 U	0.50 U	R	2.6 UJ	2.5 U	110
beta-BHC	1.8 U	0.50 U	10 JN	9.3 U	7.5 U	0.50 U	R	2.6 UJ	2.5 U	200
delta-BHC	3.5 JN	0.50 U	1.8 U	9.3 U	7.5 U	310 DJN	R	2.6 UJ	2.5 U	300
gamma-BHC (Lindane)	1.8 U	0.50 U	1.8 U	130 JN	7.5 U	38 JN	R	2.6 UJ	2.5 U	60
Heptachlor	1.8 U	0.50 U	1.8 U	9.3 U	40 J	0.50 U	R	2.6 UJ	2.5 U	100
Aldrin	1.8 U	0.73	1.8 U	9.3 U	7.5 U	970 DJN	R	2.6 UJ	370 DJN	41
Heptachlor Epoxide	1.8 U	0.50 U	1.8 U	9.3 U	28	0.50 U	2.60 JN	2.6 UJ	2.5 U	20
Endosulfan I	1.8 U	0.53 J	1.9 JN	370 DJN	89 DJN	790 DJN	R	2.6 UJ	2.5 U	900
Dieldrin	3.5 U	0.96 U	3.5 U	18 U	14 U	0.97 U	R	5.0 UJ	4.8 U	44
4,4'-DDE	6.0 JN	0.96 U	5.9	310 DJN	14 U	260 DJN	R	5.0 UJ	100 D	2100
Endrin	3.5 U	0.96 U	3.5 U	72 UJ	14 U	12 JN	9.2 JN	5.0 UJ	4.8 U	100
Endosulfan II	3.5 U	0.96 U	3.5 U	18 U	14 U	0.97 U	R	5.0 UJ	4.8 U	900
4,4'-DDD	3.5 U	0.96 U	3.5 U	18 U	14 U	0.97 U	R	5.0 UJ	4.8 U	2900
Endosulfan Sulfate	3.5 U	2.6 JN	3.5 U	18 U	33	26 JN	R	5.0 UJ	4.8 U	1000
4,4'-DDT	4.5 JN	0.96 U	3.5 U	18 U	80 JN	300 DJN	R	5.0 UJ	120 DJN	2100
Methoxychlor	18 U	5.0 U	18 U	93 U	75 U	5.0 U	41 JN	26 UJ	25 U	NC
Endrin ketone	3.5 U	0.96 U	3.5 U	140	14 U	0.97 U	5.6 JN	5.0 UJ	4.8 U	NC
Endrin aldehyde	3.5 U	0.96 U	3.5 U	18 U	590 DJN	0.97 U	R	5.0 UJ	4.8 U	NC
alpha-Chlordane	7.1	0.50 U	1.8 JN	9.3 U	78 JN	99 JN	R	2.6 UJ	2.5 U	540 (3)
gamma-Chlordane	1.8 JN	0.50 U	5.4 J	37 UJ	7.5 U	61 JN	1.0	2.6 UJ	2.5 U	540 (3)
PCBs										
Aroclor-1242	100	9.6 U	35 U	180 U	140 U	18000 DJN	R	50 UJ	48 U	10000 (4)
Aroclor-1248	35 U	13	35 U	180 U	140 U	9.7 U	R	50 UJ	5600 J	10000 (4)
Aroclor-1254	35 U	9.6 U	35 U	180 U	140 U	9.7 U	R	50 UJ	48 U	10000 (4)
Aroclor-1260	35 U	9.6 U	35 U	180 U	140 U	9.7 U	R	50 UJ	1100 JN	10000 (4)

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, total pesticide concentration shall be less than 10 ppm (10,000 ug/kg).
3. Soil cleanup objective for Chlordane does not specify isomer.
4. Recommended soil cleanup level corresponds to total PCBs in subsurface soil.
5. U = Not detected; J = Estimated value; R = Rejected value; N = Presumptive evidence of presence; D = Diluted sample; NC = No criterion; NA = Not analyzed.
6. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-11

HEXAGON LABORATORIES RI/FFS

SUBSURFACE BORING ANALYTICAL DATA SUMMARY - INORGANICS (mg/kg)

Page 1 of 2

Sample Location	EAST YARD							SOUTH YARD			
Field Sample ID	HXB1S3	HXB1S7	HXB7S2	HXB7S4	HXB17	HXB20	HXB21	HXB3S2	HXB8S4	HXB9S3	HXB9S5
Sample Interval (feet bgs)	4 - 6	11 - 13	2 - 4	6 - 8	2 - 2.5	2.2 - 2.3	2 - 2.5	2 - 4	6 - 7	4 - 6	8 - 10
Date Sampled	11/19/97	11/19/97	11/11/97	11/11/97	10/1/98	10/2/98	10/2/98	11/11/97	11/17/97	11/11/97	11/11/97
Aluminum	14200	16900	13000	13600	9410	11000	10700	10900	15500	15200	11600
Antimony	0.63 U	0.55 U	0.57 U	0.58 U	3.6 J	9.0 J	29.7 J	0.61 U	0.49 U	0.61 U	0.51 U
Arsenic	4.7	3.4	3.6	2.7	5.8 J	5.0 J	18.4 J	3.0	3.3 J	2.5	1.9
Barium	323	152	182	133	366	522	1790	172	161	195	99.8
Beryllium	0.54	0.74	0.56	0.47	0.29	0.38	0.33	0.48	0.44	0.62	0.52
Cadmium	5.7	0.11 U	1.5	0.31	4.2 J	6.4 J	28.2 J	1.2	0.10 U	0.58	0.26
Calcium	19700	1600	11600	1450	8200	5790	17600	6660	1250	2130	1070
Chromium	62.7	78.3	56.6	56.4	42.8 J	47.8 J	73.9 J	33.3	44.4	63.1	63.7
Cobalt	13.6	14.4	13.2	12.5	9.4	9.8	22.6	11.9	16.4	16.0	16.3
Copper	185 J	52.1 J	36.5	35.6	139 J	125 J	509 J	45.1	16.7 J	38.0	42.3
Iron	28200	26700	27500	23600	22500	29000	54100	110	24900	20500	19900
Lead	182 J	8.2 J	121	41.6	515 J	3850 J	3360 J	265	0.69	32.6	2.8
Magnesium	7450	8230	9360	6750	4910	5840	5540	4570	6180	6500	5980
Manganese	384	266	252 J	180 J	246	369	509	225 J	217	315 J	255 J
Mercury	0.28	0.04	0.29	0.03 U	0.23	0.19	0.78	0.07	0.03 U	0.16	0.03 U
Nickel	62.0	64.6	71.8	44.6	25.7 J	18.3 J	181 J	32.6	30.8	35.1	48.6
Potassium	5790 J	8320 J	7280	7720	4860 J	5290 J	4430 J	4850	10300 J	8820	4570
Selenium	1.1 U	0.91 U	0.95 U	0.97 U	3.2	2.0	7.1	1.1	0.81 U	1.0 U	0.85 U
Silver	0.42 UJ	0.36 UJ	0.38 UJ	0.39 UJ	R	R	R	0.41 UJ	0.32 UJ	0.40 UJ	0.34 UJ
Sodium	540	415	148	127	1830	1660	15600	264	157	182	253
Thallium	0.85	1.1	0.38 U	0.39 U	2.4	2.3	0.93	0.41 U	1.2	0.42	0.34 U
Vanadium	45.0	48.1	36.5	40.4	40.9 J	33.1 J	48.4 J	33.8	45.1	41.9	37.1
Zinc	1290	124	219 J	116 J	1350 J	1390 J	12000 J	279 J	69.1 J	153 J	96.4 J
Cyanide	1.1 U	1.0 U	0.65 U	0.64 U	0.05 U	0.08	0.27	0.84 U	0.79 U	0.82 U	0.85 U

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. Except as noted, background concentrations represent the maximum background concentration for New York State soils as reported by E.C. McGovern, NYSDEC, in "Background Concentrations of 20 Elements in Soils with Special Regard for New York State", undated.
3. Maximum concentration listed for urban New Jersey soils as reported by NJDEPE in "A Summary of Selected Soil Constituents and Contaminants at Background Locations in New Jersey", 1993.
4. Maximum concentration detected in site-specific background sample.
5. As indicated in NYSDEC TAGM HWR-94-4046, average background levels of lead in metropolitan or suburban areas or near highways typically range as high as 500 ppm.
6. Background concentrations for cyanide were not reported in literature sources reviewed. Cyanide was not detected in the three site-specific background samples and, therefore, the background concentration for cyanide is assumed to be non detect.
7. U = Not detected; J = Estimated value; R = Rejected value; BKGD = Site background concentration; NC = No criterion; ND = Non detect.
8. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-11
HEXAGON LABORATORIES RI/FFS
SUBSURFACE BORING ANALYTICAL DATA SUMMARY - INORGANICS (mg/kg)
Page 2 of 2

Sample Location	NORTH YARD	OLD PLANT			NEW PLANT	TUFO'S	HOLLERS AVE.	PEARTREE AVE.	NYSDEC TAGM Levels [1]	Background Concentrations [2]
Field Sample ID	HXB15S1	HXB5S2	HXB11S2	HXB12S2	HXB4S2	HXBK1	HXBK2	HXBK3		
Sample Interval (feet bgs)	2.5 - 4.5	2 - 4	4 - 5	2 - 4	2 - 4	2.5 - 4.5	2.5 - 4.5	2.5 - 4.5		
Date Sampled	11/19/97	11/14/97	11/12/97	11/12/97	11/18/97	11/17/97	11/17/97	11/17/97		
Aluminum	16100	20600	4410	21300	3890 J	16600	20400	13200	BKGD	25000
Antimony	0.54 U	0.86	0.47 U	0.55 U	0.45 U	0.66 U	0.57 U	0.62 U	BKGD	0.69 [3]
Arsenic	4.8	4.4 J	1.1	1.9	1.8	9.0 J	3.2	2.4	7.5 or BKGD	12
Barium	341	242	64.8	295	74.5 J	559	162	89.2	300 or BKGD	600
Beryllium	0.48	0.56	0.16 U	0.49	0.15 U	0.69	0.84	0.45	0.16 or BKGD	1.75
Cadmium	5.6	0.12 U	0.09 U	0.24	0.09 U	1.3	0.11 U	0.12 U	1 or BKGD	2.36 [3]
Calcium	15800	1260	663	836	337 J	3120	1500	853	BKGD	35000
Chromium	44.9	174	21.7	162	28.8 J	61.8	64.5	42.4	10 or BKGD	64.5 [4]
Cobalt	13.3	18.8	4.7	19.7	4.3 J	14.8	18.7	12.8	30 or BKGD	60
Copper	151 J	46.8	10.6	467	31.1 J	196 J	33.5 J	19.1 J	25 or BKGD	196 [4]
Iron	27900	31500	7030	32600	7360 J	57900	26700	19300	2000 or BKGD	57900 [4]
Lead	180 J	4.0	2.5	23.4	7.6 J	455	8.1	10.1	BKGD	500 [5]
Magnesium	7730	9200	2060	8580	1720 J	5820	8570	5380	BKGD	8570 [4]
Manganese	394	497	77.1	226	62.3 J	280	503	472	BKGD	5000
Mercury	0.03 U	0.06	11.9	0.63	0.16	0.07	0.04 U	0.04 U	0.1 or BKGD	2.71 [3]
Nickel	38.0	85.1	13.8	44.7	27.9 J	72.3	44.1	30.4	13 or BKGD	72.3 [4]
Potassium	8110 J	12000 J	2280 J	13200 J	2190 J	4900 J	6750 J	3610 J	BKGD	43000
Selenium	0.90 U	0.99 U	0.78 U	0.92 U	0.75 U	1.1 U	0.95 U	1.0 U	2 or BKGD	0.125
Silver	0.36 UJ	0.40 UJ	0.31 UJ	0.37 UJ	0.30 UJ	0.44 UJ	0.38 UJ	0.41 UJ	BKGD	1.53 [3]
Sodium	327	69.3	152	361	96.9	75.3	63.8	116	BKGD	8000
Thallium	0.99	1.6	0.31 U	0.37 U	0.30 U	1.5	1.3	0.92	BKGD	1.5 [4]
Vanadium	50.3	72.5	13.8	68.3	13.6 J	46.7	51.7	32.9	150 or BKGD	60
Zinc	1070	81.9	37.6 J	124 J	21.3	1100 J	61.2 J	52.8 J	20 or BKGD	1100 [4]
Cyanide	0.84 U	1.0 U	1.1 U	0.98 U	0.70 U	1.1 U	0.87 U	0.90 U	NC	ND[6]

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. Except as noted, background concentrations represent the maximum background concentration for New York State soils as reported by E.C. McGovern, NYSDEC, in "Background Concentrations of 20 Elements in Soils with Special Regard for New York State", undated.
3. Maximum concentration listed for urban New Jersey soils as reported by NJDEPE in "A Summary of Selected Soil Constituents and Contaminants at Background Locations in New Jersey", 1993.
4. Maximum concentration detected in site-specific background sample.
5. As indicated in NYSDEC TAGM HWR-94-4046, average background levels of lead in metropolitan or suburban areas or near highways typically range as high as 500 ppm.
6. Background concentrations for cyanide were not reported in literature sources reviewed. Cyanide was not detected in the three site-specific background samples and, therefore, the background concentration for cyanide is assumed to be non detect.
8. U = Not detected; J = Estimated value; R = Rejected value; BKGD = Site background concentration; NC = No criterion; ND = Non detect.
9. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-12
HEXAGON LABORATORIES RI/FFS
SUBSURFACE BORING ANALYTICAL DATA SUMMARY - TOTAL ORGANIC CARBON AND TOTAL PETROLEUM HYDROCARBONS (mg/kg)

Sample Location	EAST YARD			OLD PLANT			NEW PLANT	TUFO'S	HOLLERS AVE.	PEARTREE AVE.
Field Sample ID	HXB1S3	HXB1S7	HXB20	HXB5S2	HXB11S2	HXB12S2	HXB4S2	HXBK1	HXBK2	HXBK3
Sample Interval (feet bgs)	4 - 6	11 - 13	2.2 - 2.3	2 - 4	4 - 5	2 - 4	2 - 4	2.5 - 4.5	2.5 - 4.5	2.5 - 4.5
Date Sampled	11/19/97	11/19/97	10/2/98	11/14/97	11/12/97	11/12/97	11/18/97	11/17/97	11/17/97	11/17/97
TOC	11000	519	5500	2200	25900	NA	12000	6210	3690	4130
TPHC	NA	NA	NA	NA	NA	1200	NA	NA	NA	58

Notes:
1. NA = Not analyzed.

TABLE 4-13
HEXAGON LABORATORIES RI/FFS
SUBSURFACE UST ANALYTICAL DATA SUMMARY - VOLATILE ORGANICS (ug/kg)
Page 1 of 2

Sample Location	EAST YARD				SOUTH YARD					
Field Sample ID	EYT34-1	EYT35-1	EYT36-1	EYT37-1	SYTN-1	SYTS-1	SYTE-1	SYTW-1	SYTC-1	SYTEX-1 [(4)]
Sample Interval (feet bgs)	0 - 6	0 - 6	0 - 6	0 - 6	2.5 - 4.5	2.5 - 4.5	2.5 - 4.5	2.5 - 4.5	2.5 - 4.5	0 - 6
Date Sampled	8/29/97	8/29/97	8/29/97	8/29/97	12/4/97	12/4/97	12/4/97	12/4/97	12/4/97	12/4/97
Aromatics										
Benzene	12 U	11 U	11 U	12 U	760 J	33000 UJ	5700 UJ	140000 UJ	NA	2900 UJ
Toluene	12 U	11 U	11 U	70	190000 DJ	240000 J	66000 J	320000 J	NA	3400 J
Ethylbenzene	12 U	11 U	11 U	12 U	6400 J	33000 UJ	6600 J	140000 UJ	NA	3800 J
Xylene(total)	12 U	11 U	11 U	12 U	30000 J	24000 J	60000 J	140000 UJ	NA	6400 J
Styrene	12 U	11 U	11 U	12 U	3300 UJ	33000 UJ	5700 UJ	140000 UJ	NA	2900 UJ
Halogenated Aliphatics										
Chloromethane	12 UJ	11 UJ	11 UJ	12 UJ	3300 UJ	33000 UJ	5700 UJ	140000 UJ	NA	2900 UJ
Bromomethane	12 U	11 U	11 U	12 U	3300 UJ	33000 UJ	5700 UJ	140000 UJ	NA	2900 UJ
Vinyl Chloride	12 U	11 U	11 U	12 U	3300 UJ	33000 UJ	5700 UJ	140000 UJ	NA	2900 UJ
Chloroethane	12 U	11 U	11 U	12 U	3300 UJ	33000 UJ	5700 UJ	140000 UJ	NA	2900 UJ
Methylene Chloride	12 U	11 U	11 U	12 U	3300 UJ	33000 UJ	5700 UJ	140000 UJ	NA	2900 UJ
1,1-Dichloroethene	12 U	11 U	11 U	12 U	3300 UJ	33000 UJ	5700 UJ	140000 UJ	NA	2900 UJ
1,1-Dichloroethane	12 U	11 U	11 U	12 U	3300 UJ	33000 UJ	5700 UJ	140000 UJ	NA	2900 UJ
1,2-Dichloroethene (total)	12 U	11 U	11 U	12 U	3300 UJ	33000 UJ	5700 UJ	140000 UJ	NA	2900 UJ
Chloroform	12 U	11 U	11 U	12 U	3300 UJ	33000 UJ	5700 UJ	140000 UJ	NA	2900 UJ
1,2-Dichloroethane	12 U	11 U	11 U	12 U	5000 J	33000 UJ	5700 UJ	140000 UJ	NA	330 J
1,1,1-Trichloroethane	12 U	11 U	11 U	4 J	370 J	33000 UJ	5700 UJ	140000 UJ	NA	2900 UJ
1,2-Dichloropropane	12 U	11 U	11 U	12 U	3300 UJ	33000 UJ	5700 UJ	140000 UJ	NA	2900 UJ
Trichloroethene	12 U	11 U	11 U	12 U	3200 J	33000 UJ	5700 UJ	140000 UJ	NA	2900 UJ
Tetrachloroethene	12 U	11 U	11 U	12 U	5900 J	7600 J	1700 J	140000 UJ	NA	1400 J
Ketones										
Acetone	21 UJ	27 UJ	12 UJ	16 UJ	9200 J	33000 UJ	5700 UJ	140000 UJ	NA	13000 J
2-Butanone	12 U	11 U	11 U	12 U	500 J	33000 UJ	720 J	140000 UJ	NA	460 J
4-Methyl-2-pentanone	12 U	11 U	11 U	12 U	3300 UJ	33000 UJ	5700 UJ	140000 UJ	NA	2900 UJ
2-Hexanone	12 U	11 U	11 U	12 U	3300 UJ	33000 UJ	5700 UJ	140000 UJ	NA	2900 UJ
Other/Miscellaneous VOCs										
Carbon disulfide	12 U	11 U	11 U	12 U	3300 UJ	33000 UJ	5700 UJ	140000 UJ	NA	2900 UJ
Chlorobenzene	12 U	11 U	11 U	2 J	10000 J	33000 UJ	75000 J	140000 UJ	NA	6700 J
Total Target VOCs	0 J	0 J	0 J	76 J	261330 J	271600 J	210020 J	320000 J		35490 J
Number of VOC TICs	0	1	0	0	4	0	29	0		1
Total VOC TIC Concentration		24 J			12500 J		405000 J			3500 J

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, Total VOCs must be less than 10 ppm (10,000 ug/kg).
3. Recommended soil cleanup level corresponds to trans 1,2-dichloroethene.
4. Sample SYTEX-1 represents excavated material that was removed from the site during the IRM.
5. U = Not detected; J = Estimated value; D = Diluted sample; NA = Not analyzed; NC = No criterion.
6. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-13
HEXAGON LABORATORIES RI/FFS
SUBSURFACE UST ANALYTICAL DATA SUMMARY - VOLATILE ORGANICS (ug/kg)
Page 2 of 2

Sample Location	NORTH YARD		NEW PLANT				NYSDEC
Field Sample ID	NYT-1	NYT-2	NPT-1	NPT-2	NPT-3	NPT-4	
Sample Interval (feet bgs)	5.5 - 6	5.5 - 6	3 - 3.5	3 - 3.5	3 - 3.5	3 - 3.5	
Date Sampled	11/14/97	11/14/97	11/19/97	11/19/97	11/19/97	11/19/97	TAGM Levels $^{(1)(2)}$
Aromatics							
Benzene	15 J	4 J	1700 J	4800 J	7800 J	55000	60
Toluene	720	28 J	37000	1700000 D	1200000 D	1700000 D	1500
Ethylbenzene	200	30 J	560 J	55000	15000	33000	5500
Xylene(total)	1200	17 J	24000	300000	1500000 D	200000	1200
Styrene	120 U	26 UJ	3400 U	12000 U	12000 U	11000 U	NC
Halogenated Aliphatics							
Chloromethane	120 U	26 UJ	3400 U	12000 U	12000 U	11000 U	NC
Bromomethane	120 U	26 UJ	3400 U	12000 U	12000 U	11000 U	NC
Vinyl Chloride	120 U	26 UJ	3400 U	12000 U	12000 U	11000 U	200
Chloroethane	120 U	26 UJ	3400 U	12000 U	12000 U	11000 U	1900
Methylene Chloride	120 U	14 J	820 J	12000 U	1500 J	11000 U	100
1,1-Dichloroethene	120 U	26 UJ	3400 U	12000 U	12000 U	11000 U	400
1,1-Dichloroethane	120 U	26 UJ	3400 U	12000 U	12000 U	11000 U	200
1,2-Dichloroethene (total)	120 U	26 UJ	280 J	830 J	1200 J	3700 J	300 $^{(3)}$
Chloroform	120 U	26 UJ	3400 U	12000 U	12000 U	11000 U	300
1,2-Dichloroethane	130	26 UJ	6300	38000	43000	29000	100
1,1,1-Trichloroethane	120 U	26 UJ	3400 U	12000 U	12000 U	11000 U	800
1,2-Dichloropropane	120 U	26 UJ	3400 U	12000 U	12000 U	11000 U	NC
Trichloroethene	30 J	26 UJ	460 J	46000	12000	1200 J	700
Tetrachloroethene	29 J	26 UJ	440 J	100000	12000	690 J	1400
Ketones							
Acetone	65 J	230 J	1000 J	12000 U	3200 J	11000 U	200
2-Butanone	120 U	8 J	3400 UJ	12000 U	12000 U	11000 U	300
4-Methyl-2-pentanone	120 U	26 UJ	3400 U	12000 U	12000 U	11000 U	1000
2-Hexanone	120 U	26 UJ	3400 UJ	12000 U	12000 U	11000 U	NC
Other/Miscellaneous VOCs							
Carbon disulfide	120 U	26 UJ	3400 U	12000 U	12000 U	11000 U	2700
Chlorobenzene	120 U	7 J	470 J	12000	12000 U	5000 J	1700
Total Target VOCs	2389 J	338 J	73030 J	2256630 J	2795700 J	2027590 J	
Number of VOC TICs	29	30	0	6	5	25	
Total VOC TIC Concentration	79500 J	7380 J		194100 J	46700 J	291500 J	

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, Total VOCs must be less than 10 ppm (10,000 ug/kg).
3. Recommended soil cleanup level corresponds to trans 1,2-dichloroethene.
4. Sample SYTEX-1 represents excavated material that was removed from the site during the IRM.
5. U = Not detected; J = Estimated value; D = Diluted sample; NA = Not analyzed; NC = No criterion.
6. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-14
HEXAGON LABORATORIES RI/FFS
SUBSURFACE UST ANALYTICAL DATA SUMMARY - SEMIVOLATILE ORGANICS (ug/kg)
Page 1 of 2

Sample Location	EAST YARD				SOUTH YARD					
Field Sample ID	EYT34-1	EYT35-1	EYT36-1	EYT37-1	SYTN-1	SYTS-1	SYTE-1	SYTW-1	SYTC-1	SYTEX-1 (3)
Sample Interval (feet bgs)	0 - 6	0 - 6	0 - 6	0 - 6	2.5 - 4.5	2.5 - 4.5	2.5 - 4.5	2.5 - 4.5	2.5 - 4.5	0 - 6
Date Sampled	8/29/97	8/29/97	8/29/97	8/29/97	12/4/97	12/4/97	12/4/97	12/4/97	12/4/97	12/4/97
Phenols/Acid Extractables										
Phenol	400 U	360 U	360 U	390 U	NA	NA	NA	NA	R	530 U
2-Chlorophenol	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 U	530 U
2-Methylphenol (o-cresol)	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 U	R
4- Methylphenol	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2300 J	80 JN
2,4-Dimethylphenol	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 U	530 U
Pentachlorophenol	990 U	900 U	900 U	970 U	NA	NA	NA	NA	7200 UJ	210 JN
Polycyclic Aromatic Hydrocarbons (PAHs)										
Naphthalene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	4500	200 J
2-Methylnaphthalene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	16000	460 J
Acenaphthylene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 U	530 U
Acenaphthene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 U	530 U
Fluorene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2400 J	55 J
Phenanthrene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	8600	290 J
Anthracene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 UJ	54 J
Fluoranthene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	740 J	530 UJ
Pyrene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2500 JN	R
Benzo(a)anthracene	400 U	140 J	360 U	390 U	NA	NA	NA	NA	2900 U	530 U
Chrysene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	40000 DJ	840
Benzo(b)fluoranthene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	380 J	82 JN
Benzo(k)fluoranthene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 U	530 U
Benzo(a)pyrene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	R	58 J
Indeno(1,2,3-cd)pyrene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 U	530 U
Dibenz(a,h)anthracene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 U	530 U
Benzo(g,h,i)perylene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 U	530 U
Aniline Compounds										
4-Chloroaniline	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 UJ	530 UJ
4-Nitroaniline	990 U	900 U	900 U	970 U	NA	NA	NA	NA	7200 U	1300 U
Benzenes/Aromatics										
1,3-Dichlorobenzene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 U	530 U
1,4-Dichlorobenzene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 U	530 U
1,2-Dichlorobenzene	400 U	360 U	360 U	390 U	NA	NA	NA	NA	140000 D	110 J
Phthalates										
Dimethylphthalate	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 U	530 U
Diethylphthalate	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 U	86 J
Di-n-butyl phthalate	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 U	680 J
Butylbenzyl phthalate	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 U	160 JN
bis(2-Ethylhexyl)phthalate	400 U	53 J	360 U	390 U	NA	NA	NA	NA	850 J	1200 J
Di-n-octyl phthalate	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 UJ	530 UJ
Other/Miscellaneous SVOCs										
Carbazole	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 U	530 UJ
Dibenzofuran	400 U	360 U	360 U	390 U	NA	NA	NA	NA	2900 U	530 U
Total Target SVOCs	0 J	193 J	0 J	0 J					218,270 J	4,565 J
Number of SVOC TICs	1	23	7	12					36	28
Total SVOC TIC Concentration	140 J	9,289 J	1,980 J	1,851 J					320,800 J	87,210 J

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, Total semi-VOCs must be less than 500 ppm (500,000 ug/kg).
3. Sample SYTEX-1 represents excated material that was removed from the site during the IRM.
4. U = Not detected; J = Estimated value; R = Rejected value; D = Diluted sample; N = Presumptive evidence of presence; NA = Not analyzed; NC = No criterion.
5. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-14
HEXAGON LABORATORIES RI/FFS
SUBSURFACE UST ANALYTICAL DATA SUMMARY - SEMIVOLATILE ORGANICS (ug/kg)
Page 2 of 2

Sample Location	NORTH YARD		NEW PLANT				NYSDEC TAGM Levels (1)(2)
Field Sample ID	NYT-1	NYT-2	NPT-1	NPT-2	NPT-3	NPT-4	
Sample Interval (feet bgs)	5.5 - 6	5.5 - 6	3 - 3.5	3 - 3.5	3 - 3.5	3 - 3.5	
Date Sampled	11/14/97	11/14/97	11/19/97	11/19/97	11/19/97	11/19/97	
Phenols/Acid Extractables							
Phenol	2000 U	420 U	1200 J	2600 UJ	310 J	520 UJ	30
2-Chlorophenol	2000 U	420 U	640 UJ	2600 UJ	2600 U	520 UJ	800
2-Methylphenol (o-cresol)	2000 U	130 J	510 J	2800 J	2600 U	520 UJ	100
4- Methylphenol	2000 U	420 U	3600 J	2600 UJ	630 J	6400 DJ	900
2,4-Dimethylphenol	2000 U	420 U	640 UJ	2600 UJ	2600 U	520 UJ	NC
Pentachlorophenol	5000 U	1000 U	1600 UJ	6400 UJ	6600 U	1300 UJ	1000
Polycyclic Aromatic Hydrocarbons (PAHs)							
Naphthalene	3800	600	180 J	600 J	3800 J	7000 DJ	13000
2-Methylnaphthalene	14000	1200	280 J	2400 J	17000 J	26000 DJ	36400
Acenaphthylene	2000 U	420 UJ	640 UJ	2600 UJ	2600 UJ	520 UJ	41000
Acenaphthene	380 J	170 J	640 UJ	300 J	1100 J	520 UJ	50000
Fluorene	1100 J	370 J	640 UJ	2600 UJ	1100 J	520 UJ	50000
Phenanthrené	2200	1100	73 J	790 J	2400 J	520 UJ	50000
Anthracene	280 J	160 J	640 UJ	2600 UJ	390 J	640 DJ	50000
Fluoranthene	2000 U	440	640 UJ	310 J	2600 UJ	520 UJ	50000
Pyrene	2000 U	180 J	640 UJ	2600 UJ	830 J	2400 JN	50000
Benzo(a)anthracene	2000 U	140 JN	640 UJ	2600 UJ	2600 UJ	680 JN	224
Chrysene	2000 U	200 J	640 UJ	2600 UJ	1900 J	780 JN	400
Benzo(b)fluoranthene	2000 U	240 J	640 UJ	2600 UJ	2600 UJ	520 UJ	1100
Benzo(k)fluoranthene	2000 U	110 JN	640 UJ	2600 UJ	2600 UJ	520 UJ	1100
Benzo(a)pyrene	2000 U	180 J	640 UJ	2600 UJ	2600 UJ	220 JN	61
Indeno(1,2,3-cd)pyrene	2000 U	420 U	640 UJ	2600 UJ	2600 UJ	520 UJ	3200
Dibenz(a,h)anthracene	2000 U	420 U	640 UJ	2600 UJ	2600 UJ	520 UJ	14
Benzo(g,h,i)perylene	2000 U	420 U	640 UJ	2600 UJ	2600 UJ	520 UJ	50000
Aniline Compounds							
4-Chloroaniline	2000 U	420 U	640 UJ	2700 J	2600 UJ	520 UJ	220
4-Nitroaniline	5000 U	1000 JN	1600 UJ	6400 UJ	6600 UJ	1300 UJ	NC
Benzenes/Aromatics							
1,3-Dichlorobenzene	2000 U	420 U	640 UJ	2600 UJ	2600 UJ	520 UJ	1600
1,4-Dichlorobenzene	2000 U	420 U	640 UJ	2600 UJ	280 J	520 UJ	8500
1,2-Dichlorobenzene	2000 U	420 U	69 J	27000 DJ	2200 J	680 JN	7900
Phthalates							
Dimethylphthalate	2000 U	420 UJ	640 UJ	2600 UJ	2600 UJ	520 UJ	2000
Diethylphthalate	2000 U	420 UJ	640 UJ	2600 UJ	2600 UJ	520 UJ	7100
Di-n-butyl phthalate	2000 U	94 J	510 J	480 J	260 J	520 UJ	8100
Butylbenzyl phthalate	2000 U	420 U	640 UJ	2600 UJ	2600 UJ	520 UJ	50000
bis(2-Ethylhexyl)phthalate	2000 U	150 J	81 J	690 J	2600 UJ	520 UJ	50000
Di-n-octyl phthalate	2000 U	420 U	640 UJ	2600 UJ	2600 UJ	520 UJ	50000
Other/Miscellaneous SVOCs							
Carbazole	2000 U	420 U	640 UJ	2600 UJ	1300 J	520 UJ	NC
Dibenzofuran	2000 U	110 JN	640 UJ	2600 UJ	750 J	520 UJ	6200
Total Target SVOCs	21,760 J	6,574 J	6,503 J	38,070 J	34,250 J	44,800 J	
Number of SVOC TICs	39	37	31	29	29	38	
Total SVOC TIC Concentration	190,400 J	91,230 J	28,670 J	689,300 J	205,200 J	383,900 J	

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, Total semi-VOCs must be less than 500 ppm (500,000 ug/kg).
3. Sample SYTEX-1 represents excated material that was removed from the site during the IRM.
4. U = Not detected; J = Estimated value; R = Rejected value; D = Diluted sample; N = Presumptive evidence of presence; NA = Not analyzed; NC = No criterion.
5. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-15
HEXAGON LABORATORIES RI/FFS
SUBSURFACE UST ANALYTICAL DATA SUMMARY - PESTICIDES/PCBs (ug/kg)
Page 1 of 2

Sample Location	EAST YARD				SOUTH YARD					
Field Sample ID	EYT34-1	EYT35-1	EYT36-1	EYT37-1	SYTN-1	SYTS-1	SYTE-1	SYTW-1	SYTC-1	SYTEX-1 (5)
Sample Interval (feet bgs)	0 - 6	0 - 6	0 - 6	0 - 6	2.5 - 4.5	2.5 - 4.5	2.5 - 4.5	2.5 - 4.5	2.5 - 4.5	0 - 6
Date Sampled	8/29/97	8/29/97	8/29/97	8/29/97	12/4/97	12/4/97	12/4/97	12/4/97	12/4/97	12/4/97
Pesticides										
alpha-BHC	2.0 U	1.8 U	1.8 U	2.0 U	NA	NA	NA	NA	12 U	54 U
beta-BHC	2.0 U	1.8 U	1.8 U	2.0 U	NA	NA	NA	NA	12 U	54 U
delta-BHC	2.0 U	1.8 U	1.8 U	2.0 U	NA	NA	NA	NA	12 U	54 U
gamma-BHC (Lindane)	2.0 U	1.8 U	1.8 U	2.0 U	NA	NA	NA	NA	12 U	54 U
Heptachlor	2.0 U	1.8 U	1.8 U	2.0 U	NA	NA	NA	NA	12 U	54 U
Aldrin	2.0 U	1.8 U	1.8 U	2.0 U	NA	NA	NA	NA	180 JN	330 JN
Heptachlor Epoxide	2.0 U	1.8 U	1.8 U	2.0 U	NA	NA	NA	NA	12 U	54 U
Endosulfan I	2.0 U	1.8 U	1.8 U	2.0 U	NA	NA	NA	NA	R	54 U
Dieldrin	3.9 U	3.5 U	3.6 U	3.8 U	NA	NA	NA	NA	23 U	100 U
4,4'-DDE	3.9 U	3.5 U	3.6 U	3.8 U	NA	NA	NA	NA	79 J	100 U
Endrin	3.9 U	3.5 U	3.6 U	3.8 U	NA	NA	NA	NA	R	100 U
Endosulfan II	3.9 U	3.5 U	3.6 U	3.8 U	NA	NA	NA	NA	23 U	100 U
4,4'-DDD	3.9 U	3.5 U	3.6 U	3.8 U	NA	NA	NA	NA	23 U	100 U
Endosulfan Sulfate	3.9 U	3.5 U	3.6 U	3.8 U	NA	NA	NA	NA	23 U	100 U
4,4'-DDT	3.9 U	3.5 U	3.6 U	3.8 U	NA	NA	NA	NA	R	100 U
Methoxychlor	20 U	18 U	18 U	20 U	NA	NA	NA	NA	120 U	540 U
Endrin ketone	3.9 U	3.5 U	3.6 U	3.8 U	NA	NA	NA	NA	23 U	100 U
Endrin aldehyde	3.9 U	3.5 U	3.6 U	3.8 U	NA	NA	NA	NA	23 U	100 U
alpha-Chlordane	2.0 U	1.8 U	1.8 U	2.0 U	NA	NA	NA	NA	12 U	54 U
gamma-Chlordane	2.0 U	1.8 U	1.8 U	2.0 U	NA	NA	NA	NA	R	54 U
PCBs										
Aroclor-1242	39 U	35 U	36 U	38 U	NA	NA	NA	NA	230 U	1000 U
Aroclor-1248	39 U	35 U	36 U	38 U	NA	NA	NA	NA	4500	6100
Aroclor-1254	39 U	35 U	36 U	38 U	NA	NA	NA	NA	230 U	1000 U
Aroclor-1260	39 U	35 U	36 U	38 U	NA	NA	NA	NA	230 U	1000 U

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, total pesticide concentration shall be less than 10 ppm (10,000 ug/kg).
3. Soil cleanup objective for Chlordane does not specify isomer.
4. Recommended soil cleanup level corresponds to total PCBs in subsurface soil.
5. Sample SYTEX-1 represents excavated material that was removed from the site during the IRM.
6. U = Not detected; J = Estimated value; R = Rejected value; D = Diluted sample; N = Presumptive evidence of presence; NA = Not analyzed; NC = No criterion.
7. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-15
HEXAGON LABORATORIES RI/FFS
SUBSURFACE UST ANALYTICAL DATA SUMMARY - PESTICIDES/PCBs (ug/kg)
Page 2 of 2

Sample Location	NORTH YARD		NEW PLANT				NYSDEC TAGM
Field Sample ID	NYT-1	NYT-2	NPT-1	NPT-2	NPT-3	NPT-4	
Sample Interval (feet bgs)	5.5 - 6	5.5 - 6	3 - 3.5	3 - 3.5	3 - 3.5	3 - 3.5	
Date Sampled	11/14/97	11/14/97	11/19/97	11/19/97	11/19/97	11/19/97	Levels (1)(2)
Pesticides							
alpha-BHC	2.6 JN	1.8 U	3.3 U	2.6 U	2.7 U	2.7 U	110
beta-BHC	1.7 U	1.8 U	3.3 U	2.6 U	2.7 U	2.7 U	200
delta-BHC	1.7 U	1.8 U	3.3 U	300 DJN	2.7 U	2.7 U	300
gamma-BHC (Lindane)	2.9	1.8 U	3.3 U	2.6 U	2.7 U	2.7 U	60
Heptachlor	2.5	1.8 U	3.3 U	2.6 U	2.7 U	2.7 U	100
Aldrin	1.7 U	1.8 U	3.3 U	350 DJN	350 JN	2.7 U	41
Heptachlor Epoxide	1.7 U	1.8 U	3.3 U	2.6 U	2.7 U	2.7 U	20
Endosulfan I	2.7	1.8 U	3.3 U	2.6 U	2.7 U	2.7 U	900
Dieldrin	5.7	3.5 U	6.4 U	5.1 U	5.3 U	5.2 U	44
4,4'-DDE	3.4 U	3.5 U	6.4 U	130 DJN	110 JN	5.2 U	2100
Endrin	4.8	3.5 U	6.4 U	73 JN	180 JN	5.2 U	100
Endosulfan II	3.4 U	3.5 U	6.4 U	5.1 U	5.3 U	5.2 U	900
4,4'-DDD	5.5 JN	3.5 U	6.4 U	30 JN	5.3 U	5.2 U	2900
Endosulfan Sulfate	3.4 U	3.5 U	6.4 U	24	5.3 U	5.2 U	1000
4,4'-DDT	5.5 JN	3.5 U	6.4 U	55 JN	95 JN	5.2 U	2100
Methoxychlor	26	18 U	33 U	26 U	27 U	200 J	NC
Endrin ketone	3.4 U	3.5 U	6.4 U	5.1 U	5.3 U	5.2 U	NC
Endrin aldehyde	3.4 U	3.5 U	6.4 U	5.1 U	5.3 U	5.2 U	NC
alpha-Chlordane	1.7 U	7.9 JN	3.3 U	33	77 JN	2.7 U	540 (3)
gamma-Chlordane	1.7 U	7.6 JN	3.3 U	120 DJN	21	2.7 U	540 (3)
PCBs							
Aroclor-1242	34 U	100 J	64 U	51 U	53 U	52 UJ	10000 (4)
Aroclor-1248	34 U	35 U	64 U	7800 DJN	7200 JN	52 UJ	10000 (4)
Aroclor-1254	34 U	35 U	64 U	51 U	53 U	52 UJ	10000 (4)
Aroclor-1260	34 U	35 U	64 U	51 U	53 U	52 UJ	10000 (4)

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, total pesticide concentration shall be less than 10 ppm (10,000 ug/kg).
3. Soil cleanup objective for Chlordane does not specify isomer.
4. Recommended soil cleanup level corresponds to total PCBs in subsurface soil.
5. Sample SYTEX-1 represents excavated material that was removed from the site during the IRM.
6. U = Not detected; J = Estimated value; R = Rejected value; D = Diluted sample; N = Presumptive evidence of presence; NA = Not analyzed; NC = No criterion.
7. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-16
HEXAGON LABORATORIES RI/FFS
SUBSURFACE UST ANALYTICAL DATA SUMMARY - INORGANICS (mg/kg)
Page 1 of 2

Sample Location	EAST YARD				SOUTH YARD					
Field Sample ID	EYT34-1	EYT35-1	EYT36-1	EYT37-1	SYTN-1	SYTS-1	SYTE-1	SYTW-1	SYTC-1	SYTEX-1 (7)
Sample Interval (feet bgs)	0 - 6	0 - 6	0 - 6	0 - 6	2.5 - 4.5	2.5 - 4.5	2.5 - 4.5	2.5 - 4.5	2.5 - 4.5	0 - 6
Date Sampled	8/29/97	8/29/97	8/29/97	8/29/97	12/4/97	12/4/97	12/4/97	12/4/97	12/4/97	12/4/97
Aluminum	701 J	791 J	620 J	829 J	NA	NA	NA	NA	6440 J	7050 J
Antimony	0.58 U	0.58 U	0.59 U	0.52 U	NA	NA	NA	NA	0.67 UJ	0.59 UJ
Arsenic	1.7	0.70	0.39 U	0.56	NA	NA	NA	NA	2.3	4.0 J
Barium	5.1 J	5.5 J	3.9 J	5.0 J	NA	NA	NA	NA	82.3 J	103 J
Beryllium	0.19 U	0.19 U	0.20 U	0.17 U	NA	NA	NA	NA	0.31 J	0.42 J
Cadmium	0.12 U	0.12 U	0.12 U	0.10 U	NA	NA	NA	NA	0.60	0.91
Calcium	135 J	2840 J	786 J	109 J	NA	NA	NA	NA	20900 J	17700 J
Chromium	3.8 J	2.8 J	2.0 J	2.9 J	NA	NA	NA	NA	35.3	39.2
Cobalt	1.1	1.1	10.7 J	1.2	NA	NA	NA	NA	7.7 J	7.4 J
Copper	2.5	3.1	4.3	2.3	NA	NA	NA	NA	55.5 J	65.2 J
Iron	4770 J	2450 J	3190 J	3350 J	NA	NA	NA	NA	14200	16700
Lead	1.5	3.3	2.8	1.4	NA	NA	NA	NA	44.8	74.3
Magnesium	253 J	513 J	266 J	296 J	NA	NA	NA	NA	5760 J	3840 J
Manganese	39.9 J	50.3 J	48.4 J	56.9 J	NA	NA	NA	NA	158 J	197 J
Mercury	0.27	0.56	0.04 U	0.07	NA	NA	NA	NA	▨ 4.1 J	2.6 J
Nickel	2.6	2.6	2.6	2.6	NA	NA	NA	NA	▨ 101 J	55.6 J
Potassium	252 U	454	280	226 U	NA	NA	NA	NA	3300 J	2950 J
Selenium	0.97 U	0.96 U	0.98 U	0.87 U	NA	NA	NA	NA	1.1 UJ	0.98 UJ
Silver	0.43 UJ	0.33 UJ	0.37 UJ	0.41 UJ	NA	NA	NA	NA	0.44 UJ	0.39 UJ
Sodium	130	192	125	112	NA	NA	NA	NA	295	220
Thallium	0.39 U	0.38 U	0.39 U	0.35 U	NA	NA	NA	NA	0.44 U	0.41
Vanadium	4.7 J	3.1 J	2.6 J	3.5 J	NA	NA	NA	NA	21.2 J	22.5 J
Zinc	5.9 J	43.8 J	72.4 J	8.2 J	NA	NA	NA	NA	169 J	234 J
Cyanide	0.24 U	0.21 U	0.22 U	0.23 U	NA	NA	NA	NA	1.0	1.4

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. Except as noted, background concentrations represent the maximum background concentration for New York State soils as reported by E.C. McGovern, NYSDEC, in "Background Concentrations of 20 Elements in Soils with Special Regard for New York State", undated.
3. Maximum concentration listed for urban New Jersey soils as reported by NJDEPE in "A Summary of Selected Soil Constituents and Contaminants at Background Locations in New Jersey", 1993.
4. Maximum concentration detected in site-specific background sample.
5. As indicated in NYSDEC TAGM HWR-94-4046, average background levels of lead in metropolitan or suburban areas or near highways typically range as high as 500 ppm.
6. Background concentrations for cyanide were not reported in literature sources reviewed. Cyanide was not detected in the three site-specific background samples and, therefore, the background concentration for cyanide is assumed to be non detect.
7. Sample SYTEX-1 represents excavated material that was removed from the site during the IRM.
8. U = Not detected; J = Estimated value; R = Rejected value; NA = Not analyzed; BKGD = Site background concentration; NC = No criterion; ND = Non detect.
9. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-16
HEXAGON LABORATORIES RI/FFS
SUBSURFACE UST ANALYTICAL DATA SUMMARY - INORGANICS (mg/kg)
Page 2 of 2

Sample Location	NORTH YARD		NEW PLANT				NYSDEC TAGM	Background
Field Sample ID	NYT-1	NYT-2	NPT-1	NPT-2	NPT-3	NPT-4		
Sample Interval (feet bgs)	5.5 - 6	5.5 - 6	3 - 3.5	3 - 3.5	3 - 3.5	3 - 3.5		
Date Sampled	11/14/97	11/14/97	11/19/97	11/19/97	11/19/97	11/19/97	Levels [1]	Concentrations [2]
Aluminum	10500	18800	16800	14800	16700	18000	BKGD	25000
Antimony	0.48 U	0.64 U	0.66 U	0.53 U	0.64 U	0.52 U	BKGD	0.69 [3]
Arsenic	2.8	5.2 J	4.5	3.4	4.4	3.1	7.5 or BKGD	12
Barium	62.5	460	208	152	192	147	300 or BKGD	600
Beryllium	0.54	0.79	0.49	0.50	0.55	0.66	0.16 or BKGD	1.75
Cadmium	0.29	2.6	0.13 U	0.11 U	0.13 U	0.10 U	1 or BKGD	2.36 [3]
Calcium	2260	4070	3980	3090	4540	684	BKGD	35000
Chromium	62.6	88.9	56.6	49.0	63.0	48.3	10 or BKGD	64.5 [4]
Cobalt	14.7	22.8	17.1	13.0	13.7	10.7	30 or BKGD	60
Copper	28.5	127	36.1 J	95.3 J	44.6 J	31.8 J	25 or BKGD	196 [4]
Iron	24400	32800	27300	25000	26100	23000	2000 or BKGD	57900 [4]
Lead	28.0	410	44.4 J	8.5 J	49.4 J	16.1 J	BKGD	500 [5]
Magnesium	10100	10900	9050	6180	9270	7240	BKGD	8570 [4]
Manganese	297	486	306	207	276	238	BKGD	5000
Mercury	0.04 U	4.2	0.78	0.87	0.69	0.03 U	0.1 or BKGD	2.71 [3]
Nickel	135	94.1	42.6	42.3	38.5	28.1	13 or BKGD	72.3 [4]
Potassium	1700	8120 J	9170 J	7290 J	8130 J	7760 J	BKGD	43000
Selenium	0.81	1.1	1.1 U	0.89 U	1.1 U	0.87 U	2 or BKGD	0.125
Silver	0.32 UJ	0.43 UJ	0.44 UJ	0.36 UJ	0.43 UJ	0.35 UJ	BKGD	1.53 [3]
Sodium	123	452	894	1360	842	209	BKGD	8000
Thallium	0.73	0.89	1.0	1.0	0.93	0.96	BKGD	1.5 [4]
Vanadium	37.3	67.6	50.7	42.5	54.4	56.1	150 or BKGD	60
Zinc	71.4	912	118	74.3	102	63.5	20 or BKGD	1100 [4]
Cyanide	1.1 U	0.96 U	1.2 U	1.1 U	1.0 U	1.0 U	NC	ND[6]

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. Except as noted, background concentrations represent the maximum background concentration for New York State soils as reported by E.C. McGovern, NYSDEC, in "Background Concentrations of 20 Elements in Soils with Special Regard for New York State", undated.
3. Maximum concentration listed for urban New Jersey soils as reported by NJDEPE in "A Summary of Selected Soil Constituents and Contaminants at Background Locations in New Jersey", 1993.
4. Maximum concentration detected in site-specific background sample.
5. As indicated in NYSDEC TAGM HWR-94-4046, average background levels of lead in metropolitan or suburban areas or near highways typically range as high as 500 ppm.
6. Background concentrations for cyanide were not reported in literature sources reviewed. Cyanide was not detected in the three site-specific background samples *and, therefore, the background concentration for cyanide is assumed to be non detect.*
7. Sample SYTEX-1 represents excavated material that was removed from the site during the IRM.
8. U = Not detected; J = *Estimated value; R = Rejected value; NA = Not analyzed; BKGD = Site background concentration; NC = No criterion; ND = Non detect.*
9. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-17
HEXAGON LABORATORIES RI/FFS
SUBSURFACE UST ANALYTICAL DATA SUMMARY - TOTAL ORGANIC CARBON (mg/kg)

Sample Location	EAST YARD	SOUTH YARD	NORTH YARD	NEW PLANT
Field Sample ID	EYT36-1	SYTEX-1[(1)]	NYT-1	NPT-1
Sample Interval (feet bgs)	0 - 6	0 - 6	5.5 - 6	3 - 3.5
Date Sampled	8/29/97	12/4/97	11/14/97	11/19/97
TOC	620	23100	8760	2180

Note:

1. Sample SYTEX-1 represents excavated material removed from the site during the IRM.

TABLE 4-18
HEXAGON LABORATORIES RI/FFS
GROUNDWATER ANALYTICAL DATA SUMMARY - VOLATILE ORGANICS (ug/L)
Page 1 of 2

Sample Location	EAST YARD				SOUTH YARD	
Field Sample ID	HXMW1 (SHALLOW)		HXMW2 (DEEP)		HXMW3 (SHALLOW)	
Sampling Round	ROUND 1	ROUND 2	ROUND 1	ROUND 2	ROUND 1	ROUND 2
Date Sampled	1/2/98	3/5/98	1/2/98	3/5/98	1/2/98	3/5/98
Aromatics						
Benzene	94	260 J	280	230 DJ	3600	1100 DJ
Toluene	2 J	100 UJ	8 J	1 J	8800	120 DJ
Ethylbenzene	3 J	11 J	90	100 J	150 J	140 J
Xylene(total)	3 J	100 UJ	360	130 J	1000	320 DJ
Styrene	25 U	100 UJ	50 U	10 UJ	1000 U	10 UJ
Halogenated Aliphatics						
Chloromethane	25 UJ	100 UJ	50 UJ	10 UJ	1000 UJ	10 UJ
Bromomethane	25 U	100 UJ	50 U	10 UJ	1000 U	10 UJ
Vinyl Chloride	25 U	100 UJ	50 U	10 UJ	780 J	160 DJ
Chloroethane	63	250 J	180	130 DJ	1000 U	16
Methylene Chloride	25 UJ	100 UJ	50 UJ	3 J	120 J	6 J
1,1-Dichloroethene	25 U	100 UJ	50 U	10 UJ	1000 U	31 J
1,1-Dichloroethane	25 U	100 UJ	5 J	24 J	330 J	150 DJ
1,2-Dichloroethene (total)	25 UJ	100 UJ	50 UJ	10 UJ	4300 J	1200 DJ
Chloroform	25 U	100 UJ	50 U	10 UJ	1000 U	10 UJ
1,2-Dichloroethane	25 U	100 UJ	50 U	10 UJ	1800	590 DJ
1,1,1-Trichloroethane	25 U	100 UJ	50 U	2 J	1000 U	2 J
1,2-Dichloropropane	25 U	100 UJ	50 U	10 UJ	1000 U	10 UJ
Trichloroethene	25 U	100 UJ	50 U	1 J	280 J	260 DJ
Tetrachloroethene	25 U	100 UJ	50 U	10 UJ	280 J	730 DJ
Ketones						
Acetone	30	100 UJ	15 J	4 J	14000	270 DJ
2-Butanone	25 U	100 UJ	50 U	10 UJ	1000 U	10 UJ
4-Methyl-2-pentanone	25 U	100 UJ	50 U	10 UJ	1000 U	17 J
2-Hexanone	25 U	100 UJ	50 U	3 J	1000 U	37 J
Other/Miscellaneous VOCs						
Carbon disulfide	25 UJ	100 UJ	50 UJ	10 UJ	1000 UJ	10 UJ
Chlorobenzene	270	830 J	450	460 DJ	1200	360 DJ
Totat Target VOCs	465 J	1351 J	1388 J	1088 J	36640 J	5509 J
Number of VOC TICs	5	0	6	16	1	20
Total VOC TIC Concentration	486 J		496 J	327 J	700 J	515 J

Notes:

1. Class GA groundwater standards obtained from NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1.
2. Class GA groundwater standard applies to each Xylene isomer (1,2-, 1,3-, and 1,4-) individually.
3. NYSDEC Class GA Groundwater Standard for cis and trans isomers of 1,2-dichloroethene is 5 ug/L.
4. U = Not detected; J = Estimated value; D = Diluted sample; G = Guidance value; ND = Non-detect; NC = No criterion;
   N = Presumptive evidence of presence.
5. Shading indicates exceedance of NYSDEC Class GA Groundwater Standards.

TABLE 4-18
HEXAGON LABORATORIES RI/FFS
GROUNDWATER ANALYTICAL DATA SUMMARY - VOLATILE ORGANICS (ug/L)
Page 2 of 2

Sample Location	OLD PLANT		NEW PLANT		BOSTON POST ROAD		NYSDEC Class GA Groundwater Standards (1)
Field Sample ID	HXMW5 (SHALLOW)		HXMW4 (SHALLOW)		HXMW6 (SHALLOW)		
Sample Location	ROUND 1	ROUND 2	ROUND 1	ROUND 2	ROUND 1	ROUND 2	
Date Sampled	1/2/98	3/5/98	1/2/98	3/5/98	2/18/98	3/5/98	
Aromatics							
Benzene	5000 U	130 J	4000 J	3100 J	10 U	2 J	0.7
Toluene	38000	42000 DJ	280000	290000 DJ	10 U	10 UJ	5
Ethylbenzene	880 J	980 J	5200 J	3700 J	10 U	10 UJ	5
Xylene(total)	3900 J	4200 J	26000 J	19000 J	10 U	10 UJ	5 (2)
Styrene	5000 U	1000 UJ	50000 U	10000 UJ	10 U	10 UJ	5
Halogenated Aliphatics							
Chloromethane	5000 UJ	1000 UJ	50000 UJ	10000 UJ	10 U	10 UJ	NC
Bromomethane	5000 U	1000 UJ	50000 U	10000 UJ	10 U	10 UJ	5
Vinyl Chloride	5000 U	1000 UJ	50000 U	1200 J	10 U	10 UJ	2
Chloroethane	5000 U	1000 UJ	50000 U	10000 UJ	10 U	10 UJ	5
Methylene Chloride	5000 UJ	1000 UJ	15000 J	7700 J	10 U	10 UJ	5
1,1-Dichloroethene	5000 U	1000 UJ	50000 U	10000 UJ	10 U	10 UJ	5
1,1-Dichloroethane	5000 U	1000 UJ	36000 J	34000 J	0.9 J	3 J	5
1,2-Dichloroethene (total)	5000 UJ	1000 UJ	8800 J	6200 J	2 J	8 J	5 (3)
Chloroform	5000 U	1000 UJ	50000 U	10000 UJ	2 J	2 J	7
1,2-Dichloroethane	5000 U	140 J	440000	330000 DJ	3 J	8 J	5
1,1,1-Trichloroethane	5000 U	1000 UJ	50000 U	10000 UJ	10 U	10 UJ	5
1,2-Dichloropropane	5000 U	1000 UJ	50000 U	10000 UJ	10 U	10 UJ	5
Trichloroethene	5000 U	1000 UJ	19000 J	17000 J	9 J	26 J	5
Tetrachloroethene	5000 U	1000 UJ	10000 J	9500 J	10 U	1 J	5
Ketones							
Acetone	11000	4200 J	24000 J	10000 J	10 U	10 UJ	50 (G)
2-Butanone	5000 U	1000 UJ	50000 U	10000 UJ	10 U	10 UJ	NC
4-Methyl-2-pentanone	5000 U	1000 UJ	50000 U	10000 UJ	10 U	10 UJ	NC
2-Hexanone	5000 U	1000 UJ	50000 U	10000 UJ	10 U	10 UJ	50 (G)
Other/Miscellaneous VOCs							
Carbon disulfide	5000 UJ	1000 UJ	50000 UJ	10000 UJ	10 U	10 UJ	NC
Chlorobenzene	5000 U	210 J	3900 J	3100 J	2 NJ	4 J	5
Totat Target VOCs	53780 J	51860 J	871900 J	734500 J	18 J	54 J	
Number of VOC TICs	0	0	1	0	3	3	
Total VOC TIC Concentration			48000 J		57 J	143 J	

Notes:

1. Class GA groundwater standards obtained from NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1.
2. Class GA groundwater standard applies to each Xylene isomer (1,2-, 1,3-, and 1,4-) individually.
3. NYSDEC Class GA Groundwater Standard for cis and trans isomers of 1,2-dichloroethene is 5 ug/L.
4. U = Not detected; J = Estimated value; D = Diluted sample; G = Guidance value; ND = Non-detect; NC = No criterion;
   N = Presumptive evidence of presence.
5. Shading indicates exceedance of NYSDEC Class GA Groundwater Standards.

TABLE 4-19
HEXAGON LABORATORIES RI/FFS
GROUNDWATER ANALYTICAL DATA SUMMARY - SEMIVOLATILE ORGANICS (ug/L)
Page 1 of 2

Sample Location	EAST YARD				SOUTH YARD		OLD PLANT	
Field Sample ID	HXMW1 (SHALLOW)		HXMW2 (DEEP)		HXMW3 (SHALLOW)		HXMW5 (SHALLOW)	
Sampling Round	ROUND 1	ROUND 2	ROUND 1	ROUND 2	ROUND 1	ROUND 2	ROUND 1	ROUND 2
Date Sampled	1/2/98	3/5/98	1/2/98	3/5/98	1/2/98	3/5/98	1/2/98	3/5/98
Phenols/Acid Extractables								
Phenol	R	5 J	10 U	41	600 D	430 D	1600 D	1000 D
2-Chlorophenol	10 U	3 J	10 U	10 U	R	10 U	10 U	10 U
2-Methylphenol (*o-cresol*)	10 U	10 U	10 U	10 U	R	220 DJ	550 D	660 DJ
4- Methylphenol	10 U	10 U	10 U	10 U	290 DJN	210 DJ	2000 D	1000 D
2,4-Dimethylphenol	10 U	10 U	10 U	10 U	10 U	18	40	33
Pentachlorophenol	25 U	25 UJ	25 U	25 UJ	25 U	25 UJ	25 U	25 UJ
Polycyclic Aromatic Hydrocarbons (PAHs)								
Naphthalene	10 U	10 U	10 U	3 J	44	19	1 JN	1 J
2-Methylnaphthalene	10 U	10 U	10 U	10 U	17	10	10 U	10 U
Acenaphthylene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acenaphthene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Fluorene	10 U	10 U	10 U	10 U	1 J	10 U	10 U	10 U
Phenanthrene	10 U	10 U	10 U	10 U	1 J	2 J	10 U	10 U
Anthracene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Pyrene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chrysene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 UJ	10 U
Benzo(k)fluoranthene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 UJ	10 U
Benzo(a)pyrene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 UJ	10 U
Indeno(1,2,3-cd)pyrene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 UJ	10 U
Dibenz(a,h)anthracene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 UJ	10 U
Benzo(g,h,i)perylene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 UJ	10 U
Aniline Compounds								
4-Chloroaniline	10 U	10 U	10 U	10 U	R	10 U	10 U	10 U
4-Nitroaniline	25 U	R	25 U	R	25 U	R	25 U	R
Benzenes/Aromatics								
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	2 J	11	10 U	6 J	72	49	16	14
Phthalates								
Dimethylphthalate	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10 U	10 U	10 U	1 J	1 J	10 U	3 JN	10 U
Di-n-butyl phthalate	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Butylbenzyl phthalate	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10 U	10 U	10 U	10 U	14 U	1 J	48 U	2 J
Di-n-octyl phthalate	10 U	10 U	10 U	10 U	10 UJ	10 U	10 UJ	10 U
Other/Miscellaneous SVOCs								
Carbazole	10 U	10 U	10 U	1 J	10 U	10 U	10 U	10 U
Dibenzofuran	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Total Target SVOCs	2 J	19 J	0 J	52 J	1,026 J	959 J	4,210 J	2,710 J
Number of SVOC TICs	23	8	1	3	15	8	17	17
Total SVOC TIC Concentration	383 J	322 J	2 J	478 J	664 J	313 J	1,064 J	1,862 J

Notes:

1. Class GA groundwater standards obtained from NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1.
2. Class GA groundwater standard for total phenols.
3. Class GA groundwater standard for the sum of 1,2-Dichlorobenzene and 1,4-Dichlorobenzene.
4. U = Not detected; J = Estimated value; R = Rejected value; N = Presumptive evidence of presence; D = Diluted sample; G = Guidance value; ND = Non-detect; NC = No criterion.
5. Shading indicates exceedance of NYSDEC Class GA Groundwater Standards.

TABLE 4-19
HEXAGON LABORATORIES RI/FFS
GROUNDWATER ANALYTICAL DATA SUMMARY - SEMIVOLATILE ORGANICS (ug/L)
Page 2 of 2

Sample Location	NEW PLANT		BOSTON POST ROAD		NYSDEC Class GA Groundwater Standards [1]
Field Sample ID	HXMW4 (SHALLOW)		HXMW6 (SHALLOW)		
Sampling Round	ROUND 1	ROUND 2	ROUND 1	ROUND 2	
Date Sampled	1/2/98	3/5/98	2/18/98	3/5/98	
Phenols/Acid Extractables					
Phenol	3800	3700 D	10 U	10 U	1 [2]
2-Chlorophenol	500 U	200 U	10 U	10 U	1 [2]
2-Methylphenol (o-cresol)	500 U	1200	10 U	10 U	1 [2]
4- Methylphenol	9900 D	9900 D	10 U	10 U	1 [2]
2,4-Dimethylphenol	500 U	200 U	10 U	3 J	1 [2]
Pentachlorophenol	1200 U	500 UJ	25 U	25 UJ	1 [2]
Polycyclic Aromatic Hydrocarbons (PAHs)					
Naphthalene	500 U	430	10 U	10 U	10 (G)
2-Methylnaphthalene	500 U	200 U	10 U	10 U	NC
Acenaphthylene	500 U	200 UJ	10 U	10 U	NC
Acenaphthene	500 U	200 UJ	10 U	10 U	20 (G)
Fluorene	500 U	200 UJ	10 U	10 U	50 (G)
Phenanthrene	500 U	200 U	10 U	10 U	50 (G)
Anthracene	500 U	200 U	10 U	10 U	50 (G)
Fluoranthene	500 U	200 U	10 U	10 U	50 (G)
Pyrene	500 U	200 U	10 U	10 U	50 (G)
Benzo(a)anthracene	500 U	200 U	10 U	10 U	.002 (G)
Chrysene	500 U	200 U	10 U	10 U	.002 (G)
Benzo(b)fluoranthene	500 U	200 U	10 U	10 U	.002 (G)
Benzo(k)fluoranthene	500 U	200 U	10 U	10 U	.002 (G)
Benzo(a)pyrene	500 U	200 U	10 U	10 U	ND
Indeno(1,2,3-cd)pyrene	500 U	200 U	10 U	10 U	.002 (G)
Dibenz(a,h)anthracene	500 U	200 U	10 U	10 U	NC
Benzo(g,h,i)perylene	500 U	200 U	10 U	10 U	NC
Aniline Compounds					
4-Chloroaniline	500 U	200 U	10 U	10 U	NC
4-Nitroaniline	1200 U	R	25 U	R	NC
Benzenes/Aromatics					
1,3-Dichlorobenzene	500 U	200 U	10 U	10 U	5
1,4-Dichlorobenzene	500 U	200 U	10 U	10 U	4.7 [3]
1,2-Dichlorobenzene	320 J	290	6 J	11	4.7 [3]
Phthalates					
Dimethylphthalate	500 U	270 J	10 U	10 U	50 (G)
Diethylphthalate	84 J	130 J	10 U	10 U	50 (G)
Di-n-butyl phthalate	500 U	200 U	10 U	10 U	NC
Butylbenzyl phthalate	500 U	200 U	10 U	10 U	50 (G)
bis(2-Ethylhexyl)phthalate	500 U	200 U	10 U	10 U	50
Di-n-octyl phthalate	500 U	200 U	10 U	10 U	50 (G)
Other/Miscellaneous SVOCs					
Carbazole	500 U	200 U	10 U	10 U	NC
Dibenzofuran	500 U	200 UJ	10 U	10 U	NC
Total Target SVOCs	14,104 J	15,920	6 J	14 J	
Number of SVOC TICs	8	10	26	18	
Total SVOC TIC Concentration	38,590 J	64,300 J	152 J	103 J	

Notes:

1. Class GA groundwater standards obtained from NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1.
2. Class GA groundwater standard for total phenols.
3. Class GA groundwater standard for the sum of 1,2-Dichlorobenzene and 1,4-Dichlorobenzene.
4. U = Not detected; J = Estimated value; R = Rejected value; N = Presumptive evidence of presence; D = Diluted sample; G = Guidance value; ND = Non-detect; NC = No criterion.
5. Shading indicates exceedance of NYSDEC Class GA Groundwater Standards.

TABLE 4-20
HEXAGON LABORATORIES RI/FFS
GROUNDWATER ANALYTICAL DATA SUMMARY - PESTICIDES/PCBs (ug/L)
Page 1 of 2

Sample Location	EAST YARD				SOUTH YARD		OLD PLANT	
Field Sample ID	HXMW1 (SHALLOW)		HXMW2 (DEEP)		HXMW3 (SHALLOW)		HXMW5 (SHALLOW)	
Sampling Round	ROUND 1	ROUND 2	ROUND 1	ROUND 2	ROUND 1	ROUND 2	ROUND 1	ROUND 2
Date Sampled	1/2/98	3/5/98	1/2/98	3/5/98	1/2/98	3/5/98	1/2/98	3/5/98
Pesticides								
alpha-BHC	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
beta-BHC	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
delta-BHC	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-BHC (Lindane)	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Heptachlor	0.050 U	0.050 U	0.050 U	0.050 U	0.12 JN	0.050 U	0.050 U	0.050 U
Aldrin	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Endosulfan I	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Dieldrin	0.10 U	0.10 U	R	R	0.26 JN	0.17 J	0.10 U	0.10 U
4,4'-DDE	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan II	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDD.	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10 U	R	R	R	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10 U	0.21 J	0.29	0.33	0.10 U	0.10 U	0.10 U	0.10 U
Methoxychlor	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Endrin ketone	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin aldehyde	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
alpha-Chlordane	0.050 U	0.050 U	0.050 U	0.050 JN	0.050 U	0.050 U	0.050 U	0.050 U
gamma-Chlordane	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
PCBs								
Aroclor-1242	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Notes:

1. Class GA groundwater standards obtained from NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1.
2. Class GA groundwater standard is provided for Chlordane; isomer is not specified.
3. Class GA groundwater standard for total PCBs.
4. U = Not detected; J = Estimated value; R = Rejected value; D = Diluted sample; N = Presumptive evidence of presence; G = Guidance value; ND = Non-detect; NC = No criterion.
5. Shading indicates exceedance of NYSDEC Class GA Groundwater Standards.

TABLE 4-20
HEXAGON LABORATORIES RI/FFS
GROUNDWATER ANALYTICAL DATA SUMMARY - PESTICIDES/PCBs (ug/L)
Page 2 of 2

Sample Location	NEW PLANT		BOSTON POST ROAD		NYSDEC Class GA Groundwater Standards [1]
Field Sample ID	HXMW4 (SHALLOW)		HXMW6 (SHALLOW)		
Sampling Round	ROUND 1	ROUND 2	ROUND 1	ROUND 2	
Date Sampled	1/2/98	3/5/98	2/18/98	3/5/98	
Pesticides					
alpha-BHC	0.050 U	0.050 U	0.050 U	0.050 U	NC
beta-BHC	0.46 JN	0.050 U	0.050 U	0.050 U	NC
delta-BHC	R	R	0.050 U	0.050 U	NC
gamma-BHC (Lindane)	0.050 U	0.050 U	0.050 U	0.050 U	NC
Heptachlor	1.9 DJ	1.2 J	0.050 U	0.050 U	ND
Aldrin	R	R	0.050 U	0.050 U	NC
Heptachlor Epoxide	0.050 U	0.050 U	0.050 U	0.050 U	ND
Endosulfan I	R	R	0.050 U	0.050 U	NC
Dieldrin	0.10 U	0.10 U	0.10 U	0.10 U	ND
4,4'-DDE	0.25 JN	R	0.10 U	0.10 U	ND
Endrin	0.48 JN	0.10 U	0.10 UJ	0.10 U	ND
Endosulfan II	0.10 U	0.10 U	0.10 U	0.10 U	NC
4,4'-DDD	R	R	0.10 U	0.10 U	ND
Endosulfan Sulfate	R	0.10 U	0.10 U	0.10 U	NC
4,4'-DDT	R	0.10 U	0.10 U	0.10 U	ND
Methoxychlor	0.50 U	0.50 U	0.50 U	0.50 U	35
Endrin ketone	0.10 U	0.10 U	0.10 U	0.10 U	NC
Endrin aldehyde	0.10 U	0.10 U	0.10 U	0.10 U	NC
alpha-Chlordane	0.050 U	R	0.050 U	0.050 U	0.1 [2]
gamma-Chlordane	0.20 J	R	0.050 U	0.050 U	0.1 [2]
PCBs					
Arocolor-1242	1.0 U	1.0 U	1.0 U	1.0 U	.1 [3]
Arocolor-1248	13 J	17	1.0 U	1.0 U	.1 [3]
Arocolor-1254	1.0 U	1.0 U	1.0 U	1.0 U	.1 [3]
Arocolor-1260	1.0 U	1.0 U	1.0 U	1.0 U	.1 [3]

Notes:

1. Class GA groundwater standards obtained from NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1.
2. Class GA groundwater standard is provided for Chlordane; isomer is not specified.
3. Class GA groundwater standard for total PCBs.
4. U = Not detected; J = Estimated value; R = Rejected value; D = Diluted sample; N = Presumptive evidence of presence; G = Guidance value; ND = Non-detect; NC = No criterion.
5. Shading indicates exceedance of NYSDEC Class GA Groundwater Standards.

TABLE 4-21
HEXAGON LABORATORIES RI/FFS
GROUNDWATER ANALYTICAL DATA SUMMARY - INORGANICS (ug/L)
Page 1 of 2

Sample Location	EAST YARD								SOUTH YARD			
Field Sample ID	HXMW1 (SHALLOW)				HXMW2 (DEEP)				HXMW3 (SHALLOW)			
Sampling Round	ROUND 1		ROUND 2		ROUND 1		ROUND 2		ROUND 1		ROUND 2	
Sample Description	TOTAL	FILTERED	TOTAL	FILTERED	TOTAL	FILTERED	TOTAL	FILTERED	TOTAL	FILTERED	TOTAL	FILTERED
Date Sampled	1/2/98	1/2/98	3/5/98	3/5/98	1/2/98	1/2/98	3/5/98	3/5/98	1/2/98	1/2/98	3/5/98	3/5/98
Aluminum	81600	10.0 U	26700 J	10.0 U	699	17.6	409 J	10.0 U	2960	123 J	13400 J	10.0 U
Antimony	R	R	4.5	2.2	R	R	2.8	2.0 U	R	R	3.9	2.3
Arsenic	18.3	10.8	8.5	5.0 J	R	R	2.9 J	3.8 J	6.3	11.1	11.4	10.9 J
Barium	860	148 J	291 J	34.7 J	395	323 J	343 J	282 J	90.1	43.0 J	188 J	20.4 J
Beryllium	3.8	0.50 U	1.8	0.50 U	1.0 U	0.50 U	0.50 U	0.50 U	1.0 U	0.50 U	0.50 U	0.50 U
Cadmium	5.9	1.0 U	5.0 J	1.0 U	0.60 U	1.0 J	1.0 UJ	1.0 U	0.60 U	1.0 U	1.5 J	1.0 U
Calcium	87900	78600	22600	21400	38500 J	45900 J	34900	38300	72000	74200	67600	49700
Chromium	320	1.4	106 J	2.6	3.9	2.5	3.2	2.3	13.8	4.1	49.1 J	4.5
Cobalt	80.2	5.7	25.7 J	1.6	1.9	1.1	1.1	0.78	6.5	3.4	16.1 J	2.6
Copper	383	14.2 J	128 J	1.0 U	5.4	14.1 J	3.5	1.0 U	16.6	10.7 J	55.8 J	1.0 U
Iron	115000	1310 J	R	757 J	12800	10300 J	R	12600 J	12900	5370 J	R	2250 J
Lead	269	2.0 U	94.9	2.0 U	2.8	2.0 U	5.1	2.0 U	7.5	2.0 U	27.2	2.0 U
Magnesium	41200	9360 J	14400	4370	21600 J	24000 J	17000 J	18800 J	9230	9020 J	10800	6120
Manganese	1460	366 J	R	103	934 J	1060 J	R	1400	616	566 J	R	453
Mercury	R	NA	0.58 J	0.26 UJ	R	NA	0.27 UJ	0.26 UJ	R	NA	0.27 UJ	0.26 UJ
Nickel	336	37.3 J	109 J	15.5 J	12.4	10.7 J	8.8	7.5	27.7	25.4 J	52.3 J	27.3 J
Potassium	57900 J	28900	4000 UJ	42200	31900 J	35200	31800 J	33100	39800 J	38400	39900 J	31900
Selenium	5.1 J	5.0 U	5.0 U	5.0 U	5.0 UJ	5.0 U	5.0 U	5.1 U	5.0 UJ	5.0 U	5.0 U	5.0 U
Silver	R	R	R	R	R	R	R	R	R	R	R	R
Sodium	103000 J	121000 J	292000	301000	139000 J	171000 J	135000 J	155000 J	383000 J	450000 J	285000 J	342000 J
Thallium	19.0	3.0 U	4.2	3.0 U	2.0 U	3.0 U	3.0 U	3.0 U	2.7	3.0 U	3.0 U	3.0 U
Vanadium	203	4.7	62.1	4.0	17.7	5.7	3.0 U	3.2	17.7	5.8	32.9	5.3
Zinc	3300	866 J	1270	158 J	18.4	44.0 J	10.3 J	30.0 J	45.1	26.2	134	6.2 J
Cyanide	2.0 U	NA	1.5	NA	2.0 U	NA	1.8	NA	2.0 U	NA	1.4	NA

Notes:

1. Class GA groundwater standards obtained from NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1.
2. Total iron and manganese Class GA groundwater standard is 300 ug/L.
3. U = Not detected; J = Estimated value; R = Rejected value; NA = Not analyzed; G = Guidance value; ND = Non-detect; NC = No criterion.
4. Shading indicates exceedance of NYSDEC Class GA Groundwater Standards.

TABLE 4-21
HEXAGON LABORATORIES RI/FFS
GROUNDWATER ANALYTICAL DATA SUMMARY - INORGANICS (ug/L)
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Sample Location	OLD PLANT				NEW PLANT				BOSTON POST ROAD				NYSDEC Class GA Groundwater Standards (1)
Field Sample ID	HXMW5 (SHALLOW)				HXMW4 (SHALLOW)				HXMW6				
Sampling Round	ROUND 1		ROUND 2		ROUND 1		ROUND 2		ROUND 1		ROUND 2		
Sample Description	TOTAL	FILTERED	TOTAL	FILTERED	TOTAL	FILTERED	TOTAL	FILTERED	TOTAL	FILTERED	TOTAL	FILTERED	
Date Sampled	1/2/98	1/2/98	3/5/98	3/5/98	1/2/98	1/2/98	3/5/98	3/5/98	2/18/98	2/18/98	3/5/98	3/5/98	
Aluminum	2060	10.0 U	12300 J	26.1	23100	497 J	57300 J	510	5660	3910 J	805 J	10.0 U	NC
Antimony	3.0 U	3.2	4.7	2.0 U	R	R	R	R	3.6	2.6	2.4	2.0 U	3 (G)
Arsenic	R	R	5.9	3.5 J	11.2 J	12.6 J	18.1	7.2 J	3.8	3.9	2.0 UJ	2.8 J	25
Barium	63.2	24.7 J	180 J	14.1 J	353	29.8 J	775 J	22.0 J	165 J	122 J	76.3 J	72.7 J	1000
Beryllium	1.0 U	0.50 U	0.50 U	0.50 U	1.0 U	0.50 U	3.0	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	3 (G)
Cadmium	0.60 U	1.0 U	1.6 J	1.0 U	2.1	1.0 U	7.1 J	1.0 U	1.3	1.2	1.0 UJ	1.0 U	10
Calcium	44800	45300	32900	27600	102000	104000	130000	133000	49900	47600	51100 J	60000 J	NC
Chromium	160	57.7 J	230 J	76.2	424	221 J	560 J	200	40.6 J	36.3 J	9.5 J	2.7	50
Cobalt	6.5	3.7	15.8 J	2.6	28.6	11.0 J	51.1 J	8.9	13.3 J	12.3 J	6.0 J	4.4	NC
Copper	42.0	9.3	68.9 J	1.0 U	923	25.9 J	2080 J	10.4	32.1 J	35.8 J	11.0 J	4.3	200
Iron	19900	5440 J	R	8000 J	38900	5920 J	R	8970 J	7840	5940 J	R	42.9 J	300 (2)
Lead	3.7	2.0 U	10.2	2.0 U	131	2.0 U	276	2.0 U	11.1	13.2	3.9	2.0 U	25
Magnesium	4630	4070 J	7370	3330	13500	6470 J	30800	9590	9400	8720 J	8640 J	9540 J	35000 (G)
Manganese	859	765 J	R	644	801	273 J	R	464	545	504 J	R	511	300 (2)
Mercury	R	NA	0.27 UJ	0.26 UJ	R	NA	4.3 J	0.29 J	0.27 J	0.40 J	0.88 J	0.26 UJ	2
Nickel	26.5	24.0 J	43.6 J	19.3 J	949	606 J	1240 J	618 J	24.6 J	24.4 J	13.8 J	11.5 J	NC
Potassium	40200 J	41500	46000 J	38200	43800 J	34600	R	R	16100	15900	13800 J	15500 J	NC
Selenium	12.3 J	5.0 U	5.0 U	5.0 U	5.0 UJ	5.0 U	5.0 U	5.0 U	5.0 UJ	5.0 U	5.0 U	5.0 U	10
Silver	2.0 U	2.0 UJ	3.0 J	2.0 UJ	R	R	5.9 J	3.4 J	5.8 J	2.0 UJ	R	R	50
Sodium	170000 J	196000 J	153000 J	178000 J	295000 J	279000	283000 J	318000 J	68800	62800	75400 J	87600 J	20000
Thallium	2.0 U	3.0 U	3.0 U	3.0 U	7.2	3.0 U	10.2	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	4 (G)
Vanadium	14.2	3.3	41.1	3.6	113	48.2 J	177	38.2	14.3	11.5	3.3	3.0 U	NC
Zinc	R	R	98.9	67.9 J	572	223 J	974	87.3 J	104 J	96.7 J	36.5 J	42.5 J	300
Cyanide	2.0 U	NA	2.1	NA	1150	NA	2000	NA	4.5	NA	0.50 U	NA	100

Notes:

1. Class GA groundwater standards obtained from NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1.
2. Total iron and manganese Class GA groundwater standard is 300 ug/L.
3. U = Not detected; J = Estimated value; R = Rejected value; NA = Not analyzed; G = Guidance value; ND = Non-detect; NC = No criterion.
4. Shading indicates exceedance of NYSDEC Class GA Groundwater Standards.

TABLE 4-22
HEXAGON LABORATORIES RI/FFS
GROUNDWATER ANALYTICAL DATA SUMMARY - TOTAL ORGANIC CARBON, TOTAL DISSOLVED SOLIDS, AND TOTAL SUSPENDED SOLIDS (mg/L)

Sample Location	EAST YARD				SOUTH YARD		OLD PLANT		NEW PLANT		BOSTON POST ROAD	
Field Sample ID	HXMW1 (SHALLOW)		HXMW2 (DEEP)		HXMW3 (SHALLOW)		HXMW5 (SHALLOW)		HXMW4 (SHALLOW)		HXMW6 (SHALLOW)	
Sampling Round	ROUND 1	ROUND 2	ROUND 1	ROUND 2	ROUND 1	ROUND 2	ROUND 1	ROUND 2	ROUND 1	ROUND 2	ROUND 1	ROUND 2
Date Sampled	1/2/98	3/5/98	1/2/98	3/5/98	1/2/98	3/5/98	1/2/98	3/5/98	1/2/98	3/5/98	2/18/98	3/5/98
TOC	16.6	NA	46.6	NA	2720	NA	135	NA	1010	NA	NA	NA
TDS (1)	640	950 J	700	680 J	1500	1000 J	750	730 J	1300	1500 J	440 J	540 J
TSS (1)	700	1200 J	26	60 J	160	210 J	78	330 J	120	61 J	110 J	61 J

Notes:

1. For MW-1 through MW-5, only analytical data for TDS and TSS samples collected on 3/5/98 were validated; For MW-6, TDS and TSS analytical data for both sampling rounds were validated.
2. J = Estimated value; NA = Not analyzed.

TABLE 4-23
HEXAGON LABORATORIES RI/FFS
IRM UST EXCAVATED SOIL ANALYTICAL DATA SUMMARY - VOLATILE ORGANICS (ug/kg)

Sample Location	SOUTH YARD					NEW PLANT				
Field Sample ID	LD1-2-3	#1-2-3	SYS1	SYS2	SYS3	FOT#1	FOT#2	FO1	FO2	NYSDEC TAGM Levels (1) (2)
Sample Interval (feet bgs)	0 - 3	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
Date Sampled	10/8/97	12/5/97	12/22/97	12/22/97	12/22/97	11/14/97	11/14/97	12/22/97	12/22/97	
Aromatics										
Benzene	6300	5 U	250 U	250 U	NA	63000	97000	250 U	1000	60
Toluene	1700000	150	30000	100000	NA	500000	1800000	10000	260000	1500
Ethylbenzene	62000	260	2800	3900	NA	10000	62000	1300	23000	5500
Xylene(total)	270000	1500	14000	20000	NA	74000	420000	42000	180000	1200
Styrene	500 U	5 U	250 U	250 U	NA	1000 U	1000 U	250 U	500 U	NC
Halogenated Aliphatics										
Chloromethane	500 U	5 U	250 U	250 U	NA	1000 U	1000 U	250 U	500 U	NC
Bromomethane	500 U	5 U	250 U	250 U	NA	1000 U	1000 U	250 U	500 U	NC
Vinyl Chloride	500 U	5 U	250 U	250 U	NA	1000 U	1000 U	250 U	500 U	200
Chloroethane	500 U	5 U	250 U	250 U	NA	1000 U	1000 U	250 U	500 U	1900
Methylene Chloride	500 U	5 U	250 U	250 U	NA	1000 U	1000 U	250 U	500 U	100
1,1-Dichloroethene	500 U	5 U	250 U	250 U	NA	1000 U	1000 U	250 U	500 U	400
1,1-Dichloroethane	500 U	5 U	250 U	250 U	NA	1000 U	1000 U	250 U	500 U	200
1,2-Dichloroethene (total)	500 U	5 U	250 U	250 U	NA	1600	7500	250 U	500 U	300 (3)
Chloroform	500 U	5 U	250 U	250 U	NA	1000 U	1000 U	250 U	500 U	300
1,2-Dichloroethane	12000	82	250 U	950	NA	12000	57300	600	1100	100
1,1,1-Trichloroethane	500 U	5 U	250 U	250 U	NA	1000 U	1000 U	250 U	510	800
1,2-Dichloropropane	500 U	5 U	250 U	250 U	NA	1000 U	1000 U	250 U	500 U	NC
Trichloroethene	15000	9	250 U	440	NA	1000 U	3700	540	23000	700
Tetrachloroethene	7200	120	450	2600	NA	1000 U	3500	3200	84000	1400
Ketones										
Acetone	500 U	5 U	250 U	250 U	NA	1000 U	1000 U	250 U	500 U	200
2-Butanone	500 U	5 U	250 U	250 U	NA	1000 U	1000 U	250 U	500 U	300
2-Hexanone	500 U	5 U	250 U	250 U	NA	1000 U	1000 U	250 U	500 U	NC
Other/Miscellaneous VOCs										
Carbon disulfide	500 U	5 U	250 U	250 U	NA	1000 U	1000 U	250 U	500 U	2700
Chlorobenzene	72000	240	2500	7100	NA	1000 U	1000 U	250 U	5800	1700
1,2-Dichlorobenzene	500 U	39	560	250 U	NA	1000 U	1000 U	6800	20000	7900
1,4-Dichlorobenzene	2400	5 U	250 U	250 U	NA	1000 U	1000 U	250 U	500 U	8500
n-Butylbenzene	500 U	5 U	250 U	250 U	NA	3300	4600	250 U	500 U	NC
Isopropylbenzene	82000	220	7600	700	NA	2300	7000	1900	17000	NC
p-Isopropyltoluene	500 U	5 U	250 U	250 U	NA	3100	4800	790	1100	NC
Naphthalene	570	34	290	310	NA	8300	13000	1700	1700	13000
n-Propylbenzene	500 U	6	250 U	250 U	NA	4000	6300	270	670	NC
1,3,5-Trimethylbenzene	1500	6	250 U	350	NA	20000	32000	1400	2400	NC
1,2,4-Trimethylbenzene	500 U	7	250 U	290	NA	29000	37000	2200	1700	NC
TOTAL TCL VOCs	2144500	2361	49750	134990		660600	2451000	57640	578410	
TOTAL OTHER VOCs	86470	312	8450	1650		70000	104700	15060	44570	
TOTAL TARGET VOCs	2230970	2673	58200	136640		730600	2555700	72700	622980	

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, Total VOCs must be less than 10 ppm (10,000 ug/kg)
3. Recommended soil cleanup level corresponds to trans 1,2-dichloroethene.
4. Analytical data are not validated.
5. U = Not detected; NA = Not analyzed; NC = No criterion.
6. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-24
HEXAGON LABORATORIES RI/FFS
IRM UST EXCAVATED SOIL ANALYTICAL DATA SUMMARY - SEMIVOLATILE ORGANICS (ug/kg)

Sample Location	SOUTH YARD					NEW PLANT				NYSDEC TAGM Levels $^{(1)(2)}$
Field Sample ID	LD1-2-3	#1-2-3	SYS1	SYS2	SYS3	FOT#1	FOT#2	FO1	FO2	
Sample Interval (feet bgs)	0 - 3	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
Date Sampled	10/8/97	12/5/97	12/22/97	12/22/97	12/22/97	11/14/97	11/14/97	12/22/97	12/22/97	
Phenols/Acid Extractables										
Phenol	670 U	670 U	NA	NA	NA	20000 U	20000 U	NA	NA	30
2-Chlorophenol	670 U	670 U	NA	NA	NA	20000 U	20000 U	NA	NA	800
2-Methylphenol (o-cresol)	670 U	670 U	NA	NA	NA	20000 U	20000 U	NA	NA	100
4- Methylphenol	2900	670 U	NA	NA	NA	22000	23000	NA	NA	900
2,4-Dimethylphenol	670 U	670 U	NA	NA	NA	20000 U	20000 U	NA	NA	NC
Pentachlorophenol	670 U	670 U	NA	NA	NA	20000 U	20000 U	NA	NA	1000
Polycyclic Aromatic Hydrocarbons (PAHs)										
Naphthalene	330 U	510	NA	NA	NA	9900 U	9900 U	NA	NA	13000
2-Methylnaphthalene	670 U	1500	NA	NA	NA	33000	22000	NA	NA	36400
Acenaphthylene	400 U	400 U	NA	NA	NA	12000 U	12000 U	NA	NA	41000
Acenaphthene	330 U	330 U	NA	NA	NA	10000 U	10000 U	NA	NA	50000
Fluorene	330 U	380	NA	NA	NA	10000 U	10000 U	NA	NA	50000
Phenanthrene	330 U	1500	NA	NA	NA	10000 U	10000 U	NA	NA	50000
Anthracene	330 U	360	NA	NA	NA	10000 U	10000 U	NA	NA	50000
Fluoranthene	330 U	330 U	NA	NA	NA	10000 U	10000 U	NA	NA	50000
Pyrene	330 U	330 U	NA	NA	NA	10000 U	10000 U	NA	NA	50000
Benzo(a)anthracene	330 U	330 U	NA	NA	NA	10000 U	10000 U	NA	NA	224
Chrysene	40 U	720	NA	NA	NA	1200 U	1200 U	NA	NA	400
Benzo(b)fluoranthene	40 U	150	NA	NA	NA	1200 U	1200 U	NA	NA	1100
Benzo(k)fluoranthene	40 U	100 U	NA	NA	NA	1200 U	1200 U	NA	NA	1100
Benzo(a)pyrene	40 U	50	NA	NA	NA	1200 U	1200 U	NA	NA	61
Indeno(1,2,3-cd)pyrene	40 U	80	NA	NA	NA	1200 U	1200 U	NA	NA	3200
Dibenz(a,h)anthracene	40 U	70	NA	NA	NA	1200 U	1200 U	NA	NA	14
Benzo(g,h,i)perylene	40 U	100 U	NA	NA	NA	1200 U	1200 U	NA	NA	50000
Aniline Compounds										
4-Chloroaniline	670 U	670 U	NA	NA	NA	20000 U	20000 U	NA	NA	220
4-Nitroaniline	670 U	670 U	NA	NA	NA	20000 U	20000 U	NA	NA	NC
Benzenes/Aromatics										
1,3-Dichlorobenzene	670 U	670 U	NA	NA	NA	20000 U	20000 U	NA	NA	1600
1,4-Dichlorobenzene	670 U	670 U	NA	NA	NA	20000 U	20000 U	NA	NA	8500
1,2-Dichlorobenzene	730	670 U	NA	NA	NA	20000 U	20000 U	NA	NA	7900
Nitrobenzene	5600	670 U	NA	NA	NA	20000 U	20000 U	NA	NA	200
Phthalates										
Dimethylphthalate	670 U	670 U	NA	NA	NA	20000 U	20000 U	NA	NA	2000
Diethylphthalate	670 U	670 U	NA	NA	NA	20000 U	20000 U	NA	NA	7100
Di-n-butyl phthalate	670 U	670 U	NA	NA	NA	20000 U	20000 U	NA	NA	8100
Butylbenzyl phthalate	670 U	670 U	NA	NA	NA	20000 U	20000 U	NA	NA	50000
bis(2-Ethylhexyl)phthalate	670 U	1400	NA	NA	NA	20000 U	20000 U	NA	NA	50000
Di-n-octyl phthalate	670 U	670 U	NA	NA	NA	20000 U	20000 U	NA	NA	50000
Other/Miscellaneous SVOCs										
Dibenzofuran	670 U	670 U	NA	NA	NA	20000 U	20000 U	NA	NA	6200
TOTAL TCL SVOCs	9230	6720				55000	45000			
TOTAL OTHER SVOCs	0	0				0	0			
Total Target SVOCs	9230	6720				55000	45000			

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, Total semi-VOCs must be less than 500 ppm (500,000 ug/kg)
3. Analytical data are not validated.
4. U = Not detected; NA = Not analyzed; NC = No criterion.
5. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-25
HEXAGON LABORATORIES RI/FFS
IRM UST EXCAVATED SOIL ANALYTICAL DATA SUMMARY - PESTICIDES/PCBs (ug/kg)

Sample Location	SOUTH YARD					NEW PLANT				NYSDEC TAGM Levels (1)(2)
Field Sample ID	LD1-2-3	#1-2-3	SYS1	SYS2	SYS3	FOT#1	FOT#2	FO1	FO2	
Sample Interval (feet bgs)	0 - 3	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
Date Sampled	10/8/97	12/5/97	12/22/97	12/22/97	12/22/97	11/14/97	11/14/97	12/22/97	12/22/97	
Pesticides										
alpha-BHC	5 U	NA	NA	NA	NA	NA	NA	NA	NA	110
beta-BHC	5 U	NA	NA	NA	NA	NA	NA	NA	NA	200
delta-BHC	5 U	NA	NA	NA	NA	NA	NA	NA	NA	300
gamma-BHC (Lindane)	5 U	NA	NA	NA	NA	NA	NA	NA	NA	60
Heptachlor	5 U	NA	NA	NA	NA	NA	NA	NA	NA	100
Aldrin	5 U	NA	NA	NA	NA	NA	NA	NA	NA	41
Heptachlor Epoxide	5 U	NA	NA	NA	NA	NA	NA	NA	NA	20
Endosulfan I	5 U	NA	NA	NA	NA	NA	NA	NA	NA	900
Dieldrin	5 U	NA	NA	NA	NA	NA	NA	NA	NA	44
4,4'-DDE	5 U	NA	NA	NA	NA	NA	NA	NA	NA	2100
Endrin	5 U	NA	NA	NA	NA	NA	NA	NA	NA	100
Endosulfan II	5 U	NA	NA	NA	NA	NA	NA	NA	NA	900
4,4'-DDD	5 U	NA	NA	NA	NA	NA	NA	NA	NA	2900
Endosulfan Sulfate	5 U	NA	NA	NA	NA	NA	NA	NA	NA	1000
4,4'-DDT	5 U	NA	NA	NA	NA	NA	NA	NA	NA	2100
4,4'-Methoxychlor	5 U	NA	NA	NA	NA	NA	NA	NA	NA	NC
Endrin ketone	5 U	NA	NA	NA	NA	NA	NA	NA	NA	NC
Endrin aldehyde	5 U	NA	NA	NA	NA	NA	NA	NA	NA	NC
Chlordane	5 U	NA	NA	NA	NA	NA	NA	NA	NA	540
PCBs										
Aroclor-1232	9600	1000 U	NA	NA	1000 U	2000 U	2000 U	NA	NA	10000 (3)
Aroclor-1242	1000 U	1000 U	NA	NA	1000 U	2000 U	2000 U	NA	NA	10000 (3)
Aroclor-1248	87000	1000 U	NA	NA	5600	2000 U	2000 U	NA	NA	10000 (3)
Aroclor-1254	19000	1000 U	NA	NA	1000 U	2000 U	2000 U	NA	NA	10000 (3)
Aroclor-1260	1000 U	1000 U	NA	NA	1000 U	2000 U	2000 U	NA	NA	10000 (3)

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. As per TAGM #4046, total pesticide concentration shall be less than 10 ppm (10,000 ug/kg).
3. Recommended soil cleanup level corresponds to total PCBs in subsurface soil.
4. Analytical data are not validated.
5. U = Not detected; NA = Not analyzed; NC = No criterion.
6. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-26
HEXAGON LABORATORIES RI/FFS
IRM UST EXCAVATED SOIL ANALYTICAL DATA SUMMARY - INORGANICS (mg/kg)

Sample Location	SOUTH YARD					NEW PLANT					
Field Sample ID	LD1-2-3	#1-2-3	SYS1	SYS2	SYS3	FOT#1	FOT#2	FO1	FO2	NYSDEC TAGM Levels $^{(1)}$	Background Concentrations $^{(2)}$
Sample Interval (feet bgs)	0 - 3	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6		
Date Sampled	10/8/97	12/5/97	12/22/97	12/22/97	12/22/97	11/14/97	11/14/97	12/22/97	12/22/97		
Arsenic	6.6 U	6.6 U	NA	NA	NA	6.6 U	6.6 U	NA	NA	7.5 or BKGD	12
Barium	88.8	109	NA	NA	NA	119	101	NA	NA	300 or BKGD	600
Cadmium	1.65 U	1.65 U	NA	NA	NA	1.65 U	1.65 U	NA	NA	1 or BKGD	2.36 $^{(3)}$
Chromium	29.4	36.8	NA	NA	NA	35.3	44.4	NA	NA	10 or BKGD	64.5 $^{(4)}$
Copper	144	50.1	NA	NA	NA	NA	NA	NA	NA	25 or BKGD	196 $^{(4)}$
Iron	12700	21280	NA	NA	NA	NA	NA	NA	NA	2000 or BKGD	57900 $^{(4)}$
Lead	103	54.5	NA	NA	NA	7.3	35.5	NA	NA	BKGD	500 $^{(5)}$
Manganese	127	172	NA	NA	NA	NA	NA	NA	NA	BKGD	5000
Mercury	0.020 U	0.02 U	NA	NA	NA	0.02 U	0.02 U	NA	NA	0.1 or BKGD	2.71 $^{(3)}$
Nickel	32.8	51.4	NA	NA	NA	NA	NA	NA	NA	13 or BKGD	72.3 $^{(4)}$
Selenium	1.65 U	3.74	NA	NA	NA	1.65 U	1.65 U	NA	NA	2 or BKGD	0.125
Silver	1.65 U	1.65 U	NA	NA	NA	1.65 U	1.65 U	NA	NA	BKGD	1.53 $^{(3)}$
Zinc	21.9	177	NA	NA	NA	NA	NA	NA	NA	20 or BKGD	1100 $^{(4)}$

Notes:

1. Recommended soil cleanup levels obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046.
2. Except as noted, background concentrations represent the maximum background concentration for New York State soils as reported by E.C. McGovern, NYSDEC, in "Background Concentrations of 20 Elements in Soils with Special Regard for New York State", undated.
3. Maximum concentration listed for urban New Jersey soils as reported by NJDEPE in "A Summary of Selected Soil Constituents and Contaminants at Background Locations in New Jersey", 1993.
4. Maximum concentration detected in site-specific background sample.
5. As indicated in NYSDEC TAGM HWR-94-4046, average background levels of lead in metropolitan or suburban areas or near highways typically range as high as 500 ppm.
6. Analytical data are not validated.
7. U = Not detected; NA = Not analyzed; BKGD = Site background concentration.
8. Shading indicates exceedance of NYSDEC TAGM Levels.

TABLE 4-27
HEXAGON LABORATORIES RI/FFS
IRM FLOOR SLAB ANALYTICAL DATA - VOLATILE ORGANICS (ug/kg)

Sample Location	OLD PLANT			NEW PLANT		
Field Sample ID	OP1	OP2	OP3	NP4	NP5	NP6
Sample Interval (inches bgs)	0 - 0.1	0 - 0.1	0 - 0.1	0 - 0.1	0 - 0.1	0 - 0.1
Date Sampled	12/11/97	12/11/97	12/11/97	12/11/97	12/11/97	12/11/97
Aromatics						
Benzene	250 U	50 U	10 U	5 U	5 U	10 U
Toluene	65000	1000	910	130	380	1000
Ethylbenzene	3500	50 U	48	26	12	23
Xylene(total)	15000	150 U	360	140	63	180
Styrene	250 U	50 U	10 U	5 U	5 U	10 U
Halogenated Aliphatics						
Chloromethane	250 U	50 U	10 U	5 U	5 U	10 U
Bromomethane	250 U	50 U	10 U	5 U	5 U	10 U
Vinyl Chloride	250 U	50 U	10 U	5 U	5 U	10 U
Chloroethane	250 U	50 U	10 U	5 U	5 U	10 U
Methylene Chloride	250 U	50 U	10 U	5 U	5 U	10 U
1,1-Dichloroethene	250 U	50 U	10 U	5 U	5 U	10 U
1,1-Dichloroethane	250 U	50 U	10 U	5 U	5 U	10 U
1,2-Dichloroethene (total)	250 U	50 U	10 U	5 U	5 U	10 U
Chloroform	250 U	50 U	10 U	5 U	5 U	10 U
1,2-Dichloroethane	1600	4600	16	5 U	5 U	130
1,1,1-Trichloroethane	250 U	50 U	10 U	5 U	5 U	10 U
1,2-Dichloropropane	250 U	50 U	10 U	5 U	5 U	10 U
Trichloroethene	250 U	50 U	10 U	5 U	5 U	10 U
Tetrachloroethene	250 U	50 U	10 U	5 U	5 U	10 U
Ketones						
Acetone	250 U	50 U	10 U	5 U	5 U	10 U
2-Butanone	250 U	50 U	10 U	5 U	5 U	10 U
2-Hexanone	250 U	50 U	10 U	5 U	5 U	10 U
Other/Miscellaneous VOCs						
Carbon disulfide	250 U	50 U	10 U	5 U	5 U	10 U
Chlorobenzene	250 U	50 U	10 U	5 U	5 U	10 U
1,2-Dichlorobenzene	250 U	50 U	10 U	5 U	33	13
1,4-Dichlorobenzene	250 U	50 U	10 U	5 U	5 U	10 U
n-Butylbenzene	250 U	50 U	10 U	5 U	5 U	10 U
Isopropylbenzene	830	50 U	10 U	5 U	5 U	17
p-Isopropyltoluene	250 U	50 U	10 U	5 U	5 U	10 U
Naphthalene	250 U	50 U	10 U	5 U	5 U	10 U
n-Propylbenzene	250 U	50 U	10 U	5 U	5 U	10 U
1,3,5-Trimethylbenzene	250 U	50 U	10 U	5 U	5 U	10 U
1,2,4-Trimethylbenzene	330	50 U	10 U	5 U	5 U	10 U
TOTAL TCL VOCs	85100	5600	1334	296	455	1333
TOTAL OTHER VOCs	1160	0	0	0	33	30
TOTAL TARGET VOCs	86260	5600	1334	296	488	1363

Notes:
1. Analytical data are not validated.
2. U = Not detected.

TABLE 4-28
HEXAGON LABORATORIES RI/FFS
IRM FLOOR SLAB ANALYTICAL DATA - SEMIVOLATILE ORGANICS (ug/kg)

Sample Location	OLD PLANT			NEW PLANT		
Field Sample ID	OP1	OP2	OP3	NP4	NP5	NP6
Sample Interval (inches bgs)	*0 - 0.1*	*0 - 0.1*	*0 - 0.1*	*0 - 0.1*	*0 - 0.1*	*0 - 0.1*
Date Sampled	12/11/97	12/11/97	12/11/97	12/11/97	12/11/97	12/11/97
Phenols/Acid Extractables						
Phenol	670 U	670 U	670 U	670 U	670 U	670 U
2-Chlorophenol	670 U	670 U	670 U	670 U	670 U	670 U
2-Methylphenol (o-cresol)	670 U	670 U	670 U	670 U	670 U	670 U
4- Methylphenol	670 U	670 U	670 U	700 U	670 U	670 U
2,4-Dimethylphenol	670 U	670 U	670 U	670 U	670 U	670 U
4,6-Dinitro-2-methylphenol	670 U	850	670 U	670 U	670 U	670 U
Pentachlorophenol	670 U	670 U	670 U	670 U	670 U	670 U
Polycyclic Aromatic Hydrocarbons (PAHs)						
Naphthalene	330 U	330 U	330 U	330 U	330 U	330 U
2-Methylnaphthalene	670 U	670 U	670 U	670 U	670 U	670 U
2-Chloronaphthalene	670 U	670 U	670 U	670 U	670 U	670 U
Acenaphthylene	400 U	400 U	400 U	400 U	400 U	400 U
Acenaphthene	330 U	330 U	330 U	330 U	330 U	330 U
Fluorene	330 U	330 U	330 U	330 U	330 U	330 U
Phenanthrene	330 U	330 U	330 U	330 U	330 U	330 U
Anthracene	330 U	330 U	330 U	330 U	330 U	330 U
Fluoranthene	330 U	330 U	330 U	330 U	330 U	330 U
Pyrene	330 U	330 U	330 U	330 U	330 U	330 U
Benzo(a)anthracene	330 U	330 U	330 U	330 U	330 U	330 U
Chrysene	110	950	140	260	420	110
Benzo(b)fluoranthene	150 U	150 U	150 U	150 U	150 U	150 U
Benzo(k)fluoranthene	100 U	100 U	100 U	100 U	100 U	100 U
Benzo(a)pyrene	40 U	40 U	40 U	40 U	40 U	40 U
Indeno(1,2,3-cd)pyrene	40 U	40 U	40 U	40 U	40 U	40 U
Dibenz(a,h)anthracene	40 U	40 U	40 U	40 U	40 U	40 U
Benzo(g,h,i)perylene	100 U	100 U	100 U	100 U	100 U	100 U
Aniline Compounds						
4-Chloroaniline	670 U	670 U	670 U	670 U	670 U	670 U
4-Nitroaniline	670 U	670 U	670 U	670 U	670 U	670 U
Benzenes/Aromatics						
1,3-Dichlorobenzene	670 U	670 U	670 U	670 U	670 U	670 U
1,4-Dichlorobenzene	670 U	670 U	670 U	670 U	670 U	670 U
1,2-Dichlorobenzene	670 U	670 U	670 U	670 U	670 U	670 U
Nitrobenzene	670 U	4100	670 U	700 U	670 U	670 U
Phthalates						
Dimethylphthalate	670 U	670 U	670 U	670 U	670 U	670 U
Diethylphthalate	670 U	670 U	670 U	670 U	670 U	670 U
Di-n-butyl phthalate	670 U	670 U	670 U	670 U	670 U	670 U
Butylbenzyl phthalate	670 U	670 U	670 U	670 U	670 U	670 U
bis(2-Ethylhexyl)phthalate	1100	1500	1600	47000	670 U	670 U
Di-n-octyl phthalate	670 U	670 U	670 U	1400	670 U	670 U
Other/Miscellaneous SVOCs						
Dibenzofuran	670 U	670 U	670 U	670 U	670 U	670 U
Benzyl Alcohol	2800	670 U	670 U	670 U	670 U	670 U
TOTAL TCL SVOCs	1210	7400	1740	48660	420	110
TOTAL OTHER SVOCs	2800	0	0	0	0	0
Total Target SVOCs	4010	7400	1740	48660	420	110

Notes:

1. Analytical data are not validated.
2 U = Not detected

TABLE 5-1
HEXAGON LABORATORIES RI/FFS
PHYSICAL CONSTANTS OF ORGANIC CHEMICALS
Page 1 of 2

COMPOUND	Molecular Weight	Specific Gravity (Density)	Water Solubility (mg/L)	Log K_{oc}	Boiling Point (°C)	Vapor Pressure (mm Hg @ 20 °C)	Henry's Constant (atm-m^3/mole)	Environmental Half-Life		
								Soil (days)	Groundwater (days)	Surface Water (days)
VOLATILE ORGANICS										
Chlorinated Aliphatics										
Chloroethane (Ethyl chloride)	64.5	(vapor)	5740	1.43 [K_{ow}]	12.3	> 760	8.5E-03	7 - 28	14 - 56	7 - 28
1,1-Dichloroethane	99	1.175	5500	1.48	57.3	182	5.0E-03	32 - 154	64 - 154	32 - 154
1,2-Dichloroethane (Ethylene Dichloride)	99	1.253	8300	1.48 [K_{ow}]	83.5	64	9.8E-04	100 - 180	100 - 365	100 - 180
1,2-Dichloroethene (cis)	96.9	1.284	3500	1.86 [K_{ow}]	60.3	163	3.4E-03	28 - 180	56 - 2875	28 - 180
1,2-Dichloroethene (trans)	96.9	1.256	6300	1.77	47.5	265	6.7E-03			
Methylene Chloride	84.9	1.326	20000	0.94	40.2	349	2.7E-03	7 - 28	14 - 56	7 - 28
Tetrachloroethene	165.9	1.623	150	2.42	121.2	14	1.3E-02	6 - 12 mo.	1 - 2 yr	6 - 12 mo
1,1,1-Trichloroethane	133.4	1.325	1360	2.18	74.1	100	1.5E-02	140 - 270	280 - 550	140 - 270
Trichloroethene	131.4	1.464	1100	2.02	87	57	1.0E-02	6- 12 mo.	0.9 - 4.5 yr	6- 12 mo.
Vinyl chloride	62.5	0.908	~3000	0.39	-13.4	> 760	6.0E-02	28 - 180	56 d - 8 yr	28 - 180
Ketones										
Acetone	58.1	0.791	100%	-0.43	56.2	180	4.0E-05	1 - 7	2 -14	1 - 7
2-Butanone (MEK)	72.1	0.805	25%	0.09	79.6	77	4.7E-05	1 - 7	2 -14	1 - 7
2-Hexanone	100.2	0.83	1.4%	2.13	128	2	1.8E-03	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	100.2	0.801	1.9%	0.79	117	15	1.5E-05	1 - 7	2 -14	1 - 7
BTEX Compounds/Aromatics										
Benzene	78.1	0.879	1780	1.94	80.1	76	5.4E-03	5 - 16	10 d - 2 yr	5 - 16
Toluene	92.1	0.866	515	2.12	110.6	22	6.7E-03	4 - 22	7 - 28	4 - 22
Ethylbenzene	106.2	0.867	152	2.18	136	7.1	6.6E-03	3 - 10	6 - 228	3 - 10
Xylenes	106.2	~0.880	~158	~2.5	~140	~8	~6.0E-03	7 - 28	14 - 365	7 - 28
Chlorobenzene	112.6	1.106	500	2.1	132	9	3.7E-03	68 - 150	136 - 300	68 - 150
SEMIVOLATILE ORGANICS										
Polycyclic Aromatic Hydrocarbons (PAHs)										
Naphthalene	128.2	1.145	30	3.1	218	5.0E-02	5.0E-04	17 - 48	1 - 258	0.5 - 20
2-Methylnaphthalene	142.2	~ 1.025	25	3.9	241	ND	ND	ND	ND	ND
Acenaphthylene	152.2	0.899	3.9	3.68	280	3.0E-02	1.8E-04	42.5 - 60	85 - 120	42.5 - 60
Anthracene	178.2	1.283	5.0E-02	4.27	340	2.0E-04	3.4E-04	50 - 460	200 - 920	< 0.1
Benzo(a)anthracene	228	ND	1.0E-02	6.14	420	2.0E-08	2.0E-06	100 - 680	7 mo - 4 yr	1 - 3 hr
Benzo(a)pyrene	252	ND	4.0E-03	5.93	495	5.0E-07	<2.4E-06	57 - 530	114 d - 3 yr	.36 - 1.1 hr
Benzo(b)fluoranthene	252	ND	1.0E-02	5.74	ND	5.0E-09	1.2E-05	1 - 1.67 yr	2 - 3.3 yr	0.3 - 30
Benzo(k)fluoranthene	252	ND	5.0E-04	4.64	480	9.6E-11	1.0E-03	2.5 - 5.9 yr	5 - 12 yr	0.2 - 21
Benzo(ghi)perylene	276	ND	3.0E-04	6.89	>500	1.0E-10	1.4E-07	1.6 - 1.8 yr	3.2 - 3.6 yr	1.6 - 1.8 yr
Chrysene	228.3	1.274	2.0E-03	5.39	448	6.3E-07	7.3E-20	1 - 2.7 yr	2 - 5.5 yr	0.2 - 0.5 d
Dibenzo(ah)anthracene	278.3	ND	2.0E-03	5.22	524	1.0E-10	7.3E-09	1 - 2.6 yr	2 - 5.2 yr	0.25 - 33
Fluoranthene	202.2	1.252	2.4E-01	4.62	375	<1.0E-02	1.7E-02	140 - 440	280 - 880	0.9 - 2.6
Indeno(1,2,3-cd)pyrene	276	ND	6.0E-02	7.49	536	1.0E-10	1.9E-20	1.6 - 2.0 yr	3.3 - 4 yr	125 - 250
Phenanthrene	178.2	1.179	~1.0	4.36	340	2.1E-04	5.0E-05	16 - 200	32 - 400	0.13 - 1.0
Pyrene	202.2	1.277	~0.15	4.84	400	6.9E-07	1.5E-05	.58 - 5.2 yr	1.2 - 10 yr	< 0.1

TABLE 5-1
HEXAGON LABORATORIES RI/FFS
PHYSICAL CONSTANTS OF ORGANIC CHEMICALS
Page 2 of 2

COMPOUND	Molecular Weight	Specific Gravity (Density)	Water Solubility (mg/L)	Log K_{oc}	Boiling Point (°C)	Vapor Pressure (mm Hg @ 20 °C)	Henry's Constant (atm-m^3/mole)	Environmental Half-Life		
								Soil (days)	Groundwater (days)	Surface Water (days)
Phthalates										
Di-n-butyl phthalate	278.3	1.045	~10	3.84	340	1.4E-05	6.3E-05	2 - 23	2 - 23	1 - 14
Butyl benzyl phthalate	312	1.116	2.7	2.16	375	8.6E-06	1.3E-06	1 - 7	2 - 180	1 - 7
Bis(2-ethylhexyl)phthalate	390.5	0.986	0.3	5	385	1.0E-07	1.1E-05	5 - 23	10 - 390	5 - 23
Di-n-octyl phthalate	391	0.986	~1 (0.3 - 3.0)	8.99	386	1.4E-04	1.4E-12	7 - 28	14 - 365	7 - 28
Diethyl phthalate	222.2	1.123	1000	1.84	300	< 1.0E-01	8.5E-07	3 - 56	6 - 112	3 - 56
Dimethyl phthalate	194.2	1.189	4300	1.56 [K_{ow}]	284	1.7E-03	1.1E-07	1 - 7	2 - 14	1 - 7
Phenols										
Phenol	94.1	1.071	8.2%	1.33	182	2.0E-01	2.7E-07	1 - 10	0.5 - 7	0.2 - 2.4
2-Methyl phenol (o-cresol)	108.2	1.048	~ 30	1.95 [K_{ow}]	191	3.1E-01	1.6E-06	1 - 7	2 - 14	1 - 7
4-Methyl phenol (p-cresol)	108.2	1.035	~ 22	1.94 [K_{ow}]	202	1.3E-01	9.6E-07	1 - 16 hr	2 hr - 28 d	1 - 16 hr
2,4-Dimethylphenol	122.2	1.035	4200	2.50 [K_{ow}]	~210	< 1.0E+00	ND	1 - 7	2 - 14	1 - 7
2-Chlorophenol	128.6	1.256	28800	2.15 [K_{ow}]	175	1.4E+00	5.6E-07	ND	ND	ND
Miscellaneous SVOCs										
Carbazole (Dibenzo pyrrole)	167.2	ND	[insoluble]	ND	353	ND	ND	ND	ND	ND
Dibenzofuran (Diphenylene oxide)	168.2	1.089	ND	4.12 [K_{ow}]	287	ND	ND	7 - 28	8.5 - 35	7 - 28
1,2-Dichlorobenzene	147	1.305	~ 125	2.27	180	1.0E+00	1.9E-03	28 - 180	56 - 365	28 - 180
1,4-Dichlorobenzene	147	1.458	~ 80	3.52 [K_{ow}]	174	1.8E+00	1.5E-03	1 - 6 mo.	2 - 12 mo.	1 - 6 mo.
4-Chloroaniline	127.6	1.427	3.9	1.83 [K_{ow}]	230	2.5E-02	1.1E-05	ND	ND	ND
4-Nitroaniline	138.1	1.437	800	ND	ND	ND	ND	ND	ND	ND
PESTICIDES/PCBs										
PCBs (Aroclors)										
Aroclor 1016	~ 258	1.36	0.05 - 0.25	4.7	325 - 356	4.0E-04	1.2E-03	ND	ND	ND
Aroclor 1232	~ 230	1.27	1.45	3.2 [K_{ow}]	ND	4.1E-03	ND	ND	ND	ND
Aroclor 1242	~ 261	1.381	0.1 - 0.3	3.71	325 - 366	4.0E-04	5.6E-04	ND	ND	ND
Aroclor 1248	~ 288	1.41	0.05	5.61	340 - 375	1.7E-04	3.5E-04	ND	ND	ND
Aroclor 1254	~ 327	1.495	0.05	5.61	365 - 390	7.0E-05	2.5E-03	ND	ND	ND
Aroclor 1260	~ 361	1.57	0.08	7.14 [K_{ow}]	ND	4.1E-05	7.2E-03	ND	ND	ND
Pesticides										
Chlordane (technical)	409.8	~ 1.6	~ 0.1	5.54 [K_{ow}]	ND	4.6E-04	4.9E-05	0.8 - 3.8 yr	1.6 - 7.6 yr	0.8 - 3.8 yr

Notes:
1. ND = No data found.
2. Professional judgment used in the case of conflicting or apparently incorrect data.
3. Principal source for chemical data is "Groundwater Chemicals Desk Reference", Montgomery and Welkom (eds.), Lewis Publishers, 1990.
4. All half-life data from "Handbook of Environmental Degradation Rates", Howard et al., Lewis Publishers, 1991.
5. Other data from Merck Index; Lange's Handbook of Chemistry; CRC Handbook of Chemistry & Physica; Sittig (3rd ed); Fate and Exposure Data (Howard 1989); and an upublished literature compiliation (C. K. Lee, ca. 1984).
6. Log K_{ow} values shown where log K_{oc} not found; K_{ow} can be used as an approximation of K_{oc}.

TABLE 6-1
HEXAGON LABORATORIES RI/FFS
RECEPTOR POPULATIONS AND COMPLETE EXPOSURE PATHWAYS

Receptor Population	Complete Exposure Pathway
Current Use:	
Trespassers	Site is surrounded by fence and locked. Teenage (ages 12-18 years) trespassing is considered possible on site. Exposure pathways are incidental ingestion of contaminated surface soil and dermal contact with contaminated surface soil.
Future Use:	
Trespassers	Teenage trespassing may occur in the future, depending on future site use. Exposure pathways are incidental ingestion of contaminated surface soil and dermal contact with contaminated surface soil.
Site Workers	Assumes that site is used for commercial or industrial purposes, with workers having the potential to contact soils. Exposure pathways are incidental ingestion of contaminated surface soil and dermal contact with contaminated surface soil.
Construction Workers	Assumed that buildings are constructed or renovated for industrial use on site. Exposure pathways are ingestion of contaminated surface soil and dermal contact with contaminated surface soil.

TABLE 6-2
HEXAGON LABORATORIES RI/FFS
EXPOSURE ASSUMPTIONS
Page 1 of 2

	Central Tendency Estimate	High End Estimate
Adolescent (12 - 18 year old) Trespassers (Current and Future Use):		
Days per Year	1 day/week, 13 weeks/year (summer) = 13 days/year	2 days/week, 26 weeks/year (warmer months) = 52 days/year
Years Exposed	2 years	6 years
Body Weight	55.7kg (1)	78.6 kg (2)
Soil Ingestion	50 mg (3)	100 mg (4)
Ingestion Absorption	100%	100%
Exposed Body Surface	4,443 cm^2 (5)	4,443 cm^2 (5)
Skin to Soil Adherence Factor (mg/cm^2-event)	0.03 (6)	0.03 (6)
Dermal Absorption	1% lead (7) 13% benzo(a)pyrene (8)	1% lead (7) 13% benzo(a)pyrene (8)
Site Workers (Future Use):		
Days per Year	3 days/week, 13 weeks/year (summer) = 39 days/year	5 days/week, 50 weeks/year = 250 days/year
Years Exposed	10 years	25 years
Adult Body Weight	71.8 kg (9)	98.6 kg (10)
Soil Ingestion	50 mg (3)	50 mg (3)
Ingestion Absorption	100%	100%
Exposed Body Surface	4,443 cm^2 (5)	4,443 cm^2 (5)
Skin to Soil Adherence Factor (mg/cm^2-event)	0.03 (6)	0.03 (6)
Dermal Absorption	1% lead (7) 13% benzo(a)pyrene (8)	1% lead (7) 13% benzo(a)pyrene (8)

TABLE 6-2
HEXAGON LABORATORIES RI/FFS
EXPOSURE ASSUMPTIONS
Page 2 of 2

	Central Tendency Estimate	High End Estimate
Construction Workers (Future Use):		
Days per Year	5 days/week, 50 weeks/year = 250 days/year	5 days/week, 50 weeks/year = 250 days/year
Years Exposed	6 months	12 months
Body Weight	71.8 kg ⁽⁹⁾	98.6 kg ⁽¹⁰⁾
Soil Ingestion	480 mg ⁽¹¹⁾	480 mg ⁽¹¹⁾
Ingestion Absorption	100%	100%
Exposed Body Surface	4,443 cm^2 ⁽⁵⁾	4,443 cm^2 ⁽⁵⁾
Skin to Soil Adherence Rate (mg/cm^2-event)	0.045 ⁽¹²⁾	0.045 ⁽¹²⁾
Dermal Absorption	1% lead ⁽⁷⁾ 13% benzo(a)pyrene ⁽⁸⁾	1% lead ⁽⁷⁾ 13% benzo(a)pyrene ⁽⁸⁾

Notes:

(1) Average 50th percentile weight of 12 to 18 year old teenagers - male and female (calculated from USEPA, 1997)
(2) Average 95th percentile weight of 12 to 18 year old teenagers - male and female (calculated from USEPA, 1997)
(3) Default adult soil ingestion rate (USEPA, 1997)
(4) Assumed reasonable maximum ingestion (no recommendation in USEPA 1997)
(5) Surface area for hands, forearms, lower legs, and face. Calculated from USEPA, 1997.
(6) Default soil/skin adherence factor recommended by USEPA Region II (pers. com., 1998)
(7) Generic default for metals recommended by USEPA Region II (pers. com., 1998)
(8) Compound-specific value recommended by USEPA Region II (pers. com., 1998)
(9) Recommended default adult weight (USEPA, 1997)
(10) 95th percentile of 18 to 64 year old adults - male and female (calculated from USEPA, 1997)
(11) Soil ingestion for landscaper; used as surrogate for construction worker; Hawley, 1985 as cited in USEPA, 1997.
(12) Weighted average adherence, based on irrigation installers. Calculated from USEPA, 1997.

TABLE 6-3
HEXAGON LABORATORIES RI/FFS
SITE SURFACE SOIL EXPOSURE PATHWAYS - HIGH END EXPOSURE SCENARIOS

CARCINOGENIC RISKS

Receptor Group	Soil Ingestion	Dermal Exposure	Total Excess Cancer Risk (1)
Trespassers	1.3E-07	2.2E-08	1.5E-07
Site Workers	1.0E-06	3.5E-07	1.4E-06
Construction Workers	3.9E-07	2.1E-08	4.1E-07

Notes:

(1) Risk associated with semivolatile organic compound TICs is not quatifiable due to lack of slope factor data.

NONCARCINOGENIC RISKS

Receptor Group	Soil Ingestion	Dermal Exposure	Total Hazard Index (1)
Trespassers			(2)
Site Workers			(2)
Construction Workers			(2)

Notes:

(1) Risk associated with semivolatile organic compound TICs is not quatifiable due to lack of reference dose data.

(2) Hazard Index is not quantifiable due to lack of numeric reference doses for the contaminants of concern.

TABLE 6-4
HEXAGON LABORATORIES RI/FFS
SITE SURFACE SOIL EXPOSURE PATHWAYS - CENTRAL TENDENCY EXPOSURE SCENARIOS

CARCINOGENIC RISKS

Receptor Group	Soil Ingestion	Dermal Exposure	Total Excess Cancer Risk [(1)]
Trespassers	3.7E-09	2.6E-09	6.2E-09
Site Workers	4.3E-08	4.9E-07	5.4E-07
Construction Workers	1.3E-07	7.1E-09	1.4E-07

Notes:

(1) Risk associated with semivolatile organic compound TICs is not quatifiable due to lack of slope factor data.

NONCARCINOGENIC RISKS

Receptor Group	Soil Ingestion	Dermal Exposure	Total Hazard Index [(1)]
Trespassers			(2)
Site Workers			(2)
Construction Workers			(2)

Notes:

(1) Risk associated with semivolatile organic compound TICs is not quatifiable due to lack of reference dose data.

(2) Hazard Index is not quantifiable due to lack of numeric reference doses for the contaminants of concern.

TABLE 8-1
HEXAGON LABORATORIES RI/FFS
PHASE 1 REMEDIAL INVESTIGATION: DATA QUALITY SUMMARY STATISTICS
Page 1 of 2

Volatile Organic Compounds (VOCs)

	Number of Samples/Data Points			Qualifications		Data Quality Summary		
MATRIX	Environmental Samples	Data Points per Sample	Total Data Points	Qualified (J) Data Points	Rejected (R) Data Points	Percent Fully Acceptable	Percent Qualified Estimated	Percent Rejected
Surface Soil/Misc.	10	33	330	306	24	0.0%	92.7%	7.3%
Subsurface Borings	13	33	429	289	0	32.6%	67.4%	0.0%
Background Soil	3	33	99	99	0	0.0%	100.0%	0.0%
Subsurface UST	15	33	495	265	0	46.5%	53.5%	0.0%
Groundwater	12	33	396	250	0	36.9%	63.1%	0.0%
VOC TOTAL	53	33	1749	1209	24	29.5%	69.1%	1.4%

Semivolatile Organic Compounds (SVOCs)

	Number of Samples/Data Points			Qualifications		Data Quality Summary		
MATRIX	Environmental Samples	Data Points per Sample	Total Data Points	Qualified (J) Data Points	Rejected (R) Data Points	Percent Fully Acceptable	Percent Qualified Estimated	Percent Rejected
Surface Soil/Misc.	10	64	640	145	58	68.3%	22.7%	9.1%
Subsurface Borings	13	64	832	423	14	47.5%	50.8%	1.7%
Background Soil	3	64	192	178	14	0.0%	92.7%	7.3%
Subsurface UST	12	64	768	320	4	57.8%	41.7%	0.5%
Groundwater	12	64	768	15	7	97.1%	2.0%	0.9%
SVOC TOTAL	50	64	3200	1081	97	63.2%	33.8%	3.0%

Pesticides

	Number of Samples/Data Points			Qualifications		Data Quality Summary		
MATRIX	Environmental Samples	Data Points per Sample	Total Data Points	Qualified (J) Data Points	Rejected (R) Data Points	Percent Fully Acceptable	Percent Qualified Estimated	Percent Rejected
Surface Soil/Misc	10	21	210	28	56	60.0%	13.3%	26.7%
Subsurface Borings	13	21	273	16	0	94.1%	5.9%	0.0%
Background Soil	3	21	63	27	21	23.8%	42.9%	33.3%
Subsurface UST	12	21	252	20	4	90.5%	7.9%	1.6%
Groundwater	12	21	252	10	18	88.9%	4.0%	7.1%
Pesticides TOTAL	50	21	1050	101	99	81.0%	9.6%	9.4%

TABLE 8-1
HEXAGON LABORATORIES RI/FFS
PHASE 1 REMEDIAL INVESTIGATION: DATA QUALITY SUMMARY STATISTICS
Page 2 of 2

Polychlorinated Biphenyls (PCBs)

	Number of Samples/Data Points			Qualifications		Data Quality Summary		
MATRIX	Environmental Samples	Data Points per Sample	Total Data Points	Qualified (J) Data Points	Rejected (R) Data Points	Percent Fully Acceptable	Percent Qualified Estimated	Percent Rejected
Surface Soil/Misc	10	7	70	2	7	87.1%	2.9%	10.0%
Subsurface Borings	13	7	91	3	0	96.7%	3.3%	0.0%
Background Soil	3	7	21	9	7	23.8%	42.9%	33.3%
Subsurface UST	12	7	84	10	0	88.1%	11.9%	0.0%
Groundwater	12	7	84	1	0	98.8%	1.2%	0.0%
PCBs TOTAL	50	7	350	25	14	88.9%	7.1%	4.0%

Inorganics (Metals and Cyanide)

	Number of Samples/Data Points			Qualifications		Data Quality Summary		
MATRIX	Environmental Samples	Data Points per Sample	Total Data Points	Qualified (J) Data Points	Rejected (R) Data Points	Percent Fully Acceptable	Percent Qualified Estimated	Percent Rejected
Surface Soil/Misc	10	24	240	111	7	50.8%	46.3%	2.9%
Subsurface Borings	13	24	312	55	0	82.4%	17.6%	0.0%
Background Soil	3	24	72	13	0	81.9%	18.1%	0.0%
Subsurface UST	12	24	288	94	0	67.4%	32.6%	0.0%
Groundwater - Total	12	24	288	90	33	57.3%	31.3%	11.5%
Groundwater - Filtered	12	22 - 23	270	104	17	55.2%	38.5%	6.3%
Inorganics TOTAL	62	22 - 24	1470	467	57	64.4%	31.8%	3.9%

TABLE 8-2
HEXAGON LABORATORIES RI/FFS
PHASE 2 REMEDIAL INVESTIGATION: DATA QUALITY SUMMARY STATISTICS

Volatile Organic Compounds (VOCs)

	Number of Samples/Data Points			Qualifications		Data Quality Summary		
MATRIX	Environmental Samples	Data Points per Sample	Total Data Points	Qualified (J) Data Points	Rejected (R) Data Points	Percent Fully Acceptable	Percent Qualified Estimated	Percent Rejected
Surface Soil	5	33	165	10	0	93.9%	6.1%	0.0%
Soil Borings	5	33	165	31	0	81.2%	18.8%	0.0%
VOC TOTAL	10	33	330	41	0	87.6%	12.4%	0.0%

Semivolatile Organic Compounds (SVOCs)

	Number of Samples/Data Points			Qualifications		Data Quality Summary		
MATRIX	Environmental Samples	Data Points per Sample	Total Data Points	Qualified (J) Data Points	Rejected (R) Data Points	Percent Fully Acceptable	Percent Qualified Estimated	Percent Rejected
Surface Soil	5	64	320	47	0	85.3%	14.7%	0.0%
Soil Borings	5	64	320	96	14	65.6%	30.0%	4.4%
SVOC TOTAL	10	64	640	143	14	75.5%	22.3%	2.2%

Polychlorinated Biphenyls (PCBs)

	Number of Samples/Data Points			Qualifications		Data Quality Summary		
MATRIX	Environmental Samples	Data Points per Sample	Total Data Points	Qualified (J) Data Points	Rejected (R) Data Points	Percent Fully Acceptable	Percent Qualified Estimated	Percent Rejected
Surface Soil	5	7	35	1	2	91.4%	2.9%	5.7%
Soil Borings	5	7	35	4	3	80.0%	11.4%	8.6%
PCBs TOTAL	10	7	70	5	5	85.7%	7.1%	7.1%

Inorganics (Metals and Cyanide)

	Number of Samples/Data Points			Qualifications		Data Quality Summary		
MATRIX	Environmental Samples	Data Points per Sample	Total Data Points	Qualified (J) Data Points	Rejected (R) Data Points	Percent Fully Acceptable	Percent Qualified Estimated	Percent Rejected
Surface Soil	5	24	120	47	5	56.7%	39.2%	4.2%
Soil Borings	5	24	120	49	5	55.0%	40.8%	4.2%
Inorganics TOTAL	10	24	240	96	10	55.8%	40.0%	4.2%

TABLE 8-3
HEXAGON LABORATORIES RI/FFS
COMBINED PHASE I AND PHASE II REMEDIAL INVESTIGATION: DATA QUALITY SUMMARY STATISTICS
Page 1 of 2

Volatile Organic Compounds (VOCs)

	Number of Samples/Data Points			Qualifications		Data Quality Summary		
MATRIX	Environmental Samples	Data Points per Sample	Total Data Points	Qualified (J) Data Points	Rejected (R) Data Points	Percent Fully Acceptable	Percent Qualified Estimated	Percent Rejected
Surface Soil/Misc.	15	33	495	316	24	31.3%	63.8%	4.8%
Subsurface Borings	18	33	594	320	0	46.1%	53.9%	0.0%
Background Soil	3	33	99	99	0	0.0%	100.0%	0.0%
Subsurface UST	15	33	495	265	0	46.5%	53.5%	0.0%
Groundwater	12	33	396	250	0	36.9%	63.1%	0.0%
VOC TOTAL	63	33	2079	1250	24	38.7%	60.1%	1.2%

Semivolatile Organic Compounds (SVOCs)

	Number of Samples/Data Points			Qualifications		Data Quality Summary		
MATRIX	Environmental Samples	Data Points per Sample	Total Data Points	Qualified (J) Data Points	Rejected (R) Data Points	Percent Fully Acceptable	Percent Qualified Estimated	Percent Rejected
Surface Soil/Misc.	15	64	960	192	58	74.0%	20.0%	6.0%
Subsurface Borings	18	64	1152	519	28	52.5%	45.1%	2.4%
Background Soil	3	64	192	178	14	0.0%	92.7%	7.3%
Subsurface UST	12	64	768	320	4	57.8%	41.7%	0.5%
Groundwater	12	64	768	15	7	97.1%	2.0%	0.9%
SVOC TOTAL	60	64	3840	1224	111	65.2%	31.9%	2.9%

Pesticides

	Number of Samples/Data Points			Qualifications		Data Quality Summary		
MATRIX	Environmental Samples	Data Points per Sample	Total Data Points	Qualified (J) Data Points	Rejected (R) Data Points	Percent Fully Acceptable	Percent Qualified Estimated	Percent Rejected
Surface Soil/Misc	10	21	210	28	56	60.0%	13.3%	26.7%
Subsurface Borings	13	21	273	16	0	94.1%	5.9%	0.0%
Background Soil	3	21	63	27	21	23.8%	42.9%	33.3%
Subsurface UST	12	21	252	20	4	90.5%	7.9%	1.6%
Groundwater	12	21	252	10	18	88.9%	4.0%	7.1%
Pesticides TOTAL	50	21	1050	101	99	81.0%	9.6%	9.4%

TABLE 8-3
HEXAGON LABORATORIES RI/FFS
COMBINED PHASE I AND PHASE II REMEDIAL INVESTIGATION: DATA QUALITY SUMMARY STATISTICS
Page 2 of 2

Polychlorinated Biphenyls (PCBs)

	Number of Samples/Data Points			Qualifications		Data Quality Summary		
MATRIX	Environmental Samples	Data Points per Sample	Total Data Points	Qualified (J) Data Points	Rejected (R) Data Points	Percent Fully Acceptable	Percent Qualified Estimated	Percent Rejected
Surface Soil/Misc	15	7	105	3	9	88.6%	2.9%	8.6%
Subsurface Borings	18	7	126	7	3	92.1%	5.6%	2.4%
Background Soil	3	7	21	9	7	23.8%	42.9%	33.3%
Subsurface UST	12	7	84	10	0	88.1%	11.9%	0.0%
Groundwater	12	7	84	1	0	98.8%	1.2%	0.0%
PCBs TOTAL	60	7	420	30	19	88.3%	7.1%	4.5%

Inorganics (Metals and Cyanide)

	Number of Samples/Data Points			Qualifications		Data Quality Summary		
MATRIX	Environmental Samples	Data Points per Sample	Total Data Points	Qualified (J) Data Points	Rejected (R) Data Points	Percent Fully Acceptable	Percent Qualified Estimated	Percent Rejected
Surface Soil/Misc	15	24	360	158	12	52.8%	43.9%	3.3%
Subsurface Borings	18	24	432	104	5	74.8%	24.1%	1.2%
Background Soil	3	24	72	13	0	81.9%	18.1%	0.0%
Subsurface UST	12	24	288	94	0	67.4%	32.6%	0.0%
Groundwater - Total	12	24	288	90	33	57.3%	31.3%	11.5%
Groundwater - Filtered	12	22 - 23	270	104	17	55.2%	38.5%	6.3%
Inorganics TOTAL	72	22 - 24	1710	563	67	63.2%	32.9%	3.9%

QUADRANGLE LOCATION

SOURCE: USGS 7.5 MINUTE SERIES TOPOGRAPHIC MAP; NEW YORK: MOUNT VERNON QUADRANGLE, 1966 – PHOTOREVISED 1979.

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Albany, New York 12233

HEXAGON LABORATORIES SITE

BRONX COUNTY, NEW YORK

SITE LOCATION MAP

DATE :	SCALE :	DRAWING NO. :
AUGUST 1999	AS SHOWN	1-1

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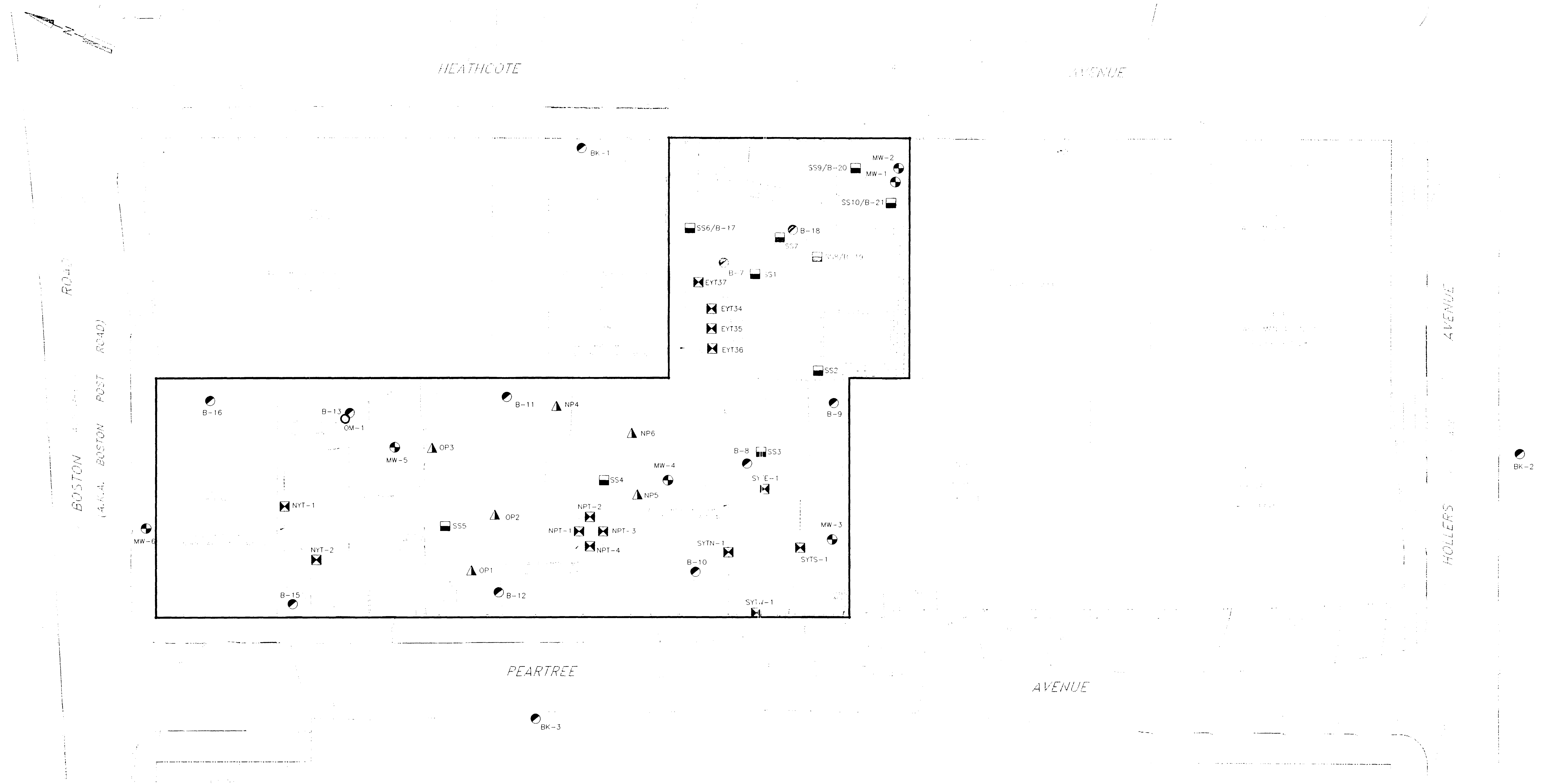

LEGEND

◐ BK, B	SOIL BORING		CONCRETE
⊕ MW	MONITORING WELL		CONCRETE CURB
○ OM-1	OILY MATERIAL SAMPLE		EDGE OF MACADAM
⬓ SS-5	SURFACE SOIL SAMPLE (TYP.)		MASONRY STONE WALL
⧓ NPT-1	UST SUBSURFACE SOIL SAMPLE (TYP.)		CONCRETE WALL
◭ OP1	FLOOR SLAB SAMPLE (TYP.)		CONCRETE STEPS
	BUILDING EDGE		CHAIN LINK FENCE
━	HEXAGON PROPERTY LINE		METAL STOCKADE FENCE
	ADJOINING PROPERTY LINE		LIGHT POLE
	CONTOUR LINE		PROPERTY OWNERSHIP INFORMATION (TYPICAL) (N/F=NOW OR FORMERLY, R=REEL, P=PAGE DEED REFERENCE)

NOTES:

1. ALL MONITORING WELL LOCATIONS AND BORING B-9, B-11, B-12, B-15, BK-1, BK-2, AND BK-3 LOCATIONS WERE SURVEYED BY YEC, INC.. ALL OTHER SAMPLING LOCATIONS ARE APPROXIMATE BASED ON TAMS FIELD NOTES.
2. FLOOR SLAB SAMPLES WERE COLLECTED BY TRADE-WINDS ENVIRONMENTAL RESTORATION, INC. AS PART OF THE IRM.
3. ONE SAMPLE OF SOIL EXCAVATED FROM THE SOUTH YARD UST EXCAVATION WAS COLLECTED BY TAMS. THIS EXCAVATED SOIL SAMPLE, SYTEX-1, IS NOT INCLUDED IN THIS FIGURE FOR CLARITY PURPOSES.
4. SIX SAMPLES OF SOIL EXCAVATED FROM THE SOUTH YARD UST EXCAVATION WERE COLLECTED BY TRADE-WINDS ENVIRONMENTAL RESTORATION, INC. OVER THE COURSE OF THE IRM. THESE SAMPLES (LD1-2-3, SYA, #1-2-3, SYS1, SYS2, AND SYS3) ARE NOT INCLUDED IN THIS FIGURE FOR CLARITY PURPOSES.
5. FOUR SAMPLES OF SOIL EXCAVATED FROM THE NEW PLANT UST EXCAVATION WERE COLLECTED BY TRADE-WINDS ENVIRONMENTAL RESTORATION, INC. OVER THE COURSE OF THE IRM. THESE SAMPLES (FOT#1, FOT#2, FO1, AND FO2) ARE NOT INCLUDED IN THIS FIGURE FOR CLARITY PURPOSES.
6. SYTC-1 IS A COMPOSITE IN-SITU SIDEWALL SAMPLE OF SYTN-1, SYTS-1, SYTE-1 AND SYTW-1.
7. FIVE SURFACE SOIL SAMPLES (SS6 THROUGH SS10) AND FIVE SUBSURFACE SOIL SAMPLES (B-17 THROUGH B-21) WERE COLLECTED AS PART OF THE PHASE II REMEDIAL INVESTIGATION.

SCALE
20 10 0 20 FT.

SYMBOL	DESCRIPTIONS	DATE	APPROVED

REVISIONS

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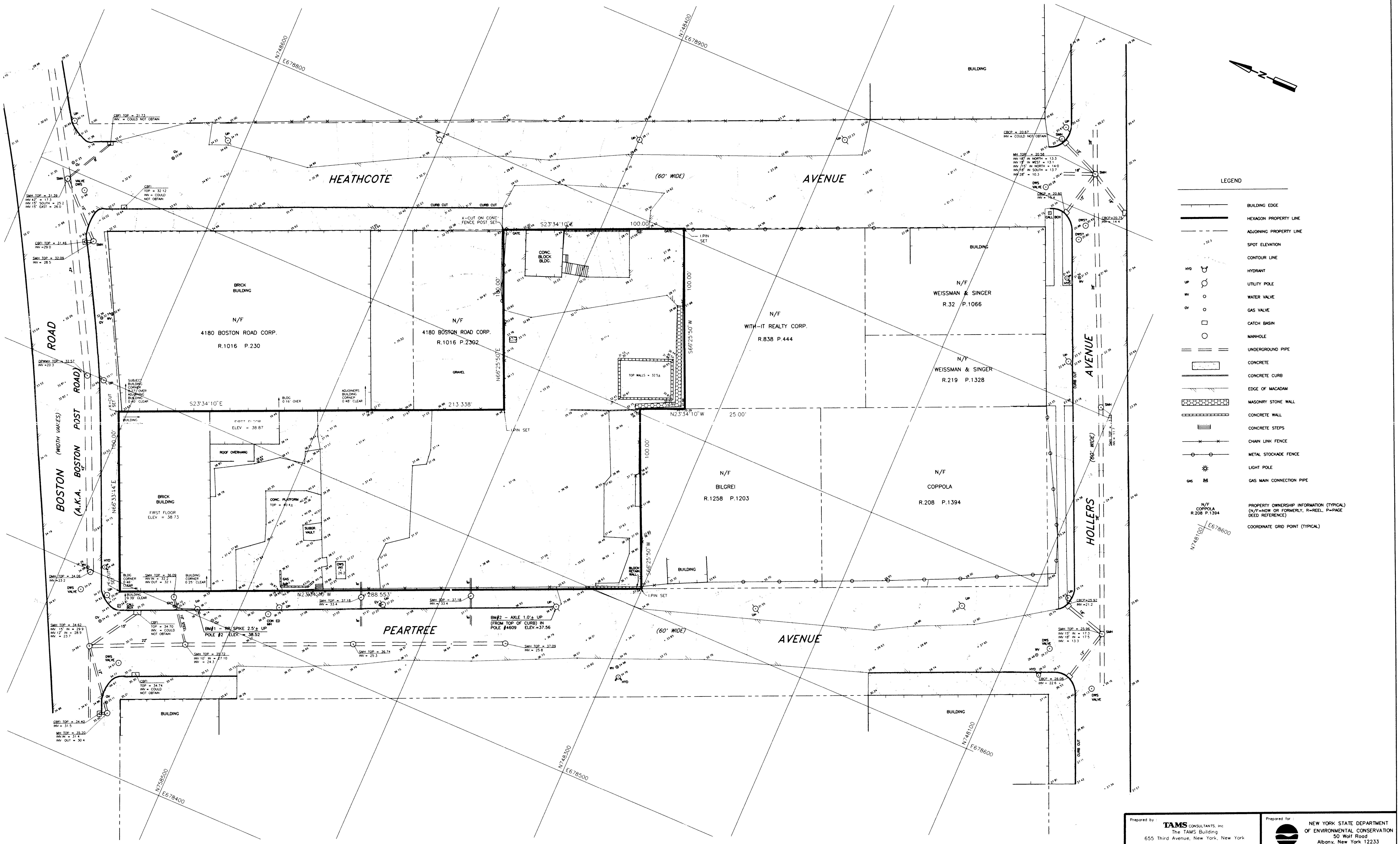
Albany, New York 12233

DESIGNED BY : PDP
DRAWN BY : PDP
CHECKED BY : PK
SUBMITTED BY : PDP

HEXAGON LABORATORIES SITE
City of New York
Bronx County, New York

SAMPLING LOCATIONS

DATE : AUGUST 1999
SCALE : 1" = 20'
DRAWING NO. : 2-1



REFERENCES:

1. INFORMATION ON FILE AT THE BRONX BOROUGH HALL.
2. DEEDS OF RECORD.
3. VERTICAL DATUM: NGVD 1929.
4. HORIZONTAL DATUM: NEW YORK STATE PLANE COORDINATE SYSTEM, EAST ZONE, NAD 1983 FROM NEW YORK STATE DEPARTMENT OF TRANSPORTATION SURVEY INFORMATION.

NOTES:

1. BASED ON SURVEY OF HEXAGON LABORATORIES SITE PREPARED BY YEC, INC., VALLEY COTTAGE, NEW YORK.
2. HEXAGON LABORATORIES PROPERTY:

TAX LOT: 17-5283-43
RECORD DEED: REEL 460, PAGE 601
AREA: 38,845 S.F. (0.892 AC.)

SCALE
20 10 0 20 FT.

SYMBOL	DESCRIPTIONS	DATE	APPROVED

REVISIONS

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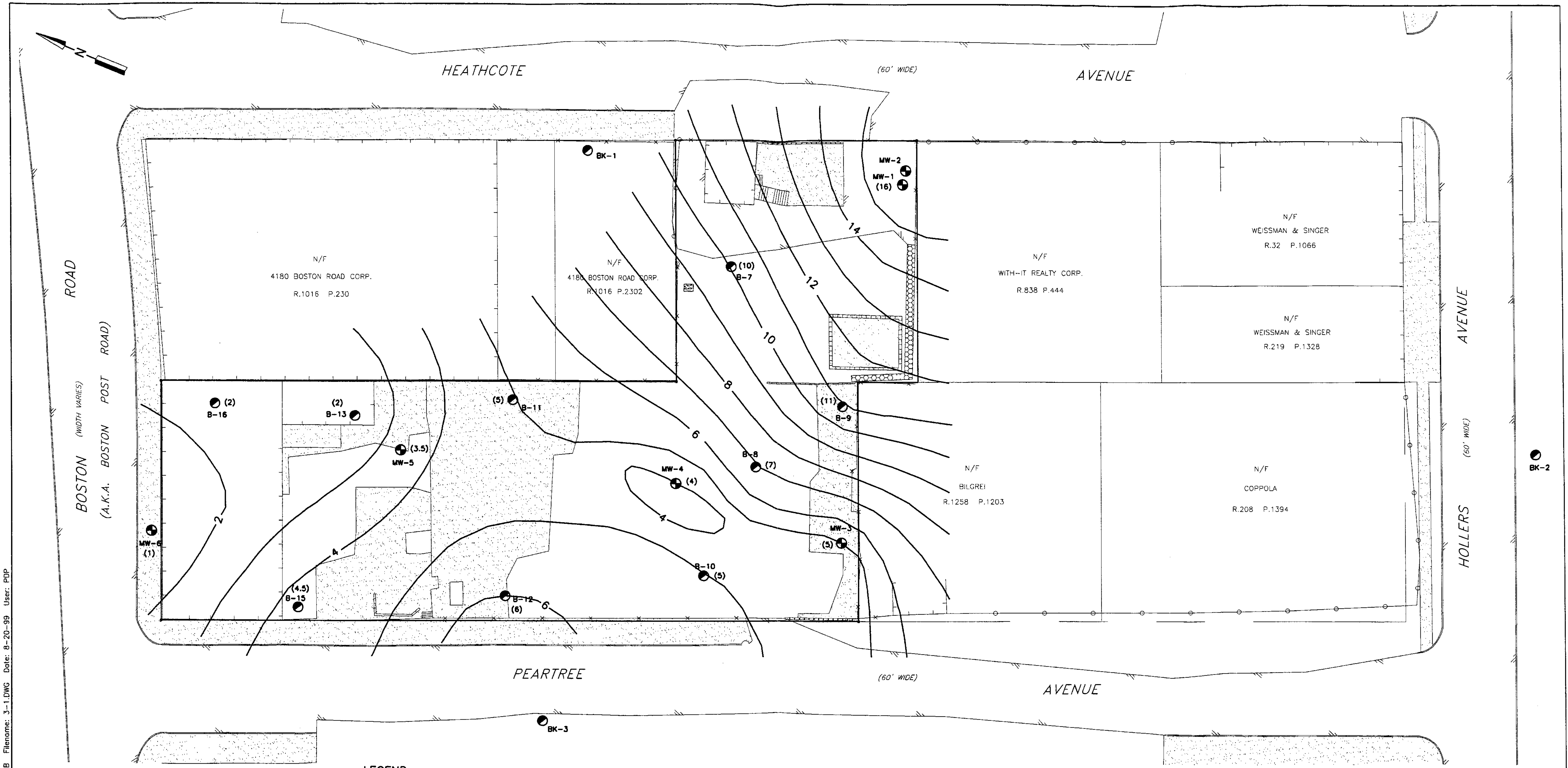
DESIGNED BY :
DRAWN BY :
CHECKED BY :

HEXAGON LABORATORIES SITE
City of New York
Bronx County, New York

TOPOGRAPHIC BASE MAP

SUBMITTED BY : PDP
DATE : AUGUST 1999
SCALE : 1" = 20'
DRAWING NO : 1-2



LEGEND

◐ BK, B	SOIL BORING
⊕ MW	MONITORING WELL
—	BUILDING EDGE
—	HEXAGON PROPERTY LINE
—	ADJOINING PROPERTY LINE
▨	CONCRETE
—	CONCRETE CURB
—	EDGE OF MACADAM
▨	MASONRY STONE WALL
▭	CONCRETE WALL
▤	CONCRETE STEPS
—×—×—	CHAIN LINK FENCE
—○—○—	METAL STOCKADE FENCE
N/F COPPOLA R.208 P.1394	PROPERTY OWNERSHIP INFORMATION (TYPICAL) (N/F=NOW OR FORMERLY, R=REEL, P=PAGE DEED REFERENCE)
(3.5)	OVERBURDEN THICKNESS IN FEET (TYP.)
—36—	OVERBURDEN THICKNESS ISOPACH (TYP.), 1 FT. CONTOUR INTERVAL

SCALE

40 20 0 40 FT.

SYMBOL	DESCRIPTIONS	DATE	APPROVED

REVISIONS

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DESIGNED BY : PK
DRAWN BY : PDP
CHECKED BY : MT
SUBMITTED BY : PDP

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New York City
Bronx County, New York

OVERBURDEN SOIL ISOPACH MAP

DATE : AUGUST 1999
SCALE : AS SHOWN
DRAWING NO. : 3-1

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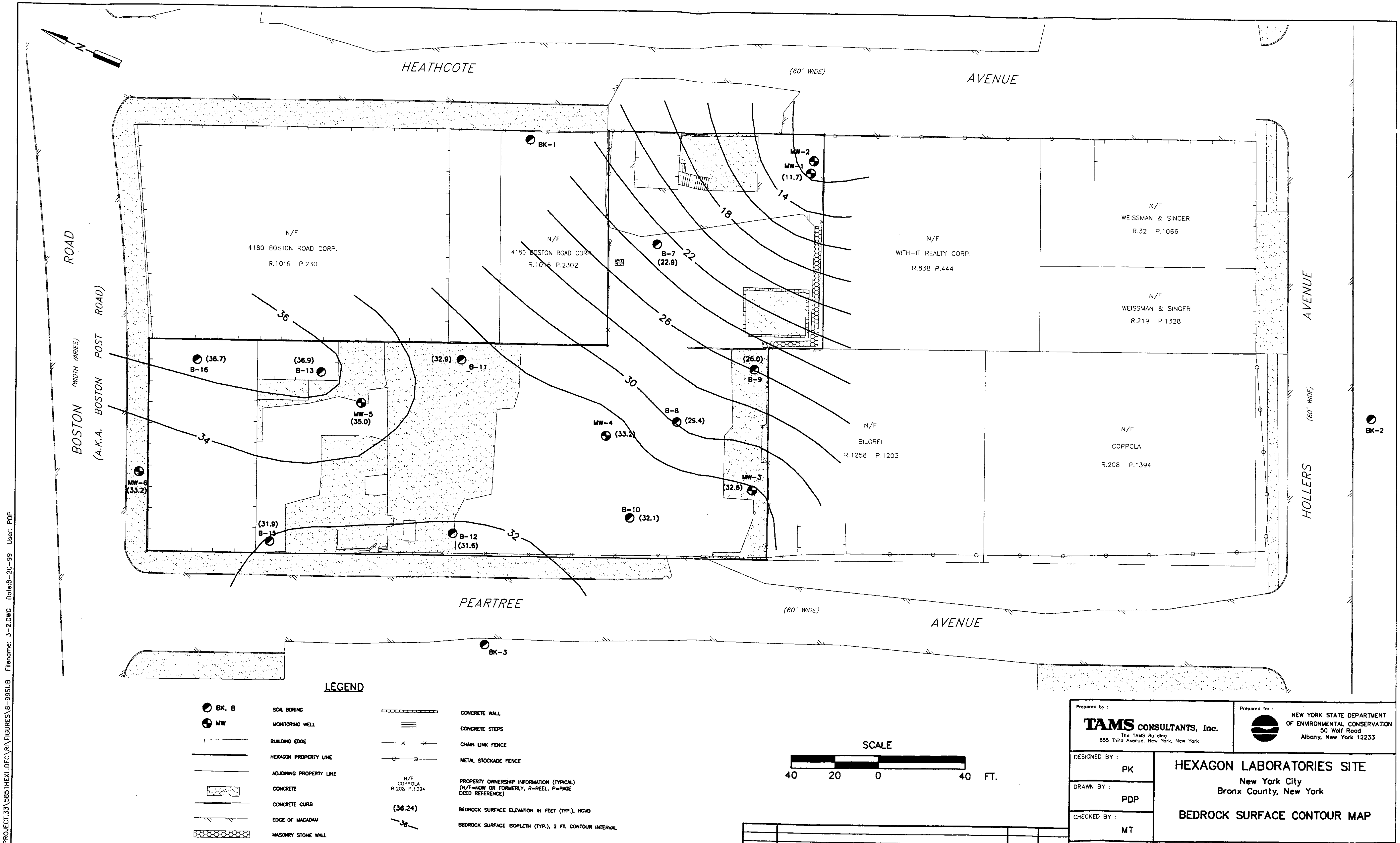

SYMBOL	DESCRIPTIONS	DATE	APPROVED
	REVISIONS		

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HEXAGON LABORATORIES SITE

New York City
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BEDROCK SURFACE CONTOUR MAP

DESIGNED BY : PK	
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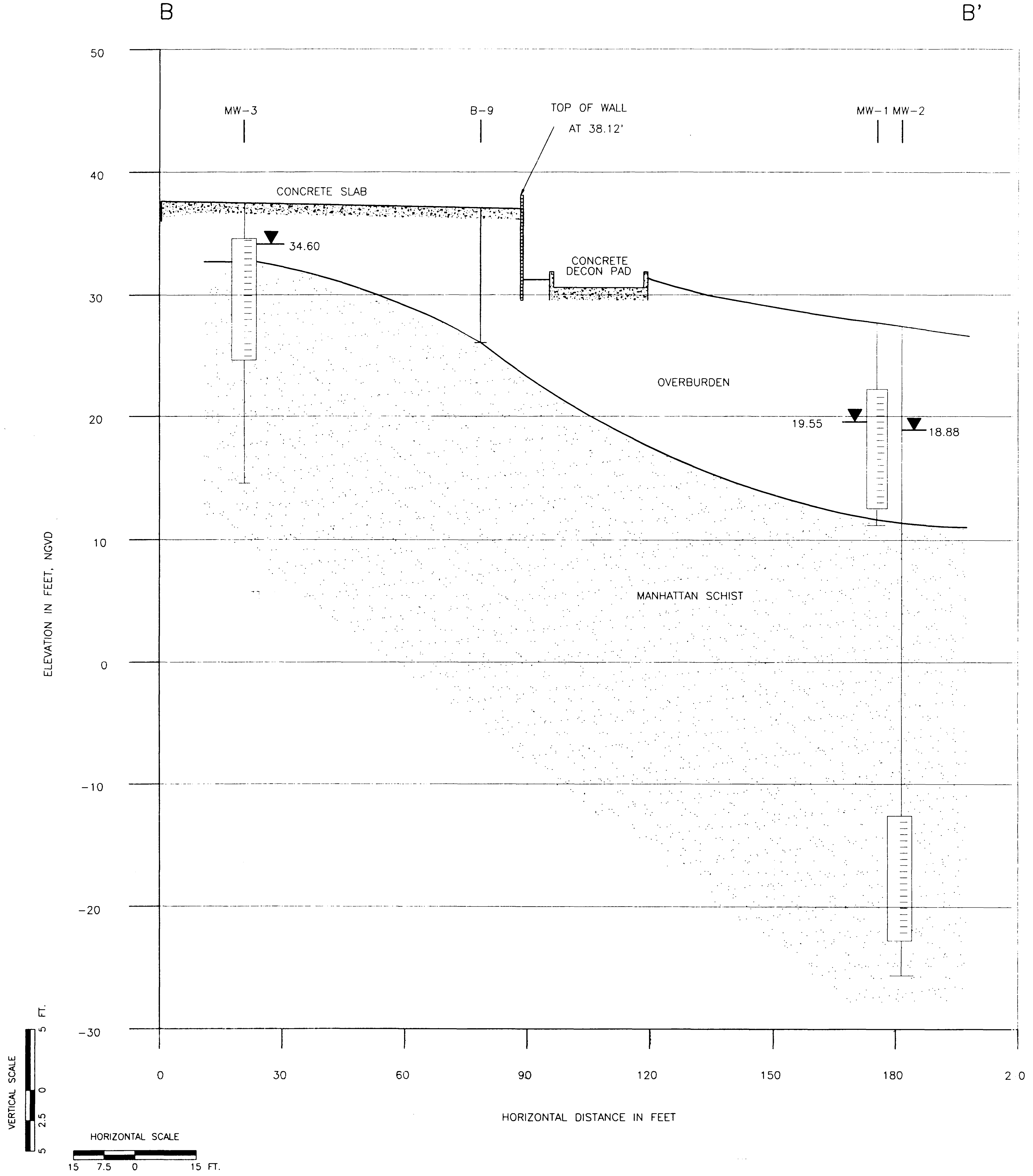
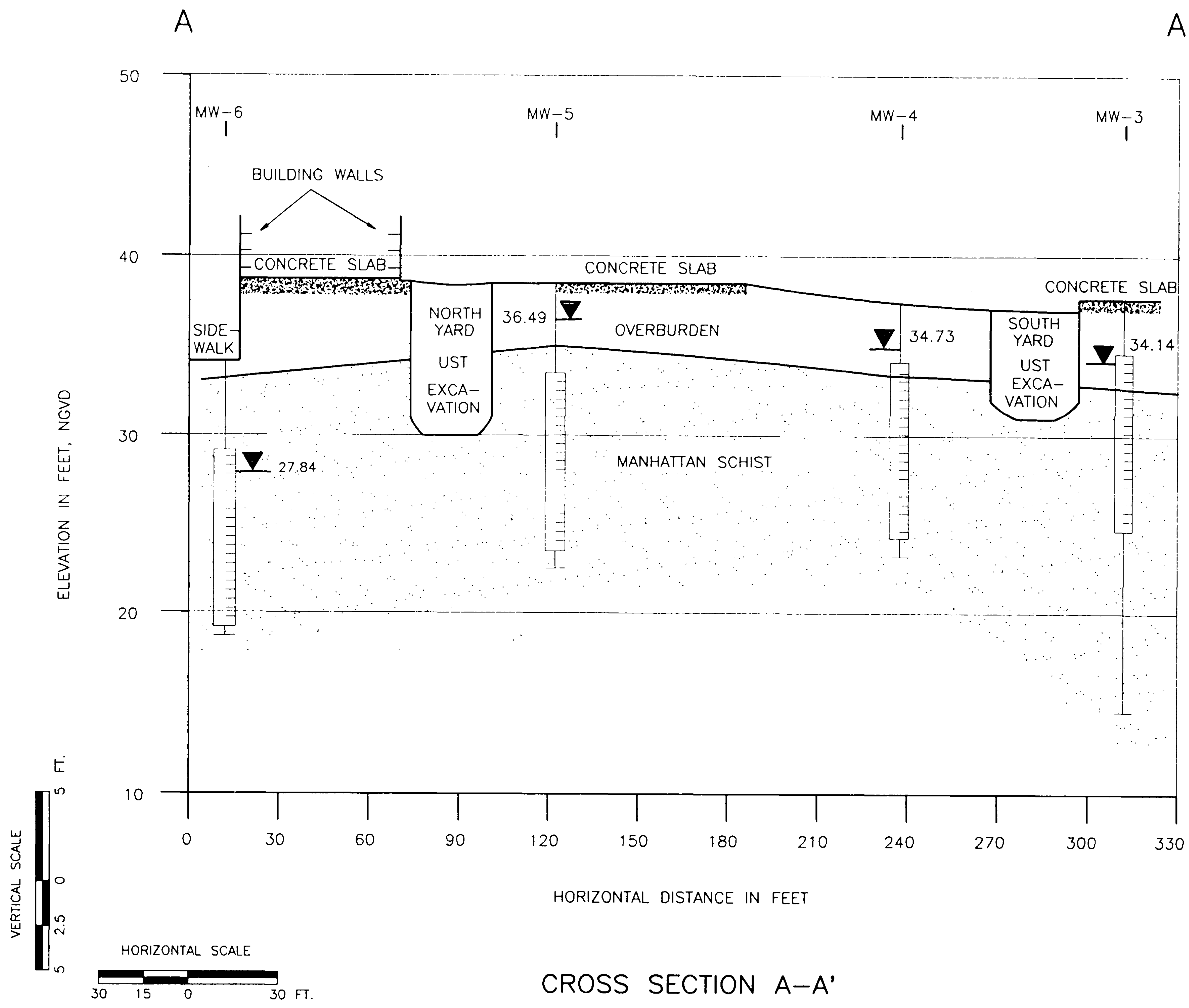
CHECKED BY : MT	
SUBMITTED BY : PDP	DATE : AUGUST 1999
SCALE : AS SHOWN	DRAWING NO. : 3-2

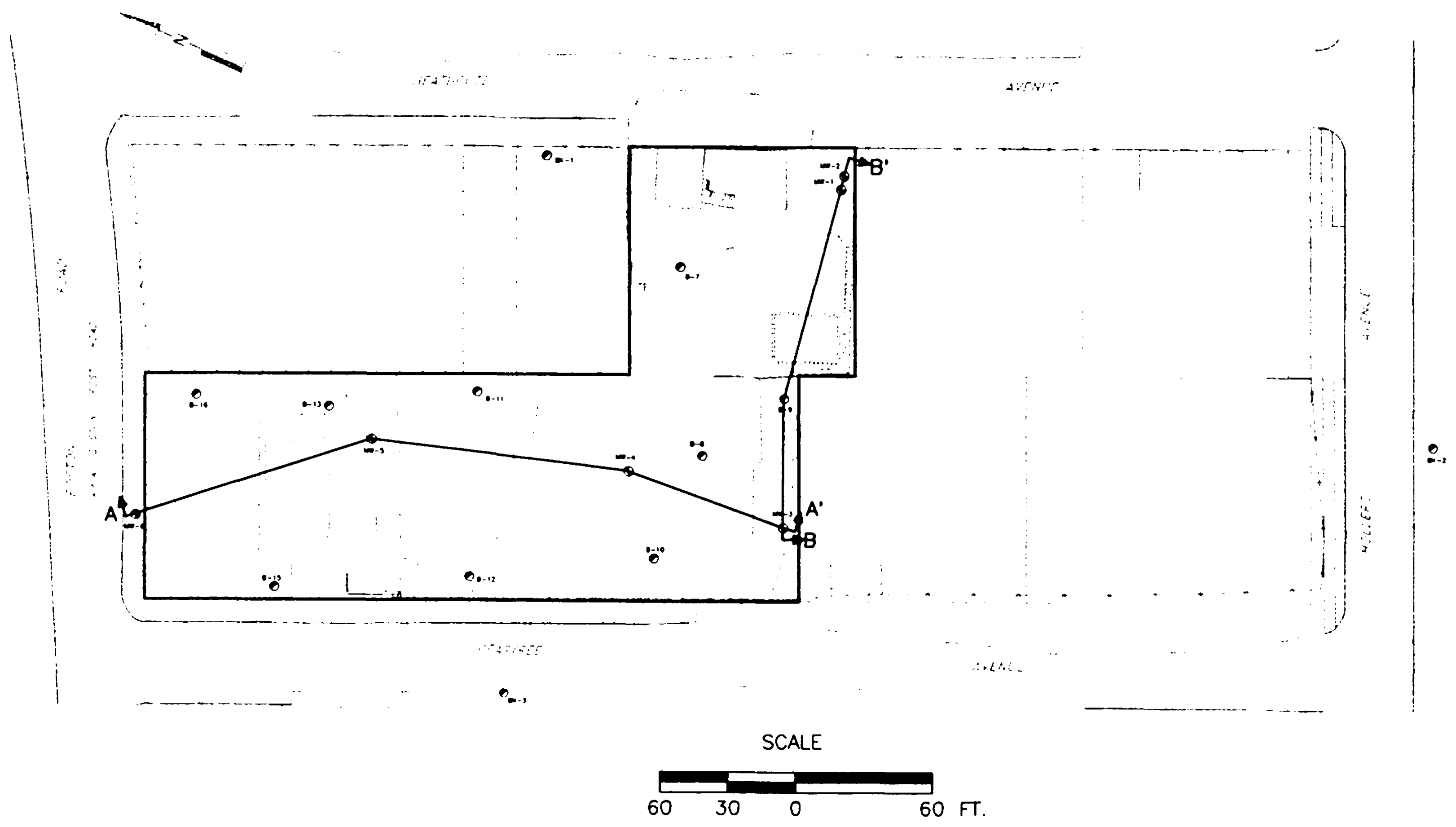


CROSS SECTION B–B'

NOTE: GROUNDWATER ELEVATIONS MEASURE) ON MARCH 5, 1998.



CROSS SECTION A–A'



LEGEND

▼ 18.88 GROUNDWATER ELEVATION IN FEET, NGVD (TYP.)

MW-1 MONITORING WELL/BORING DESIGNATION (TYP.)

MONITORING WELL SCREENED INTERVAL

MAXIMUM DEPTH OF BORING

SYMBOL	DESCRIPTIONS	DATE	APPROVED
	REVISIONS		

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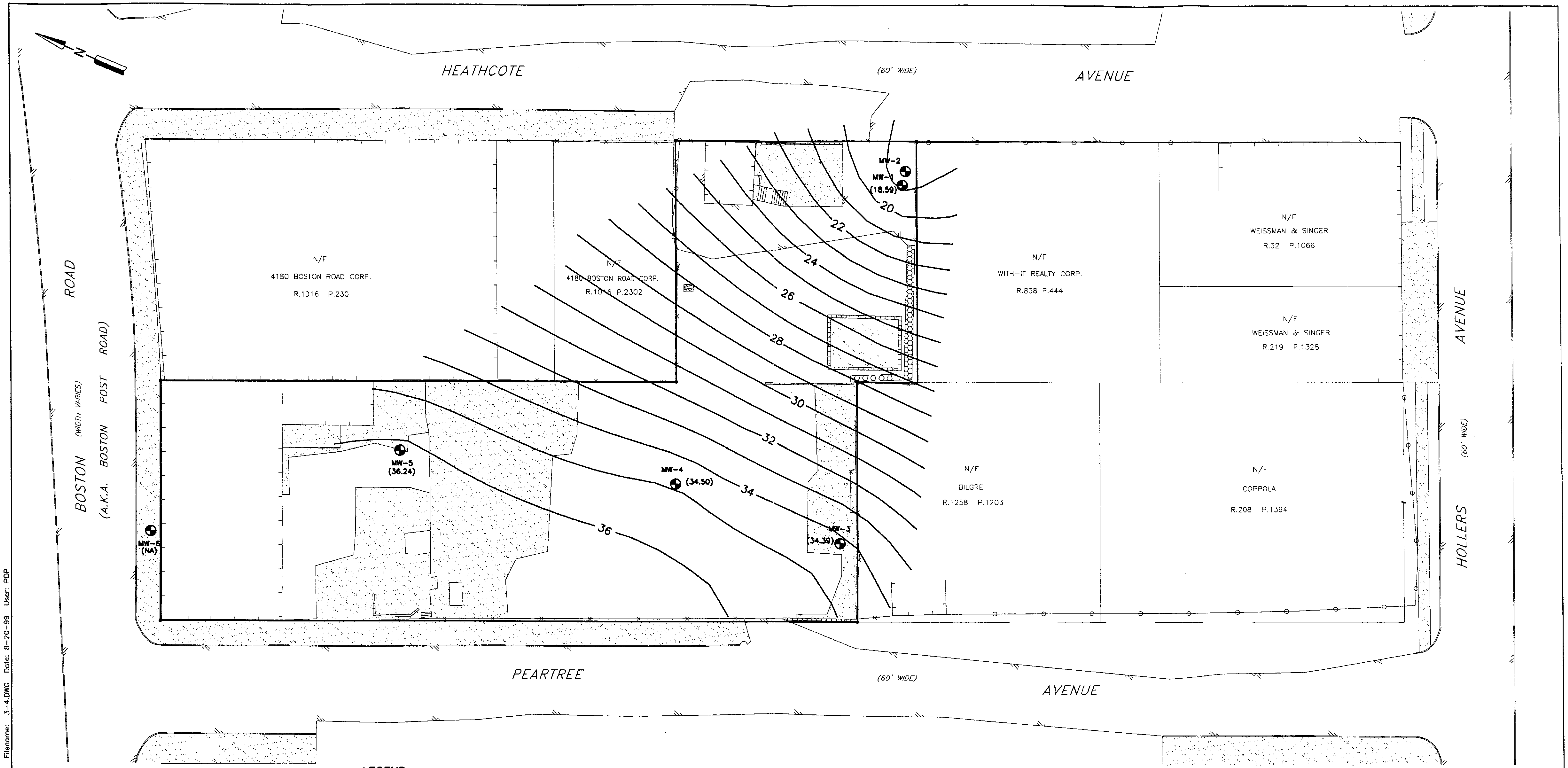
HEXAGON LABORATORIES SITE

City of New York
Bronx County, New York

GEOLOGIC CROSS SECTIONS

DESIGNED BY: PK
DRAWN BY: PDP
CHECKED BY: MT
SUBMITTED BY: PDP
DATE: AUGUST 1999
SCALE: AS SHOWN
DRAWING NO.: 3-3



LEGEND

	BUILDING EDGE
	HEXAGON PROPERTY LINE
	ADJOINING PROPERTY LINE
	CONCRETE
	CONCRETE CURB
	EDGE OF MACADAM
	MASONRY STONE WALL
	CONCRETE WALL
	CONCRETE STEPS
—×—×—	CHAIN LINK FENCE
—○—○—	METAL STOCKADE FENCE
N/F COPPOLA R.208 P.1394	PROPERTY OWNERSHIP INFORMATION (TYPICAL) (N/F=NOW OR FORMERLY, R=REEL, P=PAGE DEED REFERENCE)
(36.24)	GROUNDWATER ELEVATION IN FEET (TYP.), NGVD
(NA)	NOT AVAILABLE - MW-6 INSTALLED ON 1/6/98
36	GROUNDWATER ISOPLETH (TYP.), 1 FT. CONTOUR INTERVAL

SCALE

40 20 0 40 FT.

SYMBOL	DESCRIPTIONS	DATE	APPROVED

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DESIGNED BY : PK

DRAWN BY : PDP

CHECKED BY : MT

SUBMITTED BY : PDP

HEXAGON LABORATORIES SITE

New York City
Bronx County, New York

GROUNDWATER TABLE CONTOUR ELEVATION MAP - JANUARY 2, 1998

DATE : AUGUST 1999

SCALE : AS SHOWN

DRAWING NO. : 3-4

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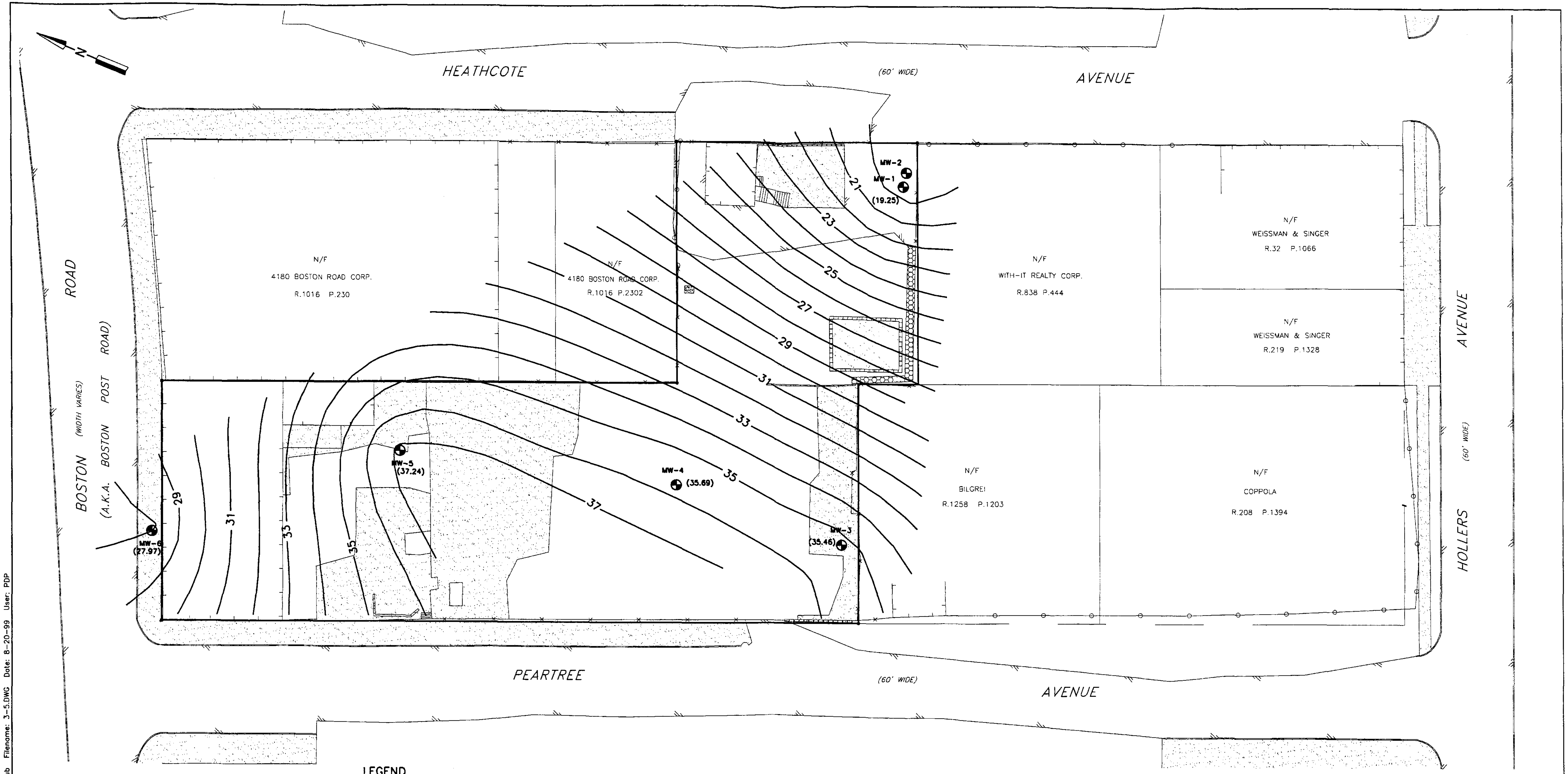

LEGEND

BUILDING EDGE
HEXAGON PROPERTY LINE
ADJOINING PROPERTY LINE
CONCRETE
CONCRETE CURB
EDGE OF MACADAM
MASONRY STONE WALL
CONCRETE WALL
CONCRETE STEPS
CHAIN LINK FENCE
METAL STOCKADE FENCE
N/F COPPOLA R.208 P.1394 — PROPERTY OWNERSHIP INFORMATION (TYPICAL) (N/F=NOW OR FORMERLY, R=REEL, P=PAGE DEED REFERENCE)
(36.24) — GROUNDWATER ELEVATION IN FEET (TYP.), NGVD
36 — GROUNDWATER ISOPLETH (TYP.), 1 FT. CONTOUR INTERVAL

SCALE
40 20 0 40 FT.

SYMBOL	DESCRIPTIONS	DATE	APPROVED
	REVISIONS		

Prepared by :
TAMS CONSULTANTS, Inc.
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Prepared for :
NEW YORK STATE DEPARTMENT
OF ENVIRONMENTAL CONSERVATION
50 Wolf Road
Albany, New York 12233

DESIGNED BY : PK
DRAWN BY : PDP
CHECKED BY : MT
SUBMITTED BY : PDP

HEXAGON LABORATORIES SITE
New York City
Bronx County, New York

GROUNDWATER TABLE CONTOUR
ELEVATION MAP – FEBRUARY 18, 1998

DATE : AUGUST 1999
SCALE : AS SHOWN
DRAWING NO. : 3-5

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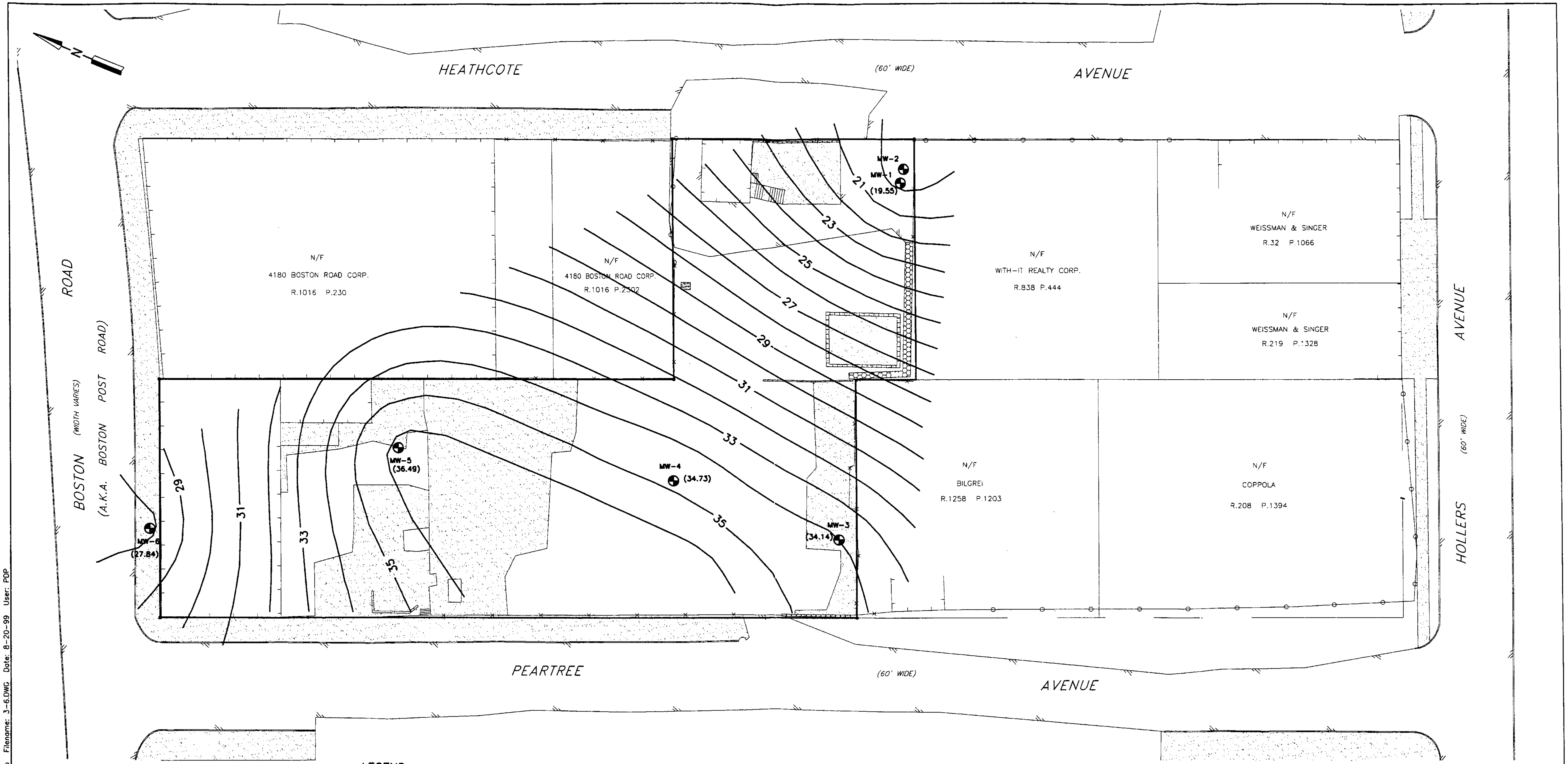

LEGEND

- BUILDING EDGE
- HEXAGON PROPERTY LINE
- ADJOINING PROPERTY LINE
- CONCRETE
- CONCRETE CURB
- EDGE OF MACADAM
- MASONRY STONE WALL
- CONCRETE WALL
- CONCRETE STEPS
- CHAIN LINK FENCE
- METAL STOCKADE FENCE
- N/F COPPOLA R.208 P.1394 — PROPERTY OWNERSHIP INFORMATION (TYPICAL) (N/F=NOW OR FORMERLY, R=REEL, P=PAGE DEED REFERENCE)
- (36.24) — GROUNDWATER ELEVATION IN FEET (TYP.), NGVD
- 36 — GROUNDWATER ISOPLETH (TYP.), 1 FT. CONTOUR INTERVAL

SCALE

40 20 0 40 FT.

SYMBOL	DESCRIPTIONS	DATE	APPROVED
	REVISIONS		

Prepared by :
TAMS CONSULTANTS, Inc.
The TAMS Building
655 Third Avenue, New York, New York

Prepared for :
NEW YORK STATE DEPARTMENT
OF ENVIRONMENTAL CONSERVATION
50 Wolf Road
Albany, New York 12233

DESIGNED BY : PK
DRAWN BY : PDP
CHECKED BY : MT
SUBMITTED BY : PDP

HEXAGON LABORATORIES SITE

New York City
Bronx County, New York

GROUNDWATER TABLE CONTOUR ELEVATION MAP – MARCH 5, 1998

DATE : AUGUST 1999
SCALE : AS SHOWN
DRAWING NO. : 3-6

U:\PROJECT.33\5851HEXL.DEC\RI\FIGURES\8-99Sub Filename: 3-6.DWG Date: 8-20-99 User: PDP

PHENOL	ND
2-METHYLPHENOL	ND
4-METHYLPHENOL	ND
1,2-DICHLOROBENZENE	ND
CARBAZOLE	28J
DIBENZOFURAN	21J
PAHS (TOTAL)	5,366J
PHTHALATES (TOTAL)	89J
TOTAL TARGET SVOCS	5,504J
TOTAL SVOCS TICS	8,675J

PHENOL	ND
2-METHYLPHENOL	ND
4-METHYLPHENOL	ND
1,2-DICHLOROBENZENE	ND
CARBAZOLE	ND
DIBENZOFURAN	ND
PAHS (TOTAL)	736J
PHTHALATES (TOTAL)	6,250J
TOTAL TARGET SVOCS	5,986J
TOTAL SVOCS TICS	18,800J

PHENOL	ND
2-METHYLPHENOL	ND
4-METHYLPHENOL	ND
1,2-DICHLOROBENZENE	ND
CARBAZOLE	ND
DIBENZOFURAN	ND
PAHS (TOTAL)	8,360,000J
PHTHALATES (TOTAL)	ND
TOTAL TARGET SVOCS	8,360,000J
TOTAL SVOCS TICS	126,000,000J

PHENOL	ND
2-METHYLPHENOL	ND
4-METHYLPHENOL	ND
1,2-DICHLOROBENZENE	ND
CARBAZOLE	ND
DIBENZOFURAN	ND
PAHS (TOTAL)	323,120J
PHTHALATES (TOTAL)	ND
TOTAL TARGET SVOCS	323,120J
TOTAL SVOCS TICS	2,572,600J

PHENOL	R
2-METHYLPHENOL	ND
4-METHYLPHENOL	R
1,2-DICHLOROBENZENE	150J
CARBAZOLE	ND
DIBENZOFURAN	ND
PAHS (TOTAL)	4,640J
PHTHALATES (TOTAL)	2,800J
TOTAL TARGET SVOCS	[illegible]
TOTAL SVOCS TICS	8,460J

PHENOL	R
2-METHYLPHENOL	R
4-METHYLPHENOL	R
1,2-DICHLOROBENZENE	ND
CARBAZOLE	130JN
DIBENZOFURAN	65J
PAHS (TOTAL)	9,574J
PHTHALATES (TOTAL)	217J
TOTAL TARGET SVOCS	[illegible]
TOTAL SVOCS TICS	[illegible]

PHENOL	ND
2-METHYLPHENOL	ND
4-METHYLPHENOL	ND
1,2-DICHLOROBENZENE	ND
CARBAZOLE	ND
DIBENZOFURAN	ND
PAHS (TOTAL)	ND
PHTHALATES (TOTAL)	ND
TOTAL TARGET SVOCS	ND
TOTAL SVOCS TICS	20,560J

PHENOL	R
2-METHYLPHENOL	ND
4-METHYLPHENOL	ND
1,2-DICHLOROBENZENE	500
CARBAZOLE	ND
DIBENZOFURAN	ND
PAHS (TOTAL)	5,270J
PHTHALATES (TOTAL)	7,390J
TOTAL TARGET SVOCS	13,160J
TOTAL SVOCS TICS	27,800J

PHENOL	180JN
2-METHYLPHENOL	1,100
4-METHYLPHENOL	1,800
1,2-DICHLOROBENZENE	83J
CARBAZOLE	ND
DIBENZOFURAN	100J
PAHS (TOTAL)	3,608J
PHTHALATES (TOTAL)	5,810
TOTAL TARGET SVOCS	12,756J
TOTAL SVOCS TICS	214,400J

PHENOL	ND
2-METHYLPHENOL	ND
4-METHYLPHENOL	ND
1,2-DICHLOROBENZENE	ND
CARBAZOLE	ND
DIBENZOFURAN	ND
PAHS (TOTAL)	132J
PHTHALATES (TOTAL)	ND
TOTAL TARGET SVOCS	132J
TOTAL SVOCS TICS	2,803J

PHENOL	ND
2-METHYLPHENOL	ND
4-METHYLPHENOL	ND
1,2-DICHLOROBENZENE	ND
CARBAZOLE	ND
DIBENZOFURAN	ND
PAHS (TOTAL)	173J
PHTHALATES (TOTAL)	222J
TOTAL TARGET SVOCS	395J
TOTAL SVOCS TICS	17,850J

PHENOL	ND
2-METHYLPHENOL	ND
4-METHYLPHENOL	ND
1,2-DICHLOROBENZENE	ND
CARBAZOLE	ND
DIBENZOFURAN	ND
PAHS (TOTAL)	1,011J
PHTHALATES (TOTAL)	218J
TOTAL TARGET SVOCS	1,229J
TOTAL SVOCS TICS	26,420J

PHENOL	ND
2-METHYLPHENOL	ND
4-METHYLPHENOL	ND
[illegible]	[illegible]
[illegible]	[illegible]
DIBENZOFURAN	ND
PAHS (TOTAL)	ND
PHTHALATES (TOTAL)	ND
TOTAL TARGET SVOCS	ND
TOTAL SVOCS TICS	30,360J

SAMPLE ID	SS8	B-19
PHENOL	ND	ND
2-METHYLPHENOL	ND	ND
4-METHYLPHENOL	ND	ND
1,2-DICHLOROBENZENE	ND	ND
CARBAZOLE	ND	ND
DIBENZOFURAN	ND	ND
PAHS (TOTAL)	560J	5,702J
PHTHALATES (TOTAL)	130J	3,693J
TOTAL TARGET SVOCS	690J	9,395J
TOTAL SVOCS TICS	33,230J	11,980J

PHENOL	R
2-METHYLPHENOL	R
4-METHYLPHENOL	R
1,2-DICHLOROBENZENE	ND
CARBAZOLE	ND
DIBENZOFURAN	ND
PAHS (TOTAL)	3,617J
PHTHALATES (TOTAL)	173J
TOTAL TARGET SVOCS	3,790J
TOTAL SVOCS TICS	40,880J

PHENOL	ND
2-METHYLPHENOL	ND
[illegible]	[illegible]
1,2-DICHLOROBENZENE	740
CARBAZOLE	ND
DIBENZOFURAN	ND
PAHS (TOTAL)	14,560J
PHTHALATES (TOTAL)	810J
TOTAL TARGET SVOCS	16,110J
TOTAL SVOCS TICS	11,540J

LEGEND

◐ BK, B — SOIL BORING
◐ MW — MONITORING WELL
○ OM-1 — OILY MATERIAL SAMPLE
▄ SS-5 — SURFACE SOIL SAMPLE (TYP.)
BUILDING EDGE
━ HEXAGON PROPERTY LINE
ADJOINING PROPERTY LINE
CONTOUR LINE

CONCRETE
CONCRETE CURB
EDGE OF MACADAM
MASONRY STONE WALL
CONCRETE WALL
CONCRETE STEPS
CHAIN LINK FENCE
METAL STOCKADE FENCE
LIGHT POLE
PROPERTY OWNERSHIP INFORMATION (TYPICAL)
(N/F=NOW OR FORMERLY, R=REEL, P=PAGE
DEED REFERENCE)

NOTES:

1. ALL MONITORING WELL LOCATIONS AND BORING B-9, B-11, B-12, B-15, BK-1, BK-2, AND BK-3 LOCATIONS WERE SURVEYED BY YEC, INC.. ALL OTHER SAMPLING LOCATIONS ARE APPROXIMATE BASED ON TAMS FIELD NOTES.
2. ALL SURFACE SOIL AND SHALLOW SUBSURFACE SOIL SAMPLES WERE COLLECTED AT A DEPTH OF LESS THAN 2 FEET BELOW GROUND SURFACE.
3. SURFACE SOIL SAMPLES SS6 THROUGH SS10 AND SHALLOW SUBSURFACE SOIL SAMPLES B-18 AND B-19 WERE COLLECTED AS PART OF THE PHASE II REMEDIAL INVESTIGATION.
4. ALL ANALYTE CONCENTRATIONS ARE IN MICROGRAMS PER KILOGRAM (UG/KG).

SCALE
20 10 0 20 FT.

SYMBOL	DESCRIPTIONS	DATE	APPROVED

REVISIONS

Prepared by:
TAMS CONSULTANTS, Inc.
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655 Third Avenue, New York, New York

Prepared for:
NEW YORK STATE DEPARTMENT
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50 Wolf Road
Albany, New York 12233

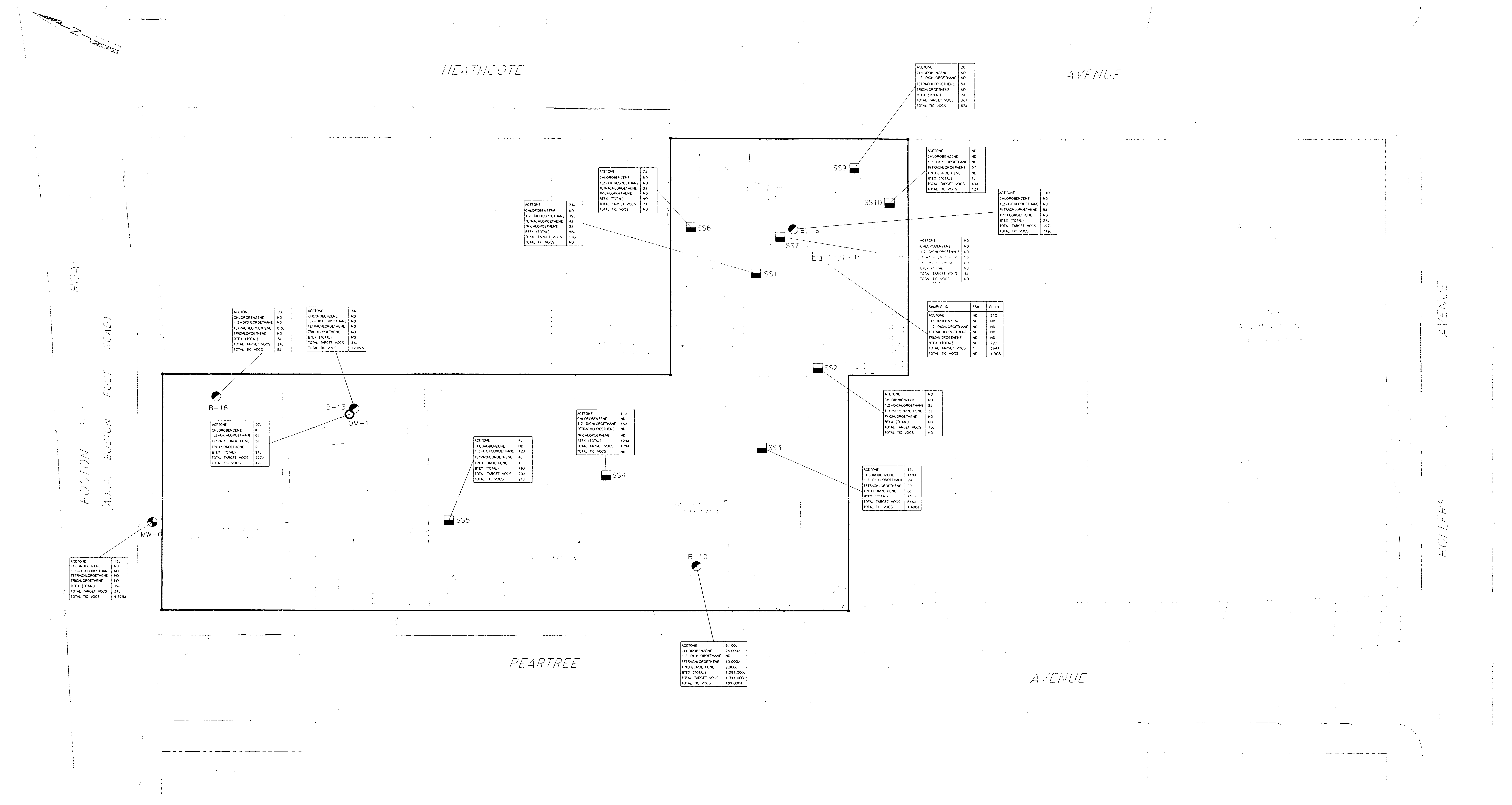
DESIGNED BY: PDP
DRAWN BY: LQ
CHECKED BY: PK
SUBMITTED BY: PDP

HEXAGON LABORATORIES SITE

City of New York
Bronx County, New York

SELECTED SEMI-VOLATILE ORGANIC COMPOUND DISTRIBUTION - SURFACE SOIL

DATE: AUGUST 1999
SCALE: 1" = 20'
NO.: 4-2



LEGEND

◐ BK, B	SOIL BORING
◕ MW	MONITORING WELL
○ OM-1	OILY MATERIAL SAMPLE
▄ SS-5	SURFACE SOIL SAMPLE (TYP.)
	BUILDING EDGE
━	HEXAGON PROPERTY LINE
	ADJOINING PROPERTY LINE
	CONTOUR LINE
	CONCRETE
	CONCRETE CURB
	EDGE OF MACADAM
	MASONRY STONE WALL
	CONCRETE WALL
	CONCRETE STEPS
	CHAIN LINK FENCE
	METAL STOCKADE FENCE
	LIGHT POLE
	PROPERTY OWNERSHIP INFORMATION (TYPICAL) (N/F=NOW OR FORMERLY, R=REEL, P=PAGE DEED REFERENCE)

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4. ALL ANALYTE CONCENTRATIONS ARE IN MICROGRAMS PER KILOGRAM (UG/KG).

SCALE
20 10 0 20 FT.

SYMBOL	DESCRIPTIONS	DATE	APPROVED
	REVISIONS		

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The TAMS Building
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Prepared for :
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DESIGNED BY :
PDP

DRAWN BY :
LQ

CHECKED BY :
PK

SUBMITTED BY :
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HEXAGON LABORATORIES SITE

City of New York
Bronx County, New York

SELECTED VOLATILE ORGANIC COMPOUND DISTRIBUTION – SURFACE SOIL

DATE :
AUGUST 1999

SCALE :
1" = 20'

DRAWING NO. :
4-1

BERYLLIUM	0.66
CHROMIUM	54.7J
COPPER	75.5J
LEAD	90.3
MERCURY	0.33J
THALLIUM	1.6
CYANIDE	ND

BERYLLIUM	0.62
CHROMIUM	52.9J
COPPER	53.7J
LEAD	54.5
MERCURY	2.3J
THALLIUM	1.3
CYANIDE	ND

BERYLLIUM	ND
CHROMIUM	318J
COPPER	293J
LEAD	1,190J
MERCURY	0.43J
THALLIUM	0.83
CYANIDE	R

BERYLLIUM	0.47
CHROMIUM	229J
COPPER	57.7J
LEAD	53.3J
MERCURY	1.1J
THALLIUM	4
CYANIDE	ND

BERYLLIUM	ND
CHROMIUM	57.9J
COPPER	80.1J
LEAD	185J
MERCURY	3.7J
THALLIUM	0.73
CYANIDE	R

BERYLLIUM	0.24
CHROMIUM	24.4J
COPPER	49.6J
LEAD	52J
MERCURY	ND
THALLIUM	2.2
CYANIDE	ND

BERYLLIUM	ND
CHROMIUM	14.8J
COPPER	14.4J
LEAD	32.8J
MERCURY	0.09J
THALLIUM	0.41
CYANIDE	R

BERYLLIUM	ND
CHROMIUM	257J
COPPER	1,050J
LEAD	1,040J
MERCURY	6.7J
THALLIUM	2.8
CYANIDE	R

BERYLLIUM	0.63
CHROMIUM	123
COPPER	61.6
LEAD	8.8
MERCURY	0.16
THALLIUM	0.38
CYANIDE	ND

BERYLLIUM	0.35
CHROMIUM	54.5J
COPPER	380J
LEAD	928J
MERCURY	0.21
THALLIUM	2.7
CYANIDE	0.13J

BERYLLIUM	0.14
CHROMIUM	9.8J
COPPER	75.1J
LEAD	286J
MERCURY	ND
THALLIUM	ND
CYANIDE	ND

BERYLLIUM	0.27
CHROMIUM	33.3J
COPPER	65.4J
LEAD	99.9J
MERCURY	0.17
THALLIUM	ND
CYANIDE	ND

BERYLLIUM	0.19
CHROMIUM	18.2J
COPPER	73.4J
LEAD	111J
MERCURY	ND
THALLIUM	ND
CYANIDE	ND

SAMPLE ID	SS8	B-19
BERYLLIUM	0.20	0.22
CHROMIUM	37.2J	123J
COPPER	266J	3,720J
LEAD	856J	1,400J
MERCURY	0.56	1.1
THALLIUM	ND	ND
CYANIDE	1.8J	3.2J

BERYLLIUM	0.35
CHROMIUM	55.1J
COPPER	57.9J
LEAD	144J
MERCURY	0.58J
THALLIUM	0.55
CYANIDE	R

BERYLLIUM	0.42
CHROMIUM	133J
COPPER	95.1J
LEAD	206J
MERCURY	7.3J
THALLIUM	0.79
CYANIDE	R

LEGEND

BK, B	SOIL BORING
MW	MONITORING WELL
○ OM-1	OILY MATERIAL SAMPLE
SS-5	SURFACE SOIL SAMPLE (TYP.)
	BUILDING EDGE
▬	HEXAGON PROPERTY LINE
	ADJOINING PROPERTY LINE
	CONTOUR LINE
	CONCRETE
	CONCRETE CURB
	EDGE OF MACADAM
	MASONRY STONE WALL
	CONCRETE WALL
	CONCRETE STEPS
	CHAIN LINK FENCE
	METAL STOCKADE FENCE
	LIGHT POLE
	PROPERTY OWNERSHIP INFORMATION (TYPICAL) (N/F=NOW OR FORMERLY, R=REEL, P=PAGE DEED REFERENCE)

NOTES:

1. ALL MONITORING WELL LOCATIONS AND BORING B-9, B-11, B-12, B-15, BK-1, BK-2, AND BK-3 LOCATIONS WERE SURVEYED BY YEC, INC.. ALL OTHER SAMPLING LOCATIONS ARE APPROXIMATE BASED ON TAMS FIELD NOTES.
2. ALL SURFACE SOIL AND SHALLOW SUBSURFACE SOIL SAMPLES WERE COLLECTED AT A DEPTH OF LESS THAN 2 FEET BELOW GROUND SURFACE.
3. SURFACE SOIL SAMPLES SS6 THROUGH SS10 AND SHALLOW SUBSURFACE SOIL SAMPLES B-18 AND B-19 WERE COLLECTED AS PART OF THE PHASE II REMEDIAL INVESTIGATION.
4. ALL ANALYTE CONCENTRATIONS ARE IN MILLIGRAMS PER KILOGRAM (MG/KG).

SCALE
20 10 0 20 FT.

SYMBOL	DESCRIPTIONS	DATE	APPROVED

REVISIONS

Prepared by :
TAMS CONSULTANTS, Inc.
The TAMS Building
655 Third Avenue, New York, New York

Prepared for :
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50 Wolf Road
Albany, New York 12233

HEXAGON LABORATORIES SITE
City of New York
Bronx County, New York

SELECTED INORGANIC COMPOUND DISTRIBUTION – SURFACE SOIL

DESIGNED BY : PDP
DRAWN BY : LQ
CHECKED BY : PK
SUBMITTED BY : PDP
DATE : AUGUST 1999
SCALE : 1" = 20'
DRAWING NO. : 4-4

LEGEND

◐ BK, B	SOIL BORING
◑ MW	MONITORING WELL
○ OM-1	OILY MATERIAL SAMPLE
▄ SS-5	SURFACE SOIL SAMPLE (TYP.)
	BUILDING EDGE
━	HEXAGON PROPERTY LINE
	ADJOINING PROPERTY LINE
	CONTOUR LINE

CONCRETE
CONCRETE CURB
EDGE OF MACADAM
MASONRY STONE WALL
CONCRETE WALL
CONCRETE STEPS
CHAIN LINK FENCE
METAL STOCKADE FENCE
LIGHT POLE
PROPERTY OWNERSHIP INFORMATION (TYPICAL)
(N/F=NOW OR FORMERLY, R=REEL, P=PAGE
DEED REFERENCE)

NOTES:

1. ALL MONITORING WELL LOCATIONS AND BORING B-9, B-11, B-12, B-15, BK-1, BK-2, AND BK-3 LOCATIONS WERE SURVEYED BY YEC, INC.. ALL OTHER SAMPLING LOCATIONS ARE APPROXIMATE BASED ON TAMS FIELD NOTES.
2. ALL SURFACE SOIL AND SHALLOW SUBSURFACE SOIL SAMPLES WERE COLLECTED AT A DEPTH OF LESS THAN 2 FEET BELOW GROUND SURFACE.
3. SURFACE SOIL SAMPLES SS6 THROUGH SS10 AND SHALLOW SUBSURFACE SOIL SAMPLES B-18 AND B-19 WERE COLLECTED AS PART OF THE PHASE II REMEDIAL INVESTIGATION.
4. ALL ANALYTE CONCENTRATIONS ARE IN MICROGRAMS PER KILOGRAM (UG/KG).

SCALE
20 10 0 20 FT.

SYMBOL	DESCRIPTIONS	DATE	APPROVED
	REVISIONS		

Prepared by
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DRAWN BY: LQ
CHECKED BY: PK
SUBMITTED BY: PDP

HEXAGON LABORATORIES SITE
City of New York
Bronx County, New York

PCB DISTRIBUTION – SURFACE SOIL

DATE: AUGUST 1999
SCALE: 1" = 20'
DRAWING NO.: 4-3

LEGEND

◐ BK, B	SOIL BORING
◐ MW	MONITORING WELL
☒ NPT-1	UST SUBSURFACE SOIL SAMPLE (TYP.)
	BUILDING EDGE
	HEXAGON PROPERTY LINE
	ADJOINING PROPERTY LINE
	CONTOUR LINE
	CONCRETE
	CONCRETE CURB
	EDGE OF MACADAM
	MASONRY STONE WALL
	CONCRETE WALL
	CONCRETE STEPS
	CHAIN LINK FENCE
	METAL STOCKADE FENCE
	LIGHT POLE
	PROPERTY OWNERSHIP INFORMATION (TYPICAL) (N/F=NOW OR FORMERLY, R=REEL, P=PAGE DEED REFERENCE)

NOTES:

1. ALL MONITORING WELL LOCATIONS AND BORING B-9, B-11, B-12, B-15, BK-1, BK-2, AND BK-3 LOCATIONS WERE SURVEYED BY YEC, INC.. ALL OTHER SAMPLING LOCATIONS ARE APPROXIMATE BASED ON TAMS FIELD NOTES.
2. ONE SAMPLE OF SOIL EXCAVATED FROM THE SOUTH YARD UST EXCAVATION WAS COLLECTED BY TAMS. THIS EXCAVATED SOIL SAMPLE, SYTEX-1, IS NOT INCLUDED IN THIS FIGURE FOR CLARITY PURPOSES.
3. ELEVEN SAMPLES OF SOIL EXCAVATED FROM THE SOUTH YARD UST EXCAVATION WERE COLLECTED BY TRADE-WINDS ENVIRONMENTAL RESTORATION, INC. OVER THE COURSE OF THE IRM. THESE SAMPLES (LD1-2-3, SYA, #1-2-3, SYS1, SYS2, AND SYS3) ARE NOT INCLUDED IN THIS FIGURE FOR CLARITY PURPOSES.
4. FOUR SAMPLES OF SOIL EXCAVATED FROM THE NEW PLANT UST EXCAVATION WERE COLLECTED BY TRADE-WINDS ENVIRONMENTAL RESTORATION, INC. OVER THE COURSE OF THE IRM. THESE SAMPLES (FOT#1, FOT#2, FO1, AND FO2) ARE NOT INCLUDED IN THIS FIGURE FOR CLARITY PURPOSES.
5. SYTC-1 IS A COMPOSITE IN-SITU SIDEWALL SAMPLE OF SYTN-1, SYTS-1, SYTE-1, AND SYTW-1.
6. SUBSURFACE SOIL SAMPLES B-17, B-20, AND B-21 WERE COLLECTED AS PART OF THE PHASE II REMEDIAL INVESTIGATION.
7. ALL ANALYTE CONCENTRATIONS ARE IN MICROGRAMS PER KILOGRAM (UG/KG).

SCALE
20 10 0 20 FT.

SYMBOL	DESCRIPTIONS	DATE	APPROVED
	REVISIONS		

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DESIGNED BY : PDP
DRAWN BY : LQ
CHECKED BY : PK
SUBMITTED BY : PDP

HEXAGON LABORATORIES SITE

City of New York
Bronx County, New York

SELECTED SEMI-VOLATILE ORGANIC COMPOUND DISTRIBUTION – SUBSURFACE SOIL

DATE : AUGUST 1999
SCALE : 1" = 20'
DRAWING NO. : 4-6

DEPTH	2'-4'	6'-8
ACETONE	290J	30J
CHLOROBENZENE	12J	2J
1,2-DICHLOROETHANE	65J	34J
TETRACHLOROETHENE	ND	5J
TRICHLOROETHENE	12J	9J
BTEX (TOTAL)	3,150J	93J
TOTAL TARGET VOCS	3,439J	180J
TOTAL TIC VOCS	13,270J	ND

DEPTH	2.2'-2.3
ACETONE	36
CHLOROBENZENE	ND
1,2-DICHLOROETHANE	ND
TETRACHLOROETHENE	18
TRICHLOROETHENE	ND
BTEX (TOTAL)	14J
TOTAL TARGET VOCS	77J
TOTAL TIC VOCS	461J

DEPTH	2.5'-4.5'
ACETONE	89J
CHLOROBENZENE	ND
1,2-DICHLOROETHANE	ND
TETRACHLOROETHENE	2J
TRICHLOROETHENE	9J
BTEX (TOTAL)	9J
TOTAL TARGET VOCS	130J
TOTAL TIC VOCS	4,169J

DEPTH	4'-6'	11'-13'
ACETONE	12J	30
CHLOROBENZENE	ND	3J
1,2-DICHLOROETHANE	34	24
TETRACHLOROETHENE	6J	ND
TRICHLOROETHENE	4J	0.9J
BTEX (TOTAL)	157J	ND
TOTAL TARGET VOCS	218J	67J
TOTAL TIC VOCS	24J	44J

DEPTH	2'-2.5'
ACETONE	240
CHLOROBENZENE	84
1,2-DICHLOROETHANE	ND
TETRACHLOROETHENE	ND
TRICHLOROETHENE	ND
BTEX (TOTAL)	850J
TOTAL TARGET VOCS	1,247J
TOTAL TIC VOCS	11,590J

DEPTH	0'-6'
ACETONE	ND
CHLOROBENZENE	2J
1,2-DICHLOROETHANE	ND
TETRACHLOROETHENE	ND
TRICHLOROETHENE	ND
BTEX (TOTAL)	70J
TOTAL TARGET VOCS	76J
TOTAL TIC VOCS	ND

DEPTH	2'-2.5'
ACETONE	140
CHLOROBENZENE	ND
1,2-DICHLOROETHANE	ND
TETRACHLOROETHENE	12J
TRICHLOROETHENE	ND
BTEX (TOTAL)	302
TOTAL TARGET VOCS	485J
TOTAL TIC VOCS	[illegible]

DEPTH	[illegible]
ACETONE	ND
CHLOROBENZENE	ND
1,2-DICHLOROETHANE	ND
TETRACHLOROETHENE	ND
TRICHLOROETHENE	ND
BTEX (TOTAL)	ND
TOTAL TARGET VOCS	ND
TOTAL TIC VOCS	ND

DEPTH	4'-5'
ACETONE	ND
CHLOROBENZENE	200,000J
1,2-DICHLOROETHANE	5,100,000DJN
TETRACHLOROETHENE	310,000J
TRICHLOROETHENE	880,000J
BTEX (TOTAL)	25,198,000J
TOTAL TARGET VOCS	32,311,000J
TOTAL TIC VOCS	919,000J

DEPTH	0'-6'
ACETONE	ND
CHLOROBENZENE	ND
1,2-DICHLOROETHANE	ND
TETRACHLOROETHENE	ND
TRICHLOROETHENE	ND
BTEX (TOTAL)	ND
TOTAL TARGET VOCS	ND
TOTAL TIC VOCS	24J

DEPTH	0'-6'
ACETONE	ND
CHLOROBENZENE	ND
1,2-DICHLOROETHANE	ND
TETRACHLOROETHENE	ND
TRICHLOROETHENE	ND
BTEX (TOTAL)	ND
TOTAL TARGET VOCS	ND
TOTAL TIC VOCS	ND

DEPTH	3'-3.5'
ACETONE	ND
CHLOROBENZENE	12,000
1,2-DICHLOROETHANE	38,000
TETRACHLOROETHENE	100,000
TRICHLOROETHENE	46,000
BTEX (TOTAL)	2,059,800J
TOTAL TARGET VOCS	2,256,630J
TOTAL TIC VOCS	194,100J

DEPTH	2'-4'
ACETONE	ND
CHLOROBENZENE	ND
1,2-DICHLOROETHANE	68,000J
TETRACHLOROETHENE	1,100,000
TRICHLOROETHENE	150,000
BTEX (TOTAL)	6,990,000
TOTAL TARGET VOCS	8,463,000J
TOTAL TIC VOCS	83,000J

DEPTH	6'-7'
ACETONE	ND
CHLOROBENZENE	25J
1,2-DICHLOROETHANE	ND
TETRACHLOROETHENE	ND
TRICHLOROETHENE	ND
BTEX (TOTAL)	281J
TOTAL TARGET VOCS	306J
TOTAL TIC VOCS	1,568J

DEPTH	4'-6'	8'-10'
ACETONE	250J	ND
CHLOROBENZENE	34J	400J
1,2-DICHLOROETHANE	36J	ND
TETRACHLOROETHENE	ND	ND
TRICHLOROETHENE	ND	ND
BTEX (TOTAL)	1,635J	5,200J
TOTAL TARGET VOCS	1,955J	6,170J
TOTAL TIC VOCS	71,500J	266,300J

DEPTH	2.5'-4.5'
ACETONE	2J
CHLOROBENZENE	ND
1,2-DICHLOROETHANE	ND
TETRACHLOROETHENE	ND
TRICHLOROETHENE	ND
BTEX (TOTAL)	ND
TOTAL TARGET VOCS	2J
TOTAL TIC VOCS	ND

DEPTH	2'-4'
ACETONE	4,700J
CHLOROBENZENE	ND
1,2-DICHLOROETHANE	ND
TETRACHLOROETHENE	ND
TRICHLOROETHENE	410J
BTEX (TOTAL)	607,000J
TOTAL TARGET VOCS	612,110J
TOTAL TIC VOCS	29,000J

DEPTH	5.5'-6'
ACETONE	65J
CHLOROBENZENE	ND
1,2-DICHLOROETHANE	130
TETRACHLOROETHENE	29J
TRICHLOROETHENE	30J
BTEX (TOTAL)	2,135J
TOTAL TARGET VOCS	2,389J
TOTAL TIC VOCS	79,500J

DEPTH	3'-3.5'
ACETONE	1,000J
CHLOROBENZENE	470J
1,2-DICHLOROETHANE	6,300
TETRACHLOROETHENE	440J
TRICHLOROETHENE	460J
BTEX (TOTAL)	63,260J
TOTAL TARGET VOCS	73,030J
TOTAL TIC VOCS	ND

DEPTH	2.5'-4.5'
ACETONE	ND
CHLOROBENZENE	75,000J
1,2-DICHLOROETHANE	ND
TETRACHLOROETHENE	1,700J
TRICHLOROETHENE	ND
BTEX (TOTAL)	132,600J
TOTAL TARGET VOCS	210,020J
TOTAL TIC VOCS	405,000J

DEPTH	2'-4'
ACETONE	38J
CHLOROBENZENE	ND
1,2-DICHLOROETHANE	30J
TETRACHLOROETHENE	51J
[illegible]	[illegible]
BTEX (TOTAL)	198J
TOTAL TARGET VOCS	378J
TOTAL TIC VOCS	43J

DEPTH	2'-4'
ACETONE	ND
CHLOROBENZENE	2,900J
1,2-DICHLOROETHANE	ND
TETRACHLOROETHENE	5,100J
TRICHLOROETHENE	840J
BTEX (TOTAL)	205,700J
TOTAL TARGET VOCS	214,540J
TOTAL TIC VOCS	73,600J

DEPTH	2.5'-4.5'
ACETONE	ND
CHLOROBENZENE	ND
1,2-DICHLOROETHANE	ND
TETRACHLOROETHENE	7,600J
TRICHLOROETHENE	ND
BTEX (TOTAL)	264,000J
TOTAL TARGET VOCS	271,600J
TOTAL TIC VOCS	ND

DEPTH	3'-3.5'
ACETONE	3,200J
CHLOROBENZENE	ND
1,2-DICHLOROETHANE	43,000
TETRACHLOROETHENE	12,000
TRICHLOROETHENE	12,000
BTEX (TOTAL)	2,722,800J
TOTAL TARGET VOCS	2,795,700J
TOTAL TIC VOCS	46,700J

DEPTH	2.5'-4.5'
ACETONE	4J
CHLOROBENZENE	ND
1,2-DICHLOROETHANE	36
TETRACHLOROETHENE	1J
TRICHLOROETHENE	0.9J
BTEX (TOTAL)	36J
TOTAL TARGET VOCS	78J
TOTAL TIC VOCS	21J

DEPTH	5.5'-6'
ACETONE	230J
CHLOROBENZENE	7J
1,2-DICHLOROETHANE	ND
TETRACHLOROETHENE	ND
TRICHLOROETHENE	ND
BTEX (TOTAL)	79J
TOTAL TARGET VOCS	338J
TOTAL TIC VOCS	7,380J

DEPTH	2.5'-4.5'
ACETONE	4J
CHLOROBENZENE	ND
1,2-DICHLOROETHANE	ND
TETRACHLOROETHENE	ND
TRICHLOROETHENE	ND
BTEX (TOTAL)	ND
TOTAL TARGET VOCS	4J
TOTAL TIC VOCS	ND

DEPTH	3'-3.5'
ACETONE	ND
CHLOROBENZENE	5,000J
1,2-DICHLOROETHANE	29,000
TETRACHLOROETHENE	690J
TRICHLOROETHENE	1,200J
BTEX (TOTAL)	1,988,000J
TOTAL TARGET VOCS	2,027,590J
TOTAL TIC VOCS	291,500J

DEPTH	2.5'-4.5'
ACETONE	ND
CHLOROBENZENE	ND
1,2-DICHLOROETHANE	ND
TETRACHLOROETHENE	ND
TRICHLOROETHENE	ND
BTEX (TOTAL)	320,000J
TOTAL TARGET VOCS	320,000J
TOTAL TIC VOCS	ND

DEPTH	2.5'-4.5'
ACETONE	9,200J
CHLOROBENZENE	10,000J
1,2-DICHLOROETHANE	5,000J
TETRACHLOROETHENE	5,900J
TRICHLOROETHENE	3,200J
BTEX (TOTAL)	227,160J
TOTAL TARGET VOCS	261,330J
TOTAL TIC VOCS	12,500J

LEGEND

◐ BK, B	SOIL BORING
◕ MW	MONITORING WELL
⧓ NPT-1	UST SUBSURFACE SOIL SAMPLE (TYP.)
	BUILDING EDGE
▬	HEXAGON PROPERTY LINE
	ADJOINING PROPERTY LINE
	CONTOUR LINE

CONCRETE
CONCRETE CURB
EDGE OF MACADAM
MASONRY STONE WALL
CONCRETE WALL
CONCRETE STEPS
CHAIN LINK FENCE
METAL STOCKADE FENCE
LIGHT POLE

PROPERTY OWNERSHIP INFORMATION (TYPICAL)
(N/F=NOW OR FORMERLY, R=REEL, P=PAGE
DEED REFERENCE)

NOTES:

1. ALL MONITORING WELL LOCATIONS AND BORING B-9, B-11, B-12, B-15, BK-1, BK-2, AND BK-3 LOCATIONS WERE SURVEYED BY YEC, INC.. ALL OTHER SAMPLING LOCATIONS ARE APPROXIMATE BASED ON TAMS FIELD NOTES.
2. ONE SAMPLE OF SOIL EXCAVATED FROM THE SOUTH YARD UST EXCAVATION WAS COLLECTED BY TAMS. THIS EXCAVATED SOIL SAMPLE, SYTEX-1, IS NOT INCLUDED IN THIS FIGURE FOR CLARITY PURPOSES.
3. ELEVEN SAMPLES OF SOIL EXCAVATED FROM THE SOUTH YARD UST EXCAVATION WERE COLLECTED BY TRADE-WINDS ENVIRONMENTAL RESTORATION, INC. OVER THE COURSE OF THE IRM. THESE SAMPLES (LD1-2-3, SYA, #1-2-3, SYS1, SYS2, AND SYS3) ARE NOT INCLUDED IN THIS FIGURE FOR CLARITY PURPOSES.
4. FOUR SAMPLES OF SOIL EXCAVATED FROM THE NEW PLANT UST EXCAVATION WERE COLLECTED BY TRADE-WINDS ENVIRONMENTAL RESTORATION, INC. OVER THE COURSE OF THE IRM. THESE SAMPLES (FOT#1, FOT#2, FO1, AND FO2) ARE NOT INCLUDED IN THIS FIGURE FOR CLARITY PURPOSES.
5. SUBSURFACE SOIL SAMPLES B-17, B-20, AND B-21 WERE COLLECTED AS PART OF THE PHASE II REMEDIAL INVESTIGATION.
6. ALL ANALYTE CONCENTRATIONS ARE IN MICROGRAMS PER KILOGRAM (UG/KG).

SCALE
20 10 0 20 FT.

SYMBOL	DESCRIPTIONS	DATE	APPROVED

REVISIONS

Prepared by
TAMS CONSULTANTS, Inc
The TAMS Building
655 Third Avenue, New York, New York

Prepared for
NEW YORK STATE DEPARTMENT
OF ENVIRONMENTAL CONSERVATION
50 Wolf Road
Albany, New York 12233

DESIGNED BY: PDP
DRAWN BY: LQ
CHECKED BY: PK
SUBMITTED BY: PDP

HEXAGON LABORATORIES SITE
City of New York
Bronx County, New York
SELECTED VOLATILE ORGANIC COMPOUND
DISTRIBUTION – SUBSURFACE SOIL

DATE: AUGUST 1999
SCALE: 1" = 20'
DRAWING NO: 4-5

DEPTH	2.5'-4.5'
BERYLLIUM	0.69
CHROMIUM	61.8
COPPER	196J
LEAD	455
MERCURY	0.07
THALLIUM	1.5
CYANIDE	ND

DEPTH	0'-6'
BERYLLIUM	ND
CHROMIUM	2.9J
COPPER	2.3
LEAD	1.4
MERCURY	0.07
THALLIUM	ND
CYANIDE	ND

DEPTH	2'-2.5'
BERYLLIUM	0.29
CHROMIUM	42.8J
COPPER	139J
LEAD	515J
MERCURY	0.23
THALLIUM	2.4
CYANIDE	ND

DEPTH	2'-4'	6'-8'
BERYLLIUM	0.56	0.47
CHROMIUM	56.6	56.4
COPPER	36.5	35.6
LEAD	121	41.6
MERCURY	0.29	ND
THALLIUM	ND	ND
CYANIDE	ND	ND

DEPTH	[illegible]
BERYLLIUM	ND
CHROMIUM	2.8J
COPPER	3.1
LEAD	3.3
MERCURY	0.56
THALLIUM	ND
CYANIDE	ND

DEPTH	0'-6'
BERYLLIUM	ND
CHROMIUM	3.8J
COPPER	2.5
LEAD	1.5
MERCURY	0.27
THALLIUM	ND
CYANIDE	ND

DEPTH	0'-6'
BERYLLIUM	ND
CHROMIUM	2.0J
COPPER	4.3
LEAD	2.8
MERCURY	ND
THALLIUM	ND
CYANIDE	ND

DEPTH	4'-5'
BERYLLIUM	ND
CHROMIUM	21.7
COPPER	10.6
LEAD	2.5
MERCURY	11.9
THALLIUM	ND
CYANIDE	ND

DEPTH	2.2'-2.3'
BERYLLIUM	0.38
CHROMIUM	47.8J
COPPER	125J
LEAD	3,850J
MERCURY	0.19
THALLIUM	2.3
CYANIDE	0.08

DEPTH	4'-6'	11'-13'
BERYLLIUM	0.54	0.74
CHROMIUM	62.7	78.3
COPPER	185J	52.1J
LEAD	182J	8.2J
MERCURY	0.28	0.04
THALLIUM	0.85	1.1
CYANIDE	ND	ND

DEPTH	2'-2.5'
BERYLLIUM	0.33
CHROMIUM	73.9J
COPPER	509J
LEAD	3,360J
MERCURY	0.78
THALLIUM	0.93
CYANIDE	0.27

DEPTH	5.5'-6'
BERYLLIUM	0.54
CHROMIUM	62.6
COPPER	28.5
LEAD	28
MERCURY	ND
THALLIUM	0.73
CYANIDE	ND

DEPTH	2'-4'
BERYLLIUM	0.56
CHROMIUM	174
COPPER	46.8
LEAD	4
MERCURY	0.06
THALLIUM	1.6
CYANIDE	ND

DEPTH	3'-3.5'
BERYLLIUM	0.49
CHROMIUM	56.6
COPPER	36.1J
LEAD	44.4J
MERCURY	0.78
THALLIUM	1
CYANIDE	ND

DEPTH	2'-4'
BERYLLIUM	0.49
CHROMIUM	162
COPPER	467
LEAD	23.4
MERCURY	0.63
THALLIUM	ND
CYANIDE	ND

DEPTH	3'-3.5'
BERYLLIUM	0.5
CHROMIUM	49
COPPER	95.3J
LEAD	8.5J
MERCURY	0.87
THALLIUM	1
CYANIDE	ND

DEPTH	3'-3.5'
BERYLLIUM	0.55
CHROMIUM	63
COPPER	44.6J
LEAD	49.4J
MERCURY	0.69
THALLIUM	0.93
CYANIDE	ND

DEPTH	2'-4
BERYLLIUM	ND
CHROMIUM	28.8J
COPPER	31.1J
LEAD	7.6J
MERCURY	0.16
THALLIUM	ND
CYANIDE	ND

DEPTH	6'-7'
BERYLLIUM	0.44
CHROMIUM	44.4
COPPER	16.7J
LEAD	0.69
MERCURY	ND
THALLIUM	1.2
CYANIDE	ND

DEPTH	4'-6	8'-10'
BERYLLIUM	0.62	0.52
CHROMIUM	63.1	63.7
COPPER	38	42.3
LEAD	32.6	2.8
MERCURY	0.16	ND
THALLIUM	0.42	ND
CYANIDE	ND	ND

DEPTH	[illegible]
BERYLLIUM	0.48
CHROMIUM	33.3
COPPER	45.1
LEAD	265
MERCURY	0.07
THALLIUM	ND
CYANIDE	ND

SYTC-1	
DEPTH	2.5'-4.5'
BERYLLIUM	0.31J
CHROMIUM	35.3
COPPER	55.5J
LEAD	44.8
MERCURY	4.1J
THALLIUM	ND
CYANIDE	1

DEPTH	2.5'-4.5'
BERYLLIUM	0.48
CHROMIUM	44.9
COPPER	151J
LEAD	180J
MERCURY	ND
THALLIUM	0.99
CYANIDE	ND

DEPTH	5.5'-6'
BERYLLIUM	0.79
CHROMIUM	88.9
COPPER	127
LEAD	410
MERCURY	4.2
THALLIUM	0.89
CYANIDE	ND

DEPTH	2.5'-4.5'
BERYLLIUM	0.45
CHROMIUM	42.4
COPPER	19.1J
LEAD	10.1
MERCURY	ND
THALLIUM	0.92
CYANIDE	ND

DEPTH	3'-3.5'
BERYLLIUM	0.66
CHROMIUM	48.3
COPPER	31.8J
LEAD	16.1J
MERCURY	ND
THALLIUM	0.96
CYANIDE	ND

DEPTH	2.5'-4.5'
BERYLLIUM	0.84
CHROMIUM	64.5
COPPER	33.5J
LEAD	8.1
MERCURY	ND
THALLIUM	1.3
CYANIDE	ND

LEGEND

◐ BK, B	SOIL BORING
⊕ MW	MONITORING WELL
☒ NPT-1	UST SUBSURFACE SOIL SAMPLE (TYP.)
	BUILDING EDGE
▬	HEXAGON PROPERTY LINE
	ADJOINING PROPERTY LINE
	CONTOUR LINE

CONCRETE
CONCRETE CURB
EDGE OF MACADAM
MASONRY STONE WALL
CONCRETE WALL
CONCRETE STEPS
CHAIN LINK FENCE
METAL STOCKADE FENCE
LIGHT POLE

PROPERTY OWNERSHIP INFORMATION (TYPICAL)
(N/F=NOW OR FORMERLY, R=REEL, P=PAGE
DEED REFERENCE)

NOTES:

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2. ONE SAMPLE OF SOIL EXCAVATED FROM THE SOUTH YARD UST EXCAVATION WAS COLLECTED BY TAMS. THIS EXCAVATED SOIL SAMPLE, SYTEX-1, IS NOT INCLUDED IN THIS FIGURE FOR CLARITY PURPOSES.
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5. SYTC-1 IS A COMPOSITE IN-SITU SIDEWALL SAMPLE OF SYTN-1, SYTS-1, SYTE-1, AND SYTW-1.
6. SUBSURFACE SOIL SAMPLES B-17, B-20, AND B-21 WERE COLLECTED AS PART OF THE PHASE II REMEDIAL INVESTIGATION.
7. ALL ANALYTE CONCENTRATIONS ARE IN MILLIGRAMS PER KILOGRAM (MG/KG).

SCALE
20 10 0 20 FT.

SYMBOL	DESCRIPTIONS	DATE	APPROVED

REVISIONS

Prepared by
TAMS CONSULTANTS, Inc
The TAMS Building
655 Third Avenue, New York, New York

Prepared for :
NEW YORK STATE DEPARTMENT
OF ENVIRONMENTAL CONSERVATION
50 Wolf Road
Albany, New York 12233

DESIGNED BY :
PDP

DRAWN BY :
LQ

CHECKED BY :
PK

SUBMITTED BY :
PDP

HEXAGON LABORATORIES SITE

City of New York
Bronx County, New York

SELECTED INORGANIC COMPOUND DISTRIBUTION – SUBSURFACE SOIL

DATE :
AUGUST 1999

SCALE :
1" = 20'

DRAWING NO. :
4-8

LEGEND

◐ BK, B	SOIL BORING
◑ MW	MONITORING WELL
⊠ NPT-1	UST SUBSURFACE SOIL SAMPLE (TYP.)
	BUILDING EDGE
━	HEXAGON PROPERTY LINE
	ADJOINING PROPERTY LINE
	CONTOUR LINE
	CONCRETE
	CONCRETE CURB
	EDGE OF MACADAM
	MASONRY STONE WALL
	CONCRETE WALL
	CONCRETE STEPS
	CHAIN LINK FENCE
	METAL STOCKADE FENCE
	LIGHT POLE

PROPERTY OWNERSHIP INFORMATION (TYPICAL)
(N/F=NOW OR FORMERLY, R=REEL, P=PAGE
DEED REFERENCE)

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7. ALL ANALYTE CONCENTRATIONS ARE IN MICROGRAMS PER KILOGRAM (UG/KG).

SCALE
20 10 0 20 FT.

SYMBOL	DESCRIPTIONS	DATE	APPROVED
	REVISIONS		

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655 Third Avenue, New York, New York

Prepared for :
NEW YORK STATE DEPARTMENT
OF ENVIRONMENTAL CONSERVATION
50 Wolf Road
Albany, New York 12233

HEXAGON LABORATORIES SITE

City of New York
Bronx County, New York

PCB DISTRIBUTION – SUBSURFACE SOIL

DESIGNED BY :	PDP
DRAWN BY :	LQ
CHECKED BY :	PK
SUBMITTED BY :	PDP
DATE :	AUGUST 1999
SCALE :	1" = 20'
DRAWING NO. :	4-7

MW-2

DATE	1/2/98	3/5/98
ACETONE	15J	4J
CHLOROBENZENE	450	460DJ
1,2-DICHLOROETHANE	ND	ND
TETRACHLOROETHENE	ND	ND
TRICHLOROETHENE	ND	1J
BTEX (TOTAL)	738J	461J
TOTAL TARGET VOCS	1,388J	1,088J
TOTAL TIC VOCS	496J	327J

MW-1

DATE	1/2/98	3/5/98
ACETONE	30	ND
CHLOROBENZENE	270	830J
1,2-DICHLOROETHANE	ND	ND
TETRACHLOROETHENE	ND	ND
TRICHLOROETHENE	ND	ND
BTEX (TOTAL)	102J	271J
TOTAL TARGET VOCS	465J	1,351J
TOTAL TIC VOCS	486J	ND

MW-3

DATE	1/2/98	3/5/98
ACETONE	14,000	2700J
CHLOROBENZENE	1,200	3600J
1,2-DICHLOROETHANE	1,800	5900J
TETRACHLOROETHENE	280J	7300J
TRICHLOROETHENE	280J	2600J
BTEX(TOTAL)	13,550J	1,680J
TOTAL TARGET VOCS	36,640J	5,509J
TOTAL TIC VOCS	700J	515J

MW-4

DATE	1/2/98	3/5/98
ACETONE	24,000J	10,000J
CHLOROBENZENE	3,900J	3,100J
1,2-DICHLOROETHANE	440,000	330,000DJ
TETRACHLOROETHENE	10,000J	9,500J
TRICHLOROETHENE	19,000J	17,000J
BTEX (TOTAL)	315,200J	315,800J
TOTAL TARGET VOCS	871,900J	734,500J
TOTAL TIC VOCS	48,000J	ND

MW-5

DATE	1/2/98	3/5/98
ACETONE	11,000	4,200J
CHLOROBENZENE	ND	210J
1,2-DICHLOROETHANE	ND	140J
TETRACHLOROETHENE	ND	ND
TRICHLOROETHENE	ND	ND
BTEX (TOTAL)	42,780J	47,310J
TOTAL TARGET VOCS	53,780J	51,860J
TOTAL TIC VOCS	ND	ND

MW-6

DATE	2/18/98	3/5/98
ACETONE	ND	ND
CHLOROBENZENE	2JN	4J
1,2-DICHLOROETHANE	3J	8J
TETRACHLOROETHENE	ND	1J
TRICHLOROETHENE	9J	26J
BTEX (TOTAL)	ND	2J
TOTAL TARGET VOCS	18J	54J
TOTAL TIC VOCS	57J	143J

LEGEND

- ● MW MONITORING WELL
- BUILDING EDGE
- ━ HEXAGON PROPERTY LINE
- ADJOINING PROPERTY LINE
- CONTOUR LINE
- CONCRETE
- CONCRETE CURB
- EDGE OF MACADAM
- MASONRY STONE WALL
- CONCRETE WALL
- CONCRETE STEPS
- CHAIN LINK FENCE
- METAL STOCKADE FENCE
- LIGHT POLE
- PROPERTY OWNERSHIP INFORMATION (TYPICAL) (N/F=NOW OR FORMERLY, R=REEL, P=PAGE DEED REFERENCE)

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SCALE
20 10 0 20 FT.

SYMBOL	DESCRIPTIONS	DATE	APPROVED

REVISIONS

Prepared by:
TAMS CONSULTANTS, Inc.
The TAMS Building
655 Third Avenue, New York, New York

Prepared for:
NEW YORK STATE DEPARTMENT
OF ENVIRONMENTAL CONSERVATION
50 Wolf Road
Albany, New York 12233

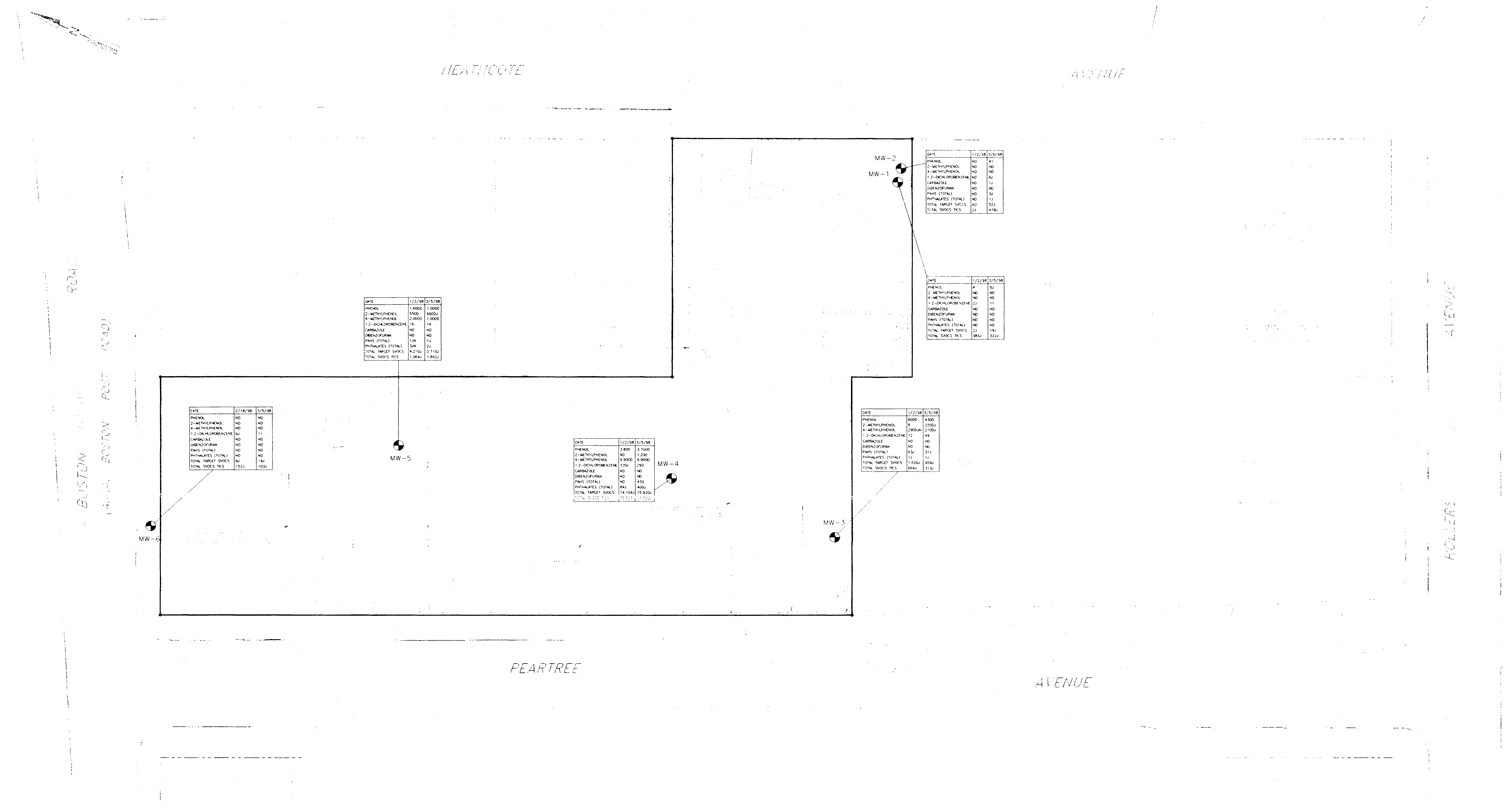
DESIGNED BY: PDP
DRAWN BY: LQ
CHECKED BY: PK
SUBMITTED BY: PDP

HEXAGON LABORATORIES SITE

City of New York
Bronx County, New York

SELECTED VOLATILE ORGANIC COMPOUND DISTRIBUTION – GROUNDWATER

DATE: AUGUST 1999
SCALE: 1" = 20'
DRAWING NO: 4-9



MW-2

DATE	1/2/98	3/5/98
PHENOL	ND	41
2-METHYLPHENOL	ND	ND
4-METHYLPHENOL	ND	ND
1,2-DICHLOROBENZENE	ND	6J
CARBAZOLE	ND	1J
DIBENZOFURAN	ND	ND
PAHS (TOTAL)	ND	3J
PHTHALATES (TOTAL)	ND	1J
TOTAL TARGET SVOCS	ND	52J
TOTAL SVOCS TICS	2J	478J

MW-1

DATE	1/2/98	3/5/98
PHENOL	R	5J
2-METHYLPHENOL	ND	ND
4-METHYLPHENOL	ND	ND
1,2-DICHLOROBENZENE	2J	11
CARBAZOLE	ND	ND
DIBENZOFURAN	ND	ND
PAHS (TOTAL)	ND	ND
PHTHALATES (TOTAL)	ND	ND
TOTAL TARGET SVOCS	2J	19J
TOTAL SVOCS TICS	383J	322J

MW-3

DATE	1/2/98	3/5/98
PHENOL	6000	4300
2-METHYLPHENOL	R	2200J
4-METHYLPHENOL	2900JN	2100J
1,2-DICHLOROBENZENE	72	49
CARBAZOLE	ND	ND
DIBENZOFURAN	ND	ND
PAHS (TOTAL)	63J	31J
PHTHALATES (TOTAL)	1J	1J
TOTAL TARGET SVOCS	1,026J	959J
TOTAL SVOCS TICS	664J	313J

MW-4

DATE	1/2/98	3/5/98
PHENOL	3,800	3,7000
2-METHYLPHENOL	ND	1,200
4-METHYLPHENOL	9,9000	9,9000
1,2-DICHLOROBENZENE	320J	290
CARBAZOLE	ND	ND
DIBENZOFURAN	ND	ND
PAHS (TOTAL)	ND	430
PHTHALATES (TOTAL)	84J	400J
TOTAL TARGET SVOCS	14,104J	15,920J
TOTAL SVOCS TICS	[illegible]	[illegible]

MW-5

DATE	1/2/98	3/5/98
PHENOL	1,600D	1,000D
2-METHYLPHENOL	550D	6600J
4-METHYLPHENOL	2,000D	1,000D
1,2-DICHLOROBENZENE	16	14
CARBAZOLE	ND	ND
DIBENZOFURAN	ND	ND
PAHS (TOTAL)	1JN	1J
PHTHALATES (TOTAL)	3JN	2J
TOTAL TARGET SVOCS	4,210J	2,710J
TOTAL SVOCS TICS	1,064J	1,862J

MW-6

DATE	2/18/98	3/5/98
PHENOL	ND	ND
2-METHYLPHENOL	ND	ND
4-METHYLPHENOL	ND	ND
1,2-DICHLOROBENZENE	6J	11
CARBAZOLE	ND	ND
DIBENZOFURAN	ND	ND
PAHS (TOTAL)	ND	ND
PHTHALATES (TOTAL)	ND	ND
TOTAL TARGET SVOCS	6J	14J
TOTAL SVOCS TICS	152J	103J

LEGEND

● MW	MONITORING WELL
	BUILDING EDGE
━━	HEXAGON PROPERTY LINE
	ADJOINING PROPERTY LINE
	CONTOUR LINE
	CONCRETE
	CONCRETE CURB
	EDGE OF MACADAM
	MASONRY STONE WALL
	CONCRETE WALL
	CONCRETE STEPS
	CHAIN LINK FENCE
	METAL STOCKADE FENCE
	LIGHT POLE
	PROPERTY OWNERSHIP INFORMATION (TYPICAL) (N/F=NOW OR FORMERLY, R=REEL, P=PAGE DEED REFERENCE)

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SCALE
20 10 0 20 FT.

SYMBOL	DESCRIPTIONS	DATE	APPROVED

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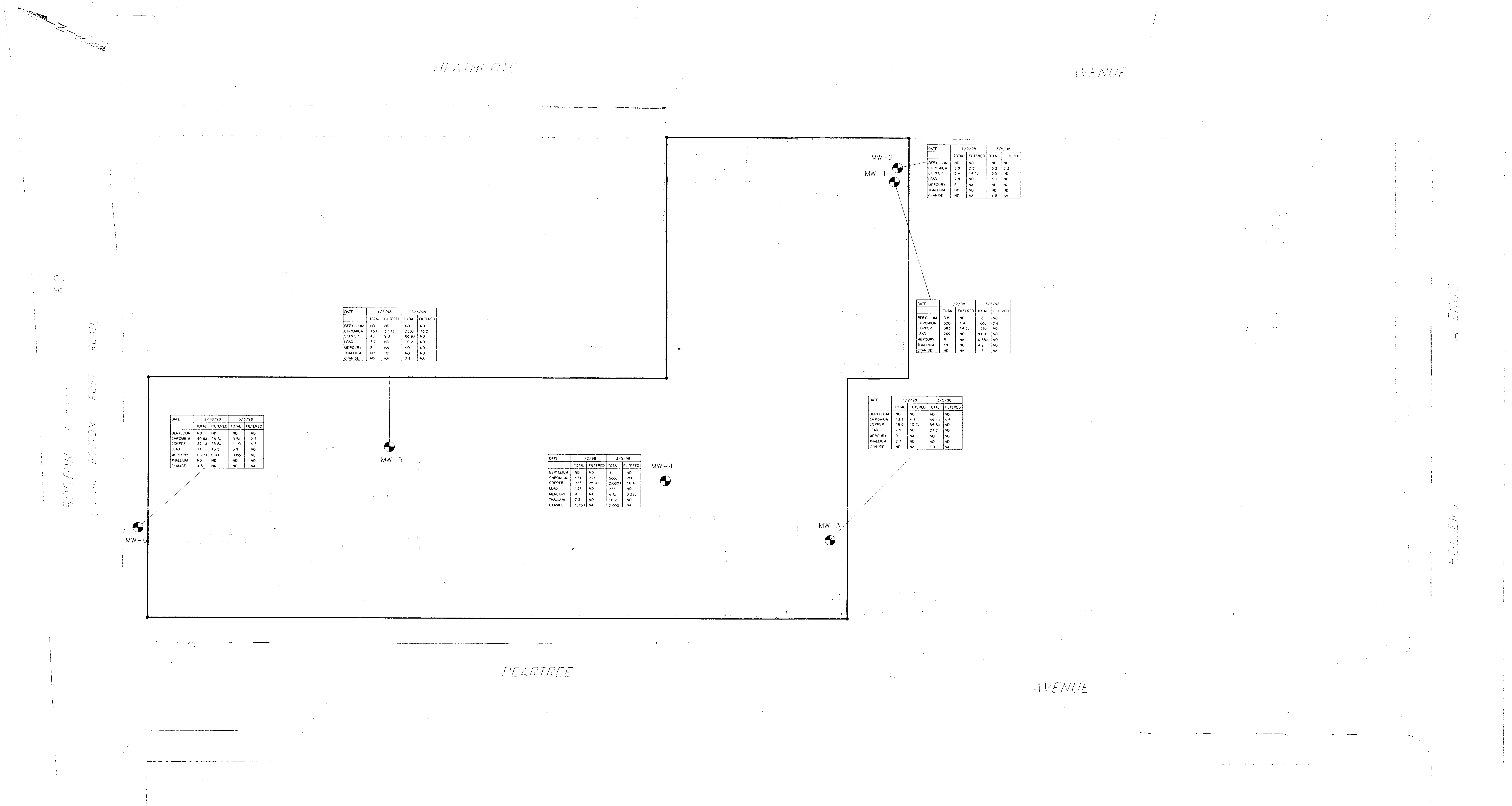
DRAWN BY: LQ
CHECKED BY: PK
SUBMITTED BY: PDP

HEXAGON LABORATORIES SITE

City of New York
Bronx County, New York

SELECTED SEMI-VOLATILE ORGANIC COMPOUND DISTRIBUTION – GROUNDWATER

DATE: AUGUST 1999
SCALE: 1" = 20'
DRAWING NO.: 4-10



DATE	1/2/98		3/5/98	
	TOTAL	FILTERED	TOTAL	FILTERED
BERYLLIUM	ND	ND	ND	ND
CHROMIUM	3.9	2.5	3.2	2.3
COPPER	5.4	14.1J	3.5	ND
LEAD	2.8	ND	5.1	ND
MERCURY	R	NA	ND	ND
THALLIUM	ND	ND	ND	ND
CYANIDE	ND	NA	1.8	NA

DATE	1/2/98		3/5/98	
	TOTAL	FILTERED	TOTAL	FILTERED
BERYLLIUM	3.8	ND	1.8	ND
CHROMIUM	320	1.4	106J	2.6
COPPER	383	14.2J	128J	ND
LEAD	269	ND	94.9	ND
MERCURY	R	NA	0.58J	ND
THALLIUM	19	ND	4.2	ND
CYANIDE	ND	NA	1.5	NA

DATE	1/2/98		3/5/98	
	TOTAL	FILTERED	TOTAL	FILTERED
BERYLLIUM	ND	ND	ND	ND
CHROMIUM	13.8	4.1	49.1J	4.5
COPPER	16.6	10.7J	55.8J	ND
LEAD	7.5	ND	27.2	ND
MERCURY	R	NA	ND	ND
THALLIUM	2.7	ND	ND	ND
CYANIDE	ND	NA	1.4	NA

DATE	1/2/98		3/5/98	
	TOTAL	FILTERED	TOTAL	FILTERED
BERYLLIUM	ND	ND	3	ND
CHROMIUM	424	221J	560J	200
COPPER	923	25.9J	2,080J	10.4
LEAD	131	ND	276	ND
MERCURY	R	NA	4.3J	0.29J
THALLIUM	7.2	ND	10.2	ND
CYANIDE	1,150	NA	2,000	NA

DATE	1/2/98		3/5/98	
	TOTAL	FILTERED	TOTAL	FILTERED
BERYLLIUM	ND	ND	ND	ND
CHROMIUM	160	57.7J	220J	76.2
COPPER	42	9.3	68.9J	ND
LEAD	3.7	ND	10.2	ND
MERCURY	R	NA	ND	ND
THALLIUM	ND	ND	ND	ND
CYANIDE	ND	NA	2.1	NA

DATE	2/18/98		3/5/98	
	TOTAL	FILTERED	TOTAL	FILTERED
BERYLLIUM	ND	ND	ND	ND
CHROMIUM	40.6J	36.3J	9.5J	2.7
COPPER	32.1J	35.8J	11.0J	4.3
LEAD	11.1	13.2	3.9	ND
MERCURY	0.27J	0.4J	0.88J	ND
THALLIUM	ND	ND	ND	ND
CYANIDE	4.5	NA	ND	NA

LEGEND

● MW	MONITORING WELL
	BUILDING EDGE
━━	HEXAGON PROPERTY LINE
	ADJOINING PROPERTY LINE
	CONTOUR LINE
	CONCRETE
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HEXAGON LABORATORIES SITE
City of New York
Bronx County, New York

SELECTED INORGANIC COMPOUND
DISTRIBUTION – GROUNDWATER

DATE : AUGUST 1999
SCALE : 1" = 20'
DRAWING NO. : 4-12

LEGEND

● MW MONITORING WELL
BUILDING EDGE
HEXAGON PROPERTY LINE
ADJOINING PROPERTY LINE
CONTOUR LINE

CONCRETE
CONCRETE CURB
EDGE OF MACADAM
MASONRY STONE WALL
CONCRETE WALL
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PCB DISTRIBUTION – GROUNDWATER

DATE: AUGUST 1999
SCALE: 1" = 20'
DRAWING NO: 4-11