REMEDIAL INVESTIGATION AT THE TIDEWATER SITE PAWTUCKET, RHODE ISLAND

VOLUME 1
TEXT, FIGURES, TABLES, APPENDICES A, B, C and D

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EXECUTIVE SUMMARY

Atlantic Environmental Services, Inc. (Atlantic) was retained by Blackstone Valley Electric Company (BVE) and Valley Gas Company (Valley Gas) to conduct a Remedial Investigation (R/I) of the former Tidewater manufactured gas plant (MGP) and electric power plant site (Tidewater site) in Pawtucket, Rhode Island, between July and September 1996. This investigation was performed in accordance with a Work Plan approved by the Rhode Island Department of Environmental Management (RIDEM). The investigation was designed to determine the presence and distribution of MGP-related residues, and the presence and distribution of other residues related to activities at the site, including electric power generation.

The Tidewater site is located in the city of Pawtucket, Rhode Island, on the western bank of the Seekonk River. The site is bounded to the north by undeveloped property of the Pawtucket Redevelopment Agency, to the east by the Seekonk River (flowing south), to the south by Pawtucket Parks and Recreation Department athletic fields, and to the west by the Francis J. Varieur elementary school and residential properties.

BVE currently operates an electrical substation on the property, including a building, transformer area and transmission towers/lines. Valley Gas operates a natural gas regulating and interchange station comprised of three buildings. Both BVE and Valley Gas properties are fully fenced. The remainder of the site is currently not used.

There are numerous structures and structural remnants clearly visible on the site. The subject site consists of the former electric power plant, known as the No. 1 Station, and former MGP, known as the Tidewater Gas Works.

In 1881, the Pawtucket Gas Company commenced building the Tidewater MGP at the site to manufacture gas for sale to industrial, commercial and residential customers in northern Rhode Island. The plant produced coal and water gas until 1954 when natural gas arrived via pipeline to Rhode Island. Thereafter, the plant produced oil gas for peak shaving purposes until 1968 when it was decommissioned. On the electric side of the facility, the No. 1 Station, also known as South Station power plant, was constructed in the early 1890s by the Pawtucket Electric Company. It generated power at that location until it was decommissioned in 1976 (historical records of BVG&E).

Beginning in 1907, the Tidewater Gas Works and the No. 1 Station were operated by Stone and Webster, Inc., Stone and Webster Management Consultants, Inc., and Stone and Webster Engineering Corporation (hereinafter referred to as Stone and Webster). Stone and Webster vastly expanded the No. 1 Station in 1907 and began making significant improvements to the Tidewater Gas Works and to the No. 1 Station (historical records of BVG&E).

The coal for the gasification process was stored alongside the river near the No. 1 Station, and the landfill area on the southern portion of the site received wastes from both facilities. Tar from the MGP was used as a fuel at the No. 1 Station from 1907 to 1950 and sold for recycling at various times through the life of the plant (Weston, 1987).

The 1902 Sanborn map provides a layout of the power plant and MGP, showing the various components of each plant. The power plant is visible as a single structure, while the MGP is comprised of two major structures: a retort house (presumably for coal carbonization), and a water gas plant. The Number 4 and 5 gas holders (240,000 cubic feet [cu ft] and 120,000 cu ft, respectively), a 133,000 gallon oil tank, purifiers, numerous tar tanks, and the common coal delivery and storage areas are also clearly visible. According to *Brown's Directory*, in 1905, the Tidewater Plant had installed a Lowe water gas process and by 1908 had six Gautier coal gas retort benches. MISSING "HISTORICAL RECORDS OF BVG & E"

In 1908, Stone & Webster incorporated Blackstone Valley Gas & Electric Company (BVE&G) in Maine and that company purchased the assets of the Pawtucket Gas Company and the Pawtucket Electric Company. Stone & Webster operated BVG&E and its subsidiaries until the plants were decommissioned (historical records of BVG&E).

In 1911, Stone & Webster built a gas pipeline to send manufactured gas to Woonsocket, and in 1915, built a new coal gas plant at the site (historical records of BVG&E). A 1919 engineering plan of the power plant identifies three mineral oil underground storage tanks (USTs) at the facility. The first tank (2,300-gallon capacity) is identified on the plan which depicts the tank located in the basement of the No. 1 Station turbine room building. The second tank (2,276-gallon capacity) is identified on a 1917 plan providing a layout of the No. 1 Station and the MGP. These two tanks have apparently been removed as subsequent investigations have not found any evidence of their existence. A third transformer oil tank (capacity unknown) was located in the existing active transformer substation southeast of the turbine room. This tank was closed in place in 1986 (Weston, 1987). Another UST, incorrectly labeled on the 1945 site plan as a storage shed, was discovered in 1995 by Valley Gas. It was removed in accordance with RIDEM regulations in July of 1995.

In 1921, *Brown's Directory* reported that a Glover West vertical coal gas system was installed at the MGP. A new carbureted water gas system was installed and modified in 1923 so that it could use either heavy or light fuel oil. The No. 1 Station changed its primary fuel from coal to oil in the early 1920s (Weston, 1987). The 1923 Sanborn map depicts two above ground oil storage tanks (Tanks 1 and 2, capacity of 28,500 barrels each) located south of the plant. Apparently these tanks were filled from a barge unloading area via buried inlet pipelines. Oil flowed from these tanks via buried pipelines to two underground 21,000-gallon concrete "service tanks" depicted on the Sanborn map northeast of the plant building. These two "service tanks" were closed in place in 1990 by Metcalf and Eddy, Inc. The oil was then fed from these tanks to

the plant's boilers. The 1923 Sanborn map indicates that the MGP had also expanded, with the addition of holder No. 7 (1 million cu ft), a machine shop building, an additional oil tank (150,000 gallons), and the addition of a governor house and meter house south of the 240,000 cu ft holder.

The 1949 Sanborn map indicates expansion of the power plant building and the addition of the substation. In addition, a third above ground oil storage tank (Tank 3, capacity of 28,500 barrels) had been added to the south of the power plant. The map indicates that the MGP had expanded onto present-day Lot 826. New structures at the MGP include gas holder No. 8 (3 million cu ft), six steel purifiers, a naphthalene tower, tar separators, a tar boiling tank, and a scrubber. The MGP was phased out of use in 1954, although the plant produced oil gas for peak shaving until 1968 (historical records of BVG&E). The No. 7 and No. 8 holders which currently remain at the site were used for the storage of natural gas until 1989, when components of the holders were partially dismantled (historical records of BVG&E).

In the early 1960s, Valley Gas acquired certain assets from BVE. As a result, Valley Gas acquired a portion of the Tidewater site (present-day Lots 662 and 826). The remainder of the site was owned by BVE (historical records of BVG&E).

In 1968, BVE sold lots 11, 644, 645, 646, 647, 648 and 649 to the city of Pawtucket. The Francis J. Varieur elementary school was built on a portion of this property circa 1970.

The No. 1 Station was decommissioned in 1976, after which time a number of structures on the site were demolished (Weston, 1987). Aerial photographs indicate that the three above ground oil storage tanks were demolished between 1975 and 1981. The facility was converted to its present configuration as an electric substation following the termination of electricity generation.

Five previous environmental investigations have been conducted with respect to the Tidewater site, including soil and air sampling, excavation of test pits, sediment sampling, geophysical surveying, and installation of five monitoring wells. The results of these investigations included the following:

- detection of total cyanide, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs) in the landfill area;
- air and soil samples taken from the school and city property revealed non-detects of compounds of interest;
- soils in the area of the former MGP were impacted with total cyanide and PAH compounds;

- soils in the area of the electric station were impacted with oils;

- PAHs, total cyanide, and PCBs were detected in the electric station property and the South Landfill Area;

- groundwater analysis in the area of the former underground oil tanks indicated the presence of volatile organic compounds (VOCs); and

- soil analysis from samples collected below a removed UST in the Gas Plant Area showed no detectable levels of TPH and low levels of VOCs.

The Blackstone River flows into the Seekonk River just north of the site. The Seekonk River, adjacent to the site, flows south to the Providence River and ultimately to the Atlantic Ocean via Narragansett Bay. Near the site, the river is located within the tidal influence of the Narragansett Bay system. A significant portion of the site is located within the 100-year floodplain of the Seekonk River.

The Seekonk River and the upstream Blackstone River have been greatly affected by heavy industrial land use over the last century. Historically, the Blackstone River has been used extensively for the supply of hydropower to industries along its banks. The Blackstone and Seekonk Rivers are still heavily used for water supply to industries and power generating facilities, and likely receive industrial discharges and municipal sewage discharges (Weston, 1987).

The site geology generally consists of 5 to 15 feet of fill material throughout the majority of the site overlying 10 to 30 feet of natural silts, sands and gravel. Bedrock was noted in seven of the borings at depths of 15 to 40 feet below grade. In the southern portion of the site, in the landfill area, the fill is approximately 10 to 35 feet thick, while the fill tapers off along the western boundary of the site. The school and city property consist mainly of natural or imported fill material.

Generally, the groundwater flows toward the Seekonk River at depths of 5 feet (elevation $2\pm$ feet) along the eastern edge of the site (Seekonk River) and at depths of over 20 feet (elevation $10\pm$ feet) along the western boundary of the site and on the school and city property.

The city of Pawtucket water supply is derived from four surface-water reservoirs and groundwater pumping wells located remotely from the site. Six private water-supply wells in Pawtucket have been identified; however, they are at least 1 mile west and northwest of the site (Weston, 1988). According to the RIDEM groundwater classification map dated June 30, 1993, the site is classified as a GB area. This means that the groundwater at this site may not be suitable for public or private drinking water without treatment due to known or presumed degradation.

The distance to the nearest GA area (water suitable for drinking, without treatment) is greater than 2 miles.

The riverbank inspection revealed details regarding the general construction and/or materials comprising the riverbank. The riverbank varies from a full bulkhead with steel and wood sheeting to a more natural riverbank with native soils and vegetation. Also noted were signs of impacts or residue migration. A summary of the observations noted during the riverbank survey include the following:

- no signs of residues/impacts were noted on the riverbank to the north of the site;
- a heavy sheen was noted on the water in the area of TSED-2. This sheen was observed on several occasions, and is located in the area of the former MGP;
- a weathered seep and weathered tar/asphalt were noted along the bulkhead south of TSED2; these areas are also in the area of the former MGP;
- no signs of impacts were noted along the central portion of the site along the area of the stone and timber bulkhead wall;
- minor sheening, slight odors and some iron staining were noted along the southern, more natural riverbank; and
- three wash-out areas were noted, two in the South Landfill Area and one near the power plant; significant movement of soils has occurred in these three areas.

The soil gas survey revealed that there were no MGP-related compounds detected in the areas surrounding the school. However, trace levels of trichloroethene (TCE) were detected. Subsequent indoor air monitoring was performed at five locations inside the school. All five samples were non-detect for TCE at a detection limit of 0.8 mg/m^3. This was the only compound analyzed in the indoor air samples.

The analytical data for all surface-soil, subsurface-soil, and groundwater samples collected were compared to regulatory criteria. Surface and subsurface data from the school and city property, and other off-site areas, were compared to the residential direct exposure criteria and the GB leachability criteria. Surface-soil samples collected within the limits of the BVE and Valley Gas properties were compared to the Industrial/Commercial direct exposure criteria and the GB leachability criteria, while the subsurface soils were compared to the GB leachability criteria. Groundwater was compared to the GB groundwater objectives.

In general, surface soils from all five Investigative Units (IUs) and the offsite properties exceeded the applicable criteria for the same compounds. These compounds include the heavier PAH compounds, arsenic, and lead. Beryllium exceeded the criteria only in the off-site properties and the school and city property, due to a lower standard. None of the surface soils collected during this program had levels of benzene, toluene, ethylbenzene, and xylenes (BTEX), total cyanide or PCBs above the applicable criteria.

There were no signs of impact detected in the school and city surface soils using visual, olfactory, and soil chemical analysis methods. The concentration of individual and total PAHs, arsenic, beryllium and lead in the school and city property surface soils and in the off-site background surface soils were comparable. Although these compounds were detected at concentrations exceeding the criteria, the data show that the concentrations of these compounds are no different from background surface soils and, as such, are not due to MGP or other site operations.

PAH concentrations for the school and city property surface soils were compared with regional New England urban soils recently reported in *Background Levels of Polycyclic Aromatic Hydrocarbons and Selected Metals in New England Urban Soils* (Bradley et al., 1994). The concentrations of individual PAHs measured in the school and city soils were found to be well within the range of values reported for the same compounds in Boston, Massachusetts, Providence, Rhode Island, and Springfield, Massachusetts urban areas.

The concentration of arsenic and lead in the surface soils of the No. 1 Station and North Landfill Areas was slightly higher than in all other areas, while the concentration of individual and total PAHs on the four IUs within the BVE/Valley Gas property was significantly higher than in the off-site and school and city properties. However, beryllium concentrations were similar in all three areas. In general, lead was not a concern as it only exceeded the criteria in three samples, including one sample from each of the following areas: off-site, school and city property, and the South Landfill Area.

There were no signs of impact detected in the school and city subsurface soils using visual, olfactory, photoionization detector (PID), and soil chemical analysis methods, with the exception that the edge of the South Landfill Area (MGP residue impacted fill) was identified at the eastern edge of Max Read Field (city of Pawtucket Parks and Recreation Department athletic field).

Within the site boundaries (BVE/Valley Gas properties), four distinct areas of subsurface impact have been identified. The area generally defined by the South Landfill Area consists of up to 35 feet of fill material. Strong tar and purifier odors, sheening, and free product tar were noted throughout. Soils within the areas near the former above ground oil tanks were impacted with oil and tar. Soils in the areas to the east and south of the No. 1 Station were impacted with

fuel oil, and soils in the area of the former MGP were impacted with tar; fuel oil impacts were noted in the southeastern corner of the former MGP.

BTEX compounds detected in six samples collected from site subsurface soils and from material within former MGP structures exceeded the GB Leachability criteria. These samples were taken from the gas plant area and the South Landfill Area. Elevated levels of PAHs, total cyanide and certain metals were detected throughout the site subsurface. PCBs were not detected in the site subsurface. Three samples were collected from subsurface soils for hazardous characteristics analysis, including toxicity characteristic leaching procedure (TCLP) methods. Two of the three samples exceeded the regulatory limit for one parameter. Both samples exceeded the limit of 0.5 mg/L for benzene. No other parameters exceeded the regulatory criteria. One sample was collected from material within the former tar well on the MGP site and one was collected from material from the South Landfill Area.

BTEX compounds were detected in five of the six sediment samples. PAHs and total cyanide were detected in all six samples. All six PCB samples were not detected.

Four of the groundwater samples collected on the BVE/Valley Gas properties exhibited some signs of visual or olfactory impacts. These samples detected concentrations of BTEX, PAHs and inorganics; however, they were below applicable GB groundwater objectives. These samples were collected from the Gas Plant, No. 1 Station and South Landfill. No samples were taken from the North Landfill. The upgradient well had no visual, olfactory or chemical impacts.

Although a variety of organic and inorganic compounds were detected at varying concentrations on site and off site, many of those found in significant levels at the site and within the BVE/Valley Gas property are associated with MGP and electric power generation processes (e.g., tar, purifier material and/or fuel oils). Residuals identified during the investigation include dense non-aqueous phase liquid (DNAPL) tar, light non-aqueous phase liquid (LNAPL) oil, purifier material, ash and clinker. The presence of heavily impacted soils is significant in that such zones may furnish a continual source of constituents to surrounding soils and groundwater.

Chemical constituents potentially could move through a variety of environmental media. At the Tidewater site, MGP residues and other chemicals of interest have been shown to be present in surface soils, subsurface soils, sediments, and groundwater. Migration of these chemicals may occur due to the following mechanisms: air, surface water, sediment conduits, subsurface soils, and groundwater.

Primary receptors of site-derived constituents include on-site workers such as employees or contractors working on the No. 1 Station and Valley Gas properties via direct contact with impacted surface soils or subsurface soils during on-site excavation activities. Recreational users of the Seekonk River may also be exposed to site-derived constituents which have reached the

river via surface runoff from impacted surface soils, active tar seeps, and/or impacted groundwater discharge. There are no direct receptors to impacted groundwater.

Several conclusions have been drawn based on the information gathered, and presented, in this report. They are as follows.

- The site geology consists of fill material overlying natural silts, sands, and gravel overlying bedrock. Generally, bedrock slopes, and groundwater flows, toward the Seekonk River.

- For the city and school property, it is noted that the far eastern end of Max Read Field is constructed over the South Landfill Area, where MGP residues were located below the surface. For the remainder of the city and school property, there were no MGP or power plant impacts. All constituents fall at or below natural background levels.

- The South Landfill Area contains fill material impacted with MGP residues, in excess of regulatory criteria. Impacts extend to depths approaching 30 feet below grade.

- Surface soils throughout the BVE and Valley Gas properties contained concentrations of compounds in excess of regulatory criteria.

- The area south of the No. 1 Station, in the area of the former above ground oil tanks, contains MGP- and fuel oil-impacted soils and fill.

- The area east of the No. 1 Station contains fuel oil impacted soil and fill.

- The Gas Plant area contains soil, fill and material within former subsurface structures, impacted with MGP residues, in excess of regulatory criteria. Impacts extend to depths approaching 35 feet below grade.

- Samples of material from each of the Gas Plant and South Landfill Areas were identified as RCRA characteristic hazardous waste, based on only one constituent (benzene). These samples were taken from the most highly impacted soils on site.

- Sediments/riverbank soils were collected which contained concentrations of compounds of concern. Sheens, tar odors, weathered tar seeps, and soil wash-out areas were noted along the riverbank.

- Impacted groundwater was found, but the concentrations do not exceed applicable regulatory criteria.

1.0 INTRODUCTION

1.1 Purpose of Report

Atlantic Environmental Services, Inc. (Atlantic) was retained by Blackstone Valley Electric Company (BVE) and Valley Gas Company (Valley Gas) to conduct a Remedial Investigation (R/I) of the former Tidewater manufactured gas plant (MGP), and electric power plant site (Tidewater site) in Pawtucket, Rhode Island. Atlantic prepared a Work Plan to conduct the R/I in accordance with the requirements of the state of Rhode Island Department of Environmental Management (RIDEM), Division of Site Remediation, Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases, Rule 8.0 (Remedial Investigations). Atlantic subsequently implemented the Work Plan with oversight by BVE, Valley Gas, and RIDEM. This report details the objectives, procedures, results and conclusions of the R/I.

The goal of the Tidewater R/I was to gain an understanding of the conditions at the site to determine:

- the presence and distribution of MGP-related residues; and
- the presence and distribution of other residues related to activities at the site, including electric power generation.

The scope of work for the R/I was designed to determine the approximate extent of impacts resulting from operation of the power plant and the MGP at the site. This effort was accomplished by evaluating the presence of potential organic and inorganic chemicals of concern in the surface and subsurface environment.

1.2 Site Background

This section provides a current description of the site, a summary of site historical use and ownership, and a brief outline of previous environmental work performed to date at the site.

1.2.1 Site Location and Description

The Tidewater site is located in the city of Pawtucket, Rhode Island, on the western bank of the Seekonk River (Figure 1-1). The site is bounded to the north by undeveloped property of the Pawtucket Redevelopment Agency, to the east by the Seekonk River (flowing south), to the south by Pawtucket Parks and Recreation Department athletic fields, and to the west by the Francis J. Varieur elementary school and residential properties. Plate 1 depicts the current configuration of the subject site. The site, for the purposes of this investigation, covers approximately 28 acres

and consists of three contiguous parcels of land owned by BVE (lots 645, 647, and 649, comprising 12 acres); two Valley Gas parcels (lots 662 and 826, comprising 8 acres); and four parcels owned by the city of Pawtucket (lots 11, 644, 646, 648, and 650, comprising 8 acres). Lot numbers are shown on Figure 2-1.

BVE currently operates an outdoor electrical substation on Lot 645. The substation facility comprises a single building and a fenced transformer area. Two electrical transmission towers are located near the river on the southern boundary of Lot 645, which support lines crossing the Seekonk River entering the substation. Valley Gas operates a natural gas regulating and interchange station on Lot 662. This facility comprises three buildings. Both BVE and Valley Gas properties are fully fenced. The city of Pawtucket Parks and Recreation Department uses the western portion of Lots 647 and 648 as a portion of Max Read Field. The remainder of the site is currently not used.

Site topography generally slopes toward the Seekonk River and varies from approximately 30 feet above mean sea level (MSL) at the site's western boundary, to approximately 8 feet above MSL near the river. Retaining walls associated with former structures are present at the site in various locations.

There are numerous structures and structural remnants clearly visible on the site. Structures remaining from the power plant include the former turbine building (currently being utilized as part of the electric substation) and two substations. Concrete remnants of the former boiler room building are visible at the surface, adjacent to the eastern side of the former turbine room building. Structures remaining from the former MGP include a 1 million cubic foot (cu ft) gas holder and a 3 million cu ft gas holder, associated governor and boiler houses, a machine shop building, a compressor and meter house building, and a gas plant office. Numerous other remnants of the MGP are visible, consisting mostly of concrete and brick foundations. These aspects include remnants of the gas plant, tar/oil storage tank bases, purifier base, and propane tank saddles.

1.2.2 Site History

This overview on the history of the Tidewater site was compiled from a review of historical records, city of Pawtucket tax maps, Sanborn Fire Insurance (Sanborn) maps (provided as Appendix A including (years 1890, 1902, 1923, 1949, and 1984), *Brown's Directory of American Gas Companies (Brown's Directory)*, and the following reports.

- *Work Study Plan, Remedial Investigation for Valley Gas Company, Pawtucket, Rhode Island.* R.I. Analytical Laboratories, Inc. with Goldberg-Zoino and Associates, Inc., December 1986.

- *Proposal for Preliminary Assessment at a Former Gas Plant Site*. Roy F. Weston, Inc. November 1986.

- *Investigations Work Plan for the Number 1 Station Site*. Roy F. Weston, Inc. August 1987.

- *Investigations at the Number 1 Station Site*. Roy F. Weston, Inc. May 1988.

- *Underground Storage Tank Closure Completion Report, Blackstone Valley Electric Company Number 1 Station, Thornton Street, Pawtucket, Rhode Island.* Metcalf and Eddy. May 1991.

- *Final Report, Site Inspection for Tidewater Coal Gasification Plant, Pawtucket, Rhode Island.* Rhode Island Department of Environmental Management. February 1993.

- *Closure Assessment Report, Underground Storage Tank Removal,* Valley Gas Company, Tidewater Street, Pawtucket, Rhode Island, E.R. Pickett Co., Inc. August 13, 1995.

In 1881, the Pawtucket Gas Company commenced building the Tidewater Manufactured Gas Plant at the site to manufacture gas for sale to industrial, commercial and residential customers in northern Rhode Island. The plant produced coal and water gas until 1954 when natural gas arrived via pipeline to Rhode Island. Thereafter, the plant produced oil gas for peak shaving purposes until 1968 when it was decommissioned. On the electric side of the facility, the No. 1 Station also known as South Station power plant was constructed in the early 1890s by the Pawtucket Electric Company. It generated power at that location until it was decommissioned in 1976 (historical records of BVG&E).

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1.2.3 Previous Investigations

Five previous environmental investigations have been conducted with respect to the Tidewater site.

- Soil and air sampling by RIDEM. This work was conducted from July through October 1986 and is detailed in the previously referenced report dated February 1993.

- Excavation of 11 test pits and soil sampling by Rhode Island Analytical Laboratories, Inc. with Goldberg-Zoino and Associates, Inc. This work was conducted in November 1986 and is detailed in the previously referenced report dated December 1986.

- Geophysical survey, excavation of 14 test pits and soil sampling, and sediment sampling by Roy F. Weston, Inc. This work was performed in October and November 1987 and is detailed in the previously referenced report dated May 1988.

- Closure of two oil USTs and installation of five groundwater monitoring wells by Metcalf and Eddy, Inc./Zecco, Inc. This work was performed in December 1990 and is detailed in the previously referenced report dated May 1991.

- Closure of one oil UST. This work was performed in July 1995 and is detailed in the previously referenced report dated August 13, 1995.

The following discussion presents a brief overview of these investigations. Sampling locations from these previous investigations are depicted in Figure 1-2. Details concerning each of these investigation programs are contained in the previous reports referenced in subsection 1.2.2.

In July of 1986, RIDEM investigated a complaint regarding an area south of the site. RIDEM representatives inspected the athletic fields and the woods near the Seekonk River, looking for evidence of coal gasification residues. In the southernmost portion of the site, RIDEM representatives apparently detected a heavy oily smell emanating from an area where the ground was stained and unvegetated. Blue-stained stones and cinder-like materials were observed in the area. In July of 1986 RIDEM collected 14 soil samples for chemical characterization in the southeastern and southwestern portions of the site (vicinity of the Francis J. Varieur School, the nursing home, and the baseball field), and on site in the southern portion in the area of the former landfill. Total cyanide and PAHs were detected in the landfill area. In two of eight on-site soil samples analyzed, low levels of PCBs were detected. Both samples were taken from the landfill area. Samples collected off site near the Francis J. Varieur School, the nursing home, and the baseball field, located southeast and southwest of the site, did not indicate the presence of elevated metals, PAHs, total cyanide, or PCBs. Table 1-1 presents a summary of this data.

In August of 1986, RIDEM conducted air sampling at the Francis J. Varieur School. Five locations at the school were chosen for sampling. The air samples were analyzed for acetylnaphthalene and naphthalene. Hydrogen cyanide concentrations of the air were measured by detector tubes. Analytical results of the samples had no indication of acetylnaphthalene or naphthalene, and no indication of hydrogen cyanide at any location in the school.

In November of 1986, a field investigation was conducted on the Valley Gas portion of the site by Goldberg-Zoino and Associates, Inc. The investigation consisted of the excavation of 11 test pits and soil sampling (Test pits labeled 1 through 11 in the area of the Gas Plant and North Landfill), as shown on Figure 1-2. Shallow geology consisted of wash-out deposits predominantly of coarse-to-fine sand with lesser concentrations of gravel and inorganic silt. Clay lenses were also noted at various locations. Groundwater was generally encountered from 8 to 10 feet below grade. Black-stained soils apparently impacted with MGP by-products were observed between depths of 0 to 10 feet. In proximity to test pits 4 and 5 (formerly the water gas production

operation area), blue-stained surficial soils were observed. Laboratory testing indicated that these soils were impacted with "ferrous cyanide" (*sic*) and PAHs. Tar materials were encountered in test pit 5, excavated to a depth of 3 feet, east of the former water gas plant. Analytical results from the investigation indicated the presence of total cyanide in soils up to 245 ppm, and total PAHs as high as 51,781 ppm. These samples were taken from test pits 4 and 5. Table 1-2 presents a summary of this analytical data.

In October and November of 1987, a field investigation was conducted on the BVE portion of the site by Roy F. Weston, Inc. The investigation consisted of a geophysical survey, the excavation of 14 test pits (TP-1 through TP-14), soil sampling, and the collection of three sediment samples (SS-1 through SS-3) in the area of the No. 1 Station, as shown on Figure 1-2.

Geophysical survey results indicated numerous magnetic anomalies on the site reported to be correlated with the foundation of the boiler room were due to the presence of rebar and other structural magnetic material. Test pits generally encountered fill material comprised of ash, cinders, wood chips, slag, and reworked native materials (silts, sands, and gravels). Groundwater was encountered between 5 and 14 feet below land surface. Apparent oil/petroleum residues were noted at varying degrees in test pits, and free-flowing oils were observed in test pit TP-2 located directly above the former oil service tanks northeast of the power plant.

Total cyanide was detected in most of the test pits, with the highest concentrations occurring in the landfill area. PAHs were detected in all of the test pits at varying depths. The same general pattern as noted previously for total cyanide is indicated by the results of the PAH analysis, in that the landfill area showed the highest concentrations. Two samples from TP-11, from the landfill, also revealed the only detections of PCBs during the investigation. The detected concentrations of PCBs were low at 5 ppm and 30 ppm. The sediment sample taken downgradient of the landfill (SS-1) contained PAHs and total cyanide while the sample taken downgradient of the oil storage tanks (SS-2) contained total cyanide, but no PAHs. A third sample (SS-3) collected near the former power plant contained no total cyanide, but did reveal PAH compounds. Table 1-3 presents a summary of this analytical data.

During December of 1990, Metcalf & Eddy (M&E)/Zecco, Inc. closed in place the two 21,000-gallon No. 6 oil USTs located northeast of the power plant. Residual materials contained within the tanks were excavated, the tank structures were cleaned, and the tanks were backfilled with soil. In conjunction with the closure, five shallow (maximum depth of 17 feet) groundwater monitoring wells were installed in the vicinity of these USTs, as shown on Figure 1-2. The results of groundwater analysis indicated the presence of volatile organic compounds (VOCs) in wells 1 and 5. Monitoring well 1 showed the highest level of impacts with VOCs and semivolatile organic compounds (SVOCs). No PCBs were detected in any wells. Table 1-4 presents this analytical data. This work was done with the approval, and under the observation, of RIDEM.

During July of 1995, E.R. Pickett Co., Inc. removed one 1,000-gallon gas/No. 2 fuel oil/mist UST located on the Valley Gas property, in the vicinity of the former machine shop. The tank was excavated, free liquids were removed, and the tank was transported offsite for final cleaning and eventual recycling at a scrap yard. Although the UST was found to be in poor condition, no evidence of a significant release of petroleum to the surrounding soil was found during the tank closure. No petroleum sheen was noted on the water within the excavation. Two soil samples were collected 2 feet below the tank. The samples were analyzed for TPH and VOCs (EPA Method 8260). No detectable levels of TPH were found in either of the two samples. Low levels of VOCs were detected at 1.9 mg/kg and 0.3 mg/kg, and are likely a result of past spillage during tank filling. Table 1-5 presents a summary of this analytical data.

1.3 Report Organization

Details of the activities associated with the R/I are discussed in Section 2.0. The site hydrology, geology, hydrogeology and land use are discussed in Section 3.0, Physical Characteristics of Study Area. A discussion of the findings of the investigation is presented in Section 4.0, Nature and Extent of Contamination. A discussion of the sources, pathways and receptors is provided in Section 5.0, Contaminant Fate and Transport, and Section 6.0 presents a summary and conclusions of the investigation.

Figures and tables are provided in separate sections at the end of this document. Appendix A provides Sanborn maps, Appendix B provides results of the indoor air monitoring, Appendix C summarizes the QA/QC results, and Appendix D contains the soil gas raw analytical data. Appendix E includes the raw analytical data for the soils, groundwater and sediment samples, and boring and test pit logs are provided as Appendices F and G, respectively.

2.0 REMEDIAL INVESTIGATION

The R/I was conducted in accordance with the Work Plan developed by Atlantic entitled *Remedial Investigation at the Tidewater Former MGP Site Pawtucket, Rhode Island, Work Plan*, dated April 11, 1996.

The Work Plan divided the Tidewater site into five Investigative Units (IUs), based upon the historical uses of the Tidewater site, available data from the previous investigation activities, and the potential future use/redevelopment. As illustrated in Figure 2-1, the five IUs of the site are:

- the School and City Area (Lots 644, 650, 646 and portions of Lot 648);
- the South Landfill Area (Lots 647, 649, and portions of Lot 648);
- the No.1 Station Area (Lot 645);
- the Gas Plant Area (Lot 662); and
- the North Landfill Area (Lot 826).

The overall field program consisted of 13 main tasks as follows.

- Site Inspection
- Surface water run-off analysis
- Soil Gas Survey
- Surface-Soil Sampling
- Test Pit Excavations
- Boring Installation
- Groundwater Monitoring Well Installation
- Groundwater Sampling
- Sediment Sampling
- Site Boundary, Topographic and Sampling Point Locations Surveys
- Off-site Surface-Soil Sampling
- Geophysical Survey
- Indoor Air Monitoring

These tasks are described in detail below.

2.1 Preparation for Site Investigation Activities

Prior to field mobilization, Atlantic contacted Dig-Safe Systems, Inc., Narragansett Bay Commission and the Pawtucket Sewer Department, BVE, and Valley Gas to arrange for the identification and mark-out of the locations of all underground utilities on the site. The locations of these utilities were field verified with representatives from BVE and Valley Gas prior to the initiation of subsurface sampling activities.

Atlantic subsequently initiated field mobilization which included the following elements:

- establishment of a decontamination area;
- establishment of a waste-storage area;
- identification of sampling locations and proximity to utilities;
- mobilization of heavy equipment to the site;
- evaluation of emergency procedures; and
- an on-site safety briefing.

2.1.1 Decontamination and Waste Storage Area

An equipment decontamination area was established at the site to decontaminate equipment and sampling apparatus. This consisted of a portable trough, wooden pallets, plastic sheeting and a steam cleaner, and was located immediately south of No. 1 Station. Heavily impacted equipment was steam cleaned in this decontamination area. Wastewater generated from the decontamination of heavily impacted drilling and sampling equipment was consolidated in steel 55-gallon drums. This area was also used as a waste storage area, whereby heavily impacted drill cuttings from drilling activities were drummed and stored.

In accordance with RIDEM regulations regarding Investigative Derived Wastes, the decontamination of all other drilling equipment (not heavily impacted), sampling equipment and personnel was performed as necessary at each sampling location except that decontamination of drilling equipment was not performed on the school and city property. In addition, all sampling equipment decontamination fluids and drill cuttings from the school and city property were containerized and stored in the Decontamination and Waste Storage Area discussed above.

2.1.2 Identify Sampling Locations

The proposed sampling locations were identified and field marked prior to commencement of the investigation. Several locations were modified based on comparison to underground and overhead utilities or access problems.

2.1.3 Safety Briefing

A Health and Safety Plan (HASP) was prepared for the Tidewater R/I. The HASP addressed the health and safety practices that were employed by all site workers participating in the site investigation.

Prior to the initiation of field activities, a safety briefing was conducted by the Atlantic Site Safety Officer (SSO) to review potential hazards, explain the HASP, obtain safety training and

medical records of on-site workers, and identify emergency procedures, specifically routes of emergency egress. As necessary, additional safety briefings were held. A copy of the site HASP, including emergency telephone numbers, was available in the Atlantic site vehicle at all times.

2.2 Field Investigations

The field investigations conducted during the Tidewater R/I included a site inspection, soil-gas survey, surface-soil sampling, test-pit excavations, drilling of test borings, collection of subsurface-soil samples, monitoring well installation and development, groundwater sampling, sediment sampling, site surveying, geophysical surveying, and air monitoring. Each component of the field program is described in detail in the following subsections. Figure 2-2 and Plate 2 depict the sampling locations.

Subcontractors to Atlantic that were utilized during the field investigation include B.L. Myers Brothers, Inc. of Belchertown, Massachusetts (drillers), META Environmental, Inc. of Watertown, Massachusetts (laboratory analysis of PAHs and BTEX via the microscale solvent extraction (MSE) method), Laboratory Resources, Inc. of Brooklyn, Connecticut (laboratory analysis of PAHs, BTEX, PCBs, metals and total cyanide via SW-846 methods), and Louis Federici and Associates, of Providence, Rhode Island (site surveying). In addition, the indoor air monitoring was performed by R.I. Analytical Laboratories, Inc. as a subcontractor to BVE and Valley Gas.

The SW-846 methods used include 8270 for PAHs, 8260 for BTEX, 8080 for PCBs, 6000/7000 series for metals (priority pollutant plus barium), and 9010, 9012 and 335.3 for total cyanide. Cyanide methods 9010 and 9012 were used for solids analysis and 335.3 was used for water analysis. All methods are based on the same methodology and all produce results indicative of total cyanide.

2.2.1 Site Inspection

An inspection was performed of all on-site manholes and drains. Four on-site catch basins were identified during this inspection. The covers could not be removed; therefore, a PID was not used. However, visual and olfactory inspections were performed.

An inspection of the bank of the Seekonk River was conducted along the entire eastern boundary of the site to visually screen for evidence of potential migration of site constituents into the Seekonk River. The inspection was accomplished from both the bank and from the river with a small boat. A videotape of this survey was also performed. Sediment samples were collected along the bulkhead and natural riverbank for screening via visual and field instrument methods (PID) for the presence of site residues.

2.2.2 Surface Water Run-off Analysis

A qualitative run-off survey was performed to identify areas of drainage and ponding. This site inspection was used in conjunction with the topographic mapping to provide a detailed analysis.

2.2.3 Soil-Gas Survey (Task 3)

A soil-gas survey was conducted as part of the investigation of the Francis J. Varieur School facility. The survey was conducted adjacent to the school building to ascertain whether the potential exists for the migration of vapors from the surrounding soils into the school. The survey consisted of 28 sampling points and is depicted in Figure 2-3.

Soil-gas samples were collected at a depth of approximately 3 to 4 feet below ground surface through the advancement of soil-gas sampling points (microwells) via a manually operated Geoprobe™ plunger bar. Temporary 0.25-inch diameter, polyethylene, soil gas sampling wells were installed into the holes generated by the slam bar, and a 1-inch thick clay collar was installed to seal the top of each well. Samples were collected upon completion of the purging of the microwells.

Soil-gas samples were analyzed in the field for BTEX using a Photovac 10S Plus portable gas chromatograph utilizing a SPCIL-5 column. Standards and blank samples (approximately 10 percent of the total samples) were also analyzed for quality assurance/quality control (QA/QC) purposes during the survey. The soil-gas survey was implemented in accordance with the Work Plan, except that additional points were installed. As such, the soil-gas survey was conducted in accordance with Atlantic Technical Procedure 1052, *Soil Gas Screening for Volatile Organics*.

2.2.4 Surface-Soil Sampling and Analysis

Surface-soil sampling and analysis at the Tidewater site was conducted in each of the five IUs at the site. Forty-five samples were collected within the five IUs. Plate 2 and Figure 2-2 depict the surface-soil sampling locations. Surface soil samples are identified on the figures with the prefix "SS"; however, for consistency with the laboratory reports, the analytical data table identifies the samples with the prefix "SS" or "TSS", as applicable. The information derived from the surface-soil sampling was collected to assess human health and ecological risks, as well as to identify potential hot spot areas for potential further investigation and/or remediation.

Surface-soil samples were collected throughout the duration of the site investigation program. Samples were collected with stainless-steel hand augers or with drill rig driven, split-spoon samplers. All surface-soil samples were collected from a depth of 0 to 2 feet, with the

exception of seven samples. Samples SS-14, SS-41, SS-19, SS-46, and SS-49 hit refusal at 1.5 to 1.8 feet. Samples SS-42 and SS-43 were collected of weathered tar and dried oily sludge material, respectively, observed on the ground surface. Upon collection, each sample was logged by Atlantic personnel for grain size, color, odor, and visual presence of MGP-related or other materials.

Surface-soil samples were analyzed for PAHs (via MSE methods), metals (13 priority pollutant metals plus barium), total cyanide, and PCBs (South Landfill Area only). A survey stake was installed in the location of each surface-soil sample and was measured for placement on sampling maps. All sampling locations were subsequently surveyed by Atlantic's subcontractors. With the exception of the collection of additional samples, the surface-soil sampling program was implemented in accordance with the Work Plan. As such, sample collection was in accordance with Atlantic Technical Procedure 1020, *Field Procedure for the Collection of Surface-Soil Samples*.

2.2.5 Test Pit Excavation and Subsurface Soil Sampling and Analysis

Test pit excavations were conducted at the former Tidewater site, in accordance with the Work Plan, to characterize landfill contents; to determine contents, depths, and integrity of subsurface structures; and to better assess potential impact of MGP residues to the Seekonk River. Twenty-three test pits were excavated at the locations depicted in Figure 2-2 and Plate 2, identified as TP-1 through TP-16, TP-3A, TP-8A, TP-8B, TP-9A, TP-10A, TP-11A, and TP-13A. Samples taken from the test pits are identified with the prefix "TTP" and a sample interval (i.e., 8-10) as a suffix. Test pits were excavated using a rubber-tired backhoe (Cat 480B) under the operation of an Occupational Safety and Health Administration (OSHA) trained heavy equipment operator.

During test pit excavations, Atlantic personnel logged the lithology of the soils, screened soils via visual and olfactory methods for the presence of tar materials or other impacts, and noted the location of any unusual debris and/or structural components encountered. If groundwater was encountered during test pit excavations, the depth to groundwater was measured, and the groundwater was screened via visual and olfactory methods. Test pit activities were videotaped for visual documentation of subsurface conditions encountered.

Clean excavated material was staged to one side of the test pit and contaminated material to the opposite side. When each test pit was completed, excavated soils were backfilled into the test pit in reverse order of removal. Each test pit was leveled to grade with the backhoe as soil conditions allowed. Atlantic marked and measured test pit locations and dimensions for placement on sampling maps.

One sample was collected from each test pit during excavation activities. Samples were collected from the most impacted soils or directly above the water table based upon field observations. Test pit soil samples were collected from the bucket of the excavator using dedicated sampling equipment. Test pit soil samples were analyzed for BTEX and PAHs (via MSE methods), 13 Priority Pollutant metals plus barium, and total cyanide (analysis for PCBs was included for samples collected in the South Landfill Area and No. 1 Station area where past investigations indicated their presence).

In addition, material characterization samples were obtained from three heavily impacted soils encountered during test pit operations. These were obtained from TP-2, TP-8B, and TP-13. These characterization samples were analyzed for Resource Conservation and Recovery Act (RCRA) hazard characterization parameters. These parameters include full TCLP, reactivity, ignitability, and corrosivity.

The test pitting program was implemented in accordance with the Work Plan and as such, sample collection equipment and quality control procedures during sampling were in accordance with those described in the QAPP and Atlantic Technical Procedure 1021, *Field Procedures for Collection of Subsurface Soils,* and the logging of soils was in accordance with Atlantic Technical Procedure 1031, *Field Procedure for Logging Subsurface Conditions in Test Pit Excavations*, with the following exceptions.

- Additional test pits were performed, in most cases to better define a subsurface structure.
- Soils were screened via visual and olfactory methods only, a PID was not used.
- Due to the nature of the site, plastic sheeting was not used to stage soils.
- Dedicated sampling equipment was used in lieu of decontaminated equipment. This eliminated potential cross-contamination.

2.2.6 Boring Installation

The boring program implemented at the Tidewater site had the following general objectives:

- determine the presence or absence of subsurface residuals from the former MGP or other operations;
- collect analytical samples to evaluate subsurface-soil quality and to chemically characterize MGP or other residues, if present;

- investigate areas where previous environmental work indicates subsurface-soil quality may be compromised such as the former landfill area and river bulkhead; and

- delineate stratigraphy and define geological/hydrological site conditions.

The above objectives were met through the advancement of 20 soil borings. This includes two additional borings installed to further delineate the edge of the South Landfill Area. The drilling locations are illustrated in Figure 2-2 and Plate 2, identified as B-1 through B-20. Samples taken from the borings are identified with the prefix "TB" and a sample interval (i.e., 8-10) as a suffix. Seven of the borings were completed as polyvinyl chloride (PVC) monitoring wells (B-6/MW-1, B-7/MW-2, B-12/MW-3, B-13/MW-4, B-14/MW-5, B-8/MW-6 and B-20/MW-7). Fifteen of the borings were advanced to approximately 20 to 25 feet, while four were advanced to a depth of 35 to 40 feet. One of the additional borings (TB-19) was advanced to 8 feet. In general, the borings were advanced deeper than the proposed depth of 20 feet, to better characterize the geology and limits of impact. All borings were grouted to the surface using cement bentonite grout, with the exception of B-6, B-7 and B-20. These borings were completed as monitoring wells 1, 2 and 7, respectively. It should be noted that monitoring wells 3, 4, 5 and 6 were installed approximately 10 feet from their respective borings. This was done because these borings were advanced well below the depth to where the wells would be installed.

Atlantic's drilling contractor utilized the hollow stem auger drilling method. Continuous split-spoon soil samples were collected for the entire depth of each boring for visual, olfactory, and instrument characterization (PID). For the school and city property, special attention was given to avoid damage to the running track and athletic fields. Plywood was laid down beneath the heavy equipment during travel and set up on the athletic fields. Decontamination and handling of drill cuttings was performed as discussed in subsection 2.1.1 (Decontamination and Waste Storage Area).

Subsurface-soil samples for laboratory analysis were collected to determine the presence or absence of MGP or other residues, and to chemically characterize obvious impacts during the investigation. A minimum of two analytical soil samples were collected from each boring. One soil sample was collected at the surface (0 to 2 feet) for inclusion in the surface-soil sampling program, while a subsurface-soil sample was collected from the most impacted interval or directly above the water table based on field observations and field instrument readings. In some borings (B-5, B-9, and B-13) an additional subsurface-soil sample was collected.

Subsurface-soil samples were analyzed for BTEX and PAHs (via MSE methods), 13 priority pollutant metals plus barium, and total cyanide. In addition, samples collected from borings B-4, B-5, and B-6 (South Landfill Area) were analyzed for PCBs.

With the exception of additional borings being installed, the boring program was implemented in accordance with the Work Plan. As such, the collection of subsurface-soil samples was in accordance with Atlantic Technical Procedure 1021, *Field Procedure for Collection of Subsurface Soils*.

2.2.7 Monitoring Well Installation

As discussed in the previous section, Atlantic installed seven monitoring wells at the Tidewater site. The initial scope of work was for six monitoring wells. However, as two of these wells did not produce any water, a seventh well was added. MW-2/TB-7 was grouted in place in accordance with Rhode Island well abandonment procedures, due to its location on the school property, while MW-5/TB-14 was left in place. The remaining five monitoring wells were used to determine groundwater flow direction and groundwater quality at the site. Monitoring well locations are represented on Figure 2-2 and Plate 2, identified as MW-1, MW-3, MW-4, MW-6 and MW-7.

Monitoring wells consisted of 2-inch PVC and were installed in accordance with *RIDEM, Rules and Regulations for Groundwater Quality* (June 1995), Appendix 1- Required Monitoring Well Construction Standards and Abandonment Procedures. Atlantic determined the specific location of each monitoring well screen in the field based on depth to water table and, if possible, consistency of the geologic unit.

In general, well construction consisted of the following:

- a 10-foot well screen was installed at various depths (14 to 25 feet);
- sand filter pack was placed around the well screen, extending 1 to 2 feet above the top of the screened section;
- a filter pack seal consisting of 1 foot of bentonite pellets was placed directly on top of the sand pack;
- an annular space seal of cement/bentonite grout was then tremied into the borehole around the PVC riser; and
- a surface seal consisting of cement concrete was formed that extended 40 inches below land surface, into which a steel locking protective cover pipe was set.

Well development was conducted on August 21, 1996, a minimum of seven days after the completion of all wells, to remove sediments from the well and to clear the filter pack around the well screen. Monitoring well development was in accordance with the Work Plan and was

accomplished by pumping and surging each well in accordance with Atlantic Technical Procedure 1070, *Well Development Procedures for Small Diameter Monitoring Wells*. Well development water was disposed of on site in the vicinity of each monitoring well.

2.2.8 Groundwater Sampling

Atlantic collected groundwater samples from the five new monitoring wells on September 4, 1996, 14 days after development, in accordance with the Work Plan. In addition to these wells, Atlantic collected one groundwater sample from Metcalf and Eddy/Zecco, Inc. monitoring well 1 (installed in 1990 in conjunction with the Metcalf and Eddy/Zecco, Inc. UST tank closure).

Prior to obtaining a sample from each well, the groundwater level in the well was measured to the nearest 0.01 foot using an electronic water level meter. Water level data obtained at the time of sampling was used to generate a water table contour map to determine groundwater flow direction at the site.

Following the measurement of the water levels and prior to collection of samples, an amount of water equal to approximately three to five well volumes was purged from each well. Purging was accomplished with a peristaltic pump, at a flow rate of 500 millimeters/minute (ml/min). During purging operations, the pH, temperature, and conductivity of the groundwater were monitored at the effluent side of the pump. At the conclusion of well purging, analytical samples were obtained from the well. The pump flow rate was reduced to 100 ml/min, and samples slated for PAH and inorganic analysis were obtained. Following collection of these samples, purge/sample tubing was removed from the well, and samples for volatile organic parameters were collected with a dedicated Teflon™ bailer.

Groundwater samples were analyzed for BTEX and PAHs (via MSE methods), 13 priority pollutant metals plus barium, and total cyanide.

2.2.9 Sediment Sampling

Sediment sampling and analysis at the Tidewater site was conducted along the riverbank adjacent to the site and across the river from the site. Figure 2-2 and Plate 2 depict the sediment sampling locations, identified as TSED-1 through TSED-6.

Sediment samples were collected on July 31, 1996. Samples were collected with stainless-steel hand augers. All sediment samples were taken from a depth of 0 to 6 inches. Upon collection, each sample was logged by Atlantic personnel based upon grain size, color, odor, and visual presence of MGP-related or other materials.

Sediment samples were analyzed for PAHs (via MSE methods), 13 priority pollutant metals (plus barium), total cyanide, and PCBs (South Landfill Area only). The relative location of each sampling point was measured for placement on sampling maps.

The sediment sampling program was implemented in accordance with the Work Plan. As such, sample collection was in accordance with Atlantic Technical Procedure 1020, *Field Procedure for the Collection of Surface-Soil Samples*.

2.2.10 Site Survey

Following the completion of field investigation activities, site boundary, topographic, and sampling location surveys were conducted by Louis Federici and Associates of North Providence, Rhode Island. The boundary survey is a Rhode Island Class 1 survey, and includes a delineation of site property boundaries, installation of iron pin markers, and development of a site boundary plan. The topographic survey is a Class III survey, while the sampling location survey is a Class 2 survey. All sampling locations were surveyed, except for the sediment samples and where noted as approximate.

2.2.11 Off-site Surface-Soil Sampling

Off-site surface-soil sampling and analysis was conducted at various locations throughout the immediate area to assess typical background conditions. Four surface-soil samples were collected within 1/4 mile of the site and one sample was collected approximately 2/3 mile of the site. Figure 2-4 depicts the off-site surface-soil sampling locations, identified as TSS-45 through TSS-49. The information derived from the off-site surface-soil sampling was collected to assess the typical background conditions relative to the Tidewater site.

Surface-soil samples were collected on September 5, 1996. Samples were collected with stainless-steel hand augers. All surface-soil samples were taken from a depth of 0 to 2 feet, with the exception of TSS-46 and TSS-49 which hit refusal at depths of 20 inches and 18 inches, respectively. Upon collection, each sample was logged by Atlantic personnel based upon grain size, color, odor, and visual presence of MGP-related materials.

This was an additional task from those specified in the Work Plan. However, sample collection procedures were in accordance with the Work Plan and, as such, samples were collected in accordance with Atlantic Technical Procedure 1020, *Field Procedure for the Collection of Surface Soil Samples*.

Surface soil samples were analyzed for PAHs (via MSE methods) and 13 priority pollutant metals (plus barium). The relative location of each sample was measured for placement on sampling maps.

2.2.12 Geophysical Survey

A geophysical survey was performed by Atlantic on August 7, 1996 using an EM-31. This survey was performed to help delineate the edge of landfill material identified in boring TB-18, located at the eastern end of Max Read Field.

2.2.13 Indoor Air Monitoring

Following an initial review of the soil gas survey data, it was determined that indoor air quality monitoring for TCE would be implemented at the Francis J. Varieur School.

The air monitoring program consisted of the collection of five samples inside the school on August 28, 1996. Sample locations included the cafeteria, the kindergarten classroom, the mechanical room, the library, and room 13. All five samples were non-detect for TCE at a detection limit of 0.8 mg/m^3.

This task was administered by BVE and VG. Samples were collected and analyzed by R.I. Analytical Laboratories, Inc., Warwick, Rhode Island. The results are provided as Appendix B.

2.3 Field Procedures

2.3.1 Equipment Decontamination

To prevent cross contamination of samples by sampling devices, all equipment used for sample collection and compositing was decontaminated before each use, in accordance with the Work Plan. As such, sampling equipment decontamination was conducted according to Atlantic Technical Procedure 1060, *Cleaning Procedure for Sampling Devices Used in Environmental Site Investigations,* outlined as follows:

- nonphosphate detergent and tap-water wash;
- tap-water rinse;
- 10 percent nitric acid rinse;
- triple distilled/deionized water rinse;
- methanol rinse;

- distilled/deionized water rinse; and
- air dry.

This decontamination procedure was used for all sample spoons, sample compositing bowls, and driller's split spoons. All sampling equipment was decontaminated at temporary stations set up at the sampling locations.

Appendix C includes data for QA/QC samples that were collected in association with equipment decontamination. Two types of samples were collected: equipment rinsate blanks and field blanks. Equipment rinsate blanks were obtained from the final analyte-free water rinse from sampling equipment decontamination. These samples ensure that sampling equipment decontamination is effective. Field blanks were obtained from unused decontamination rinse water and steam-cleaning source water to screen for the presence of constituents in the water used for sampling equipment decontamination.

2.3.2 Sample and Data Quality Assurance/Quality Control

Atlantic conducted field operations in accordance with the Quality Assurance Project Plan (QAPP). The QAPP describes the protocols and procedures that were followed during site investigation activities in detail. The protocols and procedures ensure that the site investigation is performed in a manner consistent with the data quality objectives established for the project. As referenced in the QAPP, Atlantic technical procedures were followed during collection of samples. QA/QC samples were also collected and analyzed to verify sample collection and management techniques.

Sample identification followed a standard system to allow samples to be tracked in field notes, chain-of-custody forms, and laboratory reports. The sample identification system was as follows:

Sample Designation	Meaning
TB7 (0-2)	Surface-soil sample taken at a boring
TB7 (6-8)	Subsurface-soil sample taken at a boring at the 6 to 8 foot interval
TTP1 (3-4)	Subsurface-soil sample collected at a test pit at the 3 to 4 foot interval
TSS-23 or SS-1	Surface-soil sample
MW-7	Monitoring well or groundwater sample
ER-1	Equipment rinsate sample
FB-DIWATER	Field blank using deionized water
TSED-1	Sediment/riverbank sample
TW-SG-1 or SG-1	Soil gas sampling location

Following the collection of samples, and prior to receipt of samples at the laboratory facility, Atlantic personnel managed samples in accordance with Atlantic Technical Procedure 1040, *Sample Preservation for Solid and Liquid Matrices*. Trip blanks accompanied the groundwater samples to the laboratory. These blanks indicate whether cross-contamination by VOCs has occurred during sample shipment.

2.3.3 Record Keeping and Documentation

A specific record keeping and site documentation plan was implemented at the Tidewater site. The following specific documents were incorporated into the record keeping procedure.

Document	Purpose
Site Field Logs	These logs are waterproof and were the principal document for recording field data.
Master Sample Log (MSL)	A page-numbered bound laboratory notebook to document every sample collected.
Chain-of-Custody Record	Triplicate form used to track possession of all samples from field to laboratory.
Waybills	Shipping form, used to maintain receipt of sample shipment.

2.3.4 Data Validation

Data validation was performed by Atlantic on all analytical results received from the laboratory to ensure that:

- data packages were complete;
- holding times have been met;
- blanks were reviewed;
- results were qualified if sample duplicates were not comparable; and
- generally, that the analytical data were complete, reliable, and of high quality.

Analytical summary tables include qualifiers resulting from the validation process. A data validation summary is provided in Appendix C.

3.0 PHYSICAL CHARACTERISTICS OF STUDY AREA

3.1 Surface Features/Hydrology

The Tidewater site is located in Pawtucket, Rhode Island on the western bank of the Seekonk River as shown on Figure 1-1. The topographic and surface features of the site are shown on Plate 1. All topographic information is based on the National Geodetic Vertical Datum (NGVD) 1929 vertical datum, referred to as MSL, while horizontal control is based on 1983 North American Datum (NAD). The site gently slopes toward the Seekonk River except along the western edge, where there is significant relief. The upgradient properties to the west are at elevation 35 to 40 MSL, while the remainder of the site is at elevation 5 to 20 MSL. Also of note are the former oil tank storage areas, where bermed/excavation areas were created for the tanks. Surface-water hydrology is generally consistent with the topography. The site generally drains via overland flow toward the river with no significant detention or conveyance features other than several catch basins and storm drains. Two wash-out areas were noted along the eastern edge of the South Landfill Area. These areas appear on the topographic map provided on Plate 1. A third wash-out area was noted along the river near the No. 1 Station. These areas have experienced significant erosion.

The Blackstone River flows into the Seekonk River just north of the site. The Seekonk River, adjacent to the site, flows south to the Providence River and ultimately to the Atlantic Ocean via Narragansett Bay. Near the site, the river is located within the tidal influence of the Narragansett Bay system. A significant portion of the site is located within the 100-year floodplain of the Seekonk River, as shown on Figure 3-1.

The Seekonk River and the upstream Blackstone River have been greatly affected by heavy industrial land use over the last century. Historically, the Blackstone River has been used extensively for the supply of hydropower to industries along its banks. The Blackstone and Seekonk Rivers are still heavily used for water supply to industries and power generating facilities, and likely receive industrial discharges and municipal sewage discharges (Weston, 1987).

According to the RIDEM Water Quality Regulations, Draft, dated March 1995, the surface-water classification of the adjacent Seekonk River is SB1(a). The SB1 designation means that this surface waterbody is sea water and has the following designated uses: secondary contact recreational activities; fish and wildlife habitat; migration of fish; and good aesthetic value. Primary contact recreation activities are impacted due to pathogens from approved wastewater discharges. The (a) designation means that this waterbody may be impacted by combined sewer overflows (CSO) due to storms that exceed the storm design flow of CSO abatement structures in accordance with approved CSO Facilities Plans and in compliance with the Rhode Island CSO

Policy. Therefore, primary contact recreational activities; shellfishing uses; and fish and wildlife habitat may be restricted during these overflow periods.

Flow information was not available for the Seekonk River. However, according to the United States Geological Survey (USGS) gaging station in Woonsocket, Rhode Island, the annual mean flow of the Blackstone River for the water years 1929-1995 was 772 cubic feet per second (cfs). It should be noted that this station is located 10 to 15 miles upstream of the site. According to the *1996 Eldridge Tide and Pilot Book*, the mean tidal range of Narragansett Bay in Pawtucket, Rhode Island is 4.5 feet. According to city of Pawtucket Zoning department, the 100-year flood elevation is 19 feet. This encompasses a majority of the eastern half of the site as shown on Figure 3-1.

3.2 Geology

Twenty borings were installed at the site. Most of the borings were advanced to 20 or 25 feet. The site geology generally consists of 5 to 15 feet of fill material throughout the majority of the site overlying 10 to 30 feet of natural silts, sands and gravel. Bedrock was noted in seven of the borings at depths of 15 to 40 feet below grade. Bedrock generally slopes toward the river.

In the southern portion of the site, in the landfill area, the fill is approximately 10 to 35 feet thick, while along the western boundary of the site the fill tapers off. The school and city property consists only of natural or imported fill material with the exception of the easternmost end of Max Read Field, where the edge of the South Landfill Area was identified. Figures 3-2 through 3-5 show typical cross-sections throughout the site. Cross-section locations are illustrated in Figure 3-6.

According to the *1994 Bedrock Geologic Map of Rhode Island*, the bedrock geology at the Tidewater site consists of the Rhode Island Formation. In northern Rhode Island, this formation consists of gray to black, fine- to coarse-grained quartz arsenite, litharenite, shale and conglomerate, with minor beds of anthracite and meta-anthracite. This description is generally consistent with the bedrock encountered during the investigation.

3.3 Hydrogeology

The five new monitoring wells installed as part of this investigation were used to collect groundwater elevation data. Table 3-1 shows the depths to water and the corresponding water-surface elevation. This information was collected on September 4, 1996. All new monitoring wells were surveyed for horizontal and vertical control. Other sources of water surface elevation information are also shown on Table 3-1. This information includes data from boring and test pit

logs. This secondary information was used in conjunction with site topography to help develop the groundwater surface contours shown on Figure 3-7.

Generally, the groundwater flows toward the Seekonk River at depths of 5 feet (elevation 2±) along the eastern edge of the site (Seekonk River) and at depths of over 20 feet (elevation 10±) along the western boundary of the site and on the school and city property. Figures 3-2 through 3-5 show typical cross sections of the site and the approximate elevation of the groundwater surface.

The city of Pawtucket water supply is derived from four surface-water reservoirs and groundwater pumping wells located remotely from the site. Six private water-supply wells in Pawtucket have been identified; however, they are at least 1 mile west and northwest of the site (Weston, 1988). According to the RIDEM map of Wellhead Protection Areas, dated February 1993, there are no wellhead protection areas within 2 miles of the site.

According to the RIDEM groundwater classification map dated June 30, 1993, the site is classified as a GB area. This means that the groundwater at this site may not be suitable for public or private drinking water without treatment due to known or presumed degradation. The distance to the nearest GA area (water suitable for drinking, without treatment) is greater than 2 miles.

3.4 Demography and Land Use

Currently, the Tidewater site is classified as Industrial Open (MO) under zoning laws of the city of Pawtucket. The site is bordered by the Seekonk River to the east and developed land to the west and south. The parcel to the north of the site is currently vacant land, but was formerly owned by the Newell Coal and Lumber Company. It is currently owned by the Pawtucket Redevelopment Authority. To the south and southwest of the site are the Francis J. Varieur Elementary School, a nursing home and the city of Pawtucket Parks and Recreation Department athletic fields (Max Read Field). To the west of the site are residential properties. The surrounding neighborhoods are zoned as Residential or Commercial General.

According to Mr. Rick Enser of the RIDEM Natural Heritage Program, there are no endangered or threatened species in the area.

4.0 NATURE AND EXTENT OF CONTAMINATION

4.1 Site Inspection

An inspection was performed of all on-site manholes and drains. Only four catch basins were identified on site during this inspection. Visual and olfactory inspection did not reveal any signs of impact. A number of manholes were identified, most of which were for electric utilities.

A qualitative run-off survey was performed and used in conjunction with the topographic survey to develop Figure 3-1, which shows site drainage patterns. The site has significant topographic features, but generally slopes eastward toward the Seekonk River. The site surface consists largely of vegetation and gravel. Some broken-up pavement exists in the area of the No. 1 Station. Run-off is generally by overland flow; however, several catch basins exist in the area of the No. 1 Station.

The riverbank inspection revealed details regarding the general construction and/or materials comprising the riverbank. Also noted were any signs of impacts or residue migration. The observations noted during the riverbank survey are provided on Figure 3-1 and include the following.

- No signs of residues/impacts were noted on the riverbank to the north of the site.
- A heavy sheen was noted on the water in the area of TSED-2. This sheen was observed on several occasions, and is located in the area of the former MGP.
- A weathered seep and weathered tar/asphalt were noted along the bulkhead south of TSED-2; these areas are also in the area of the former MGP.
- No signs of impacts were noted along the central portion of the site along the area of the stone and timber bulkhead wall.
- Minor sheening, slight odors and some iron staining were noted along the southern, more natural riverbank.
- Three wash-out areas were noted, two in the South Landfill Area and one near the power plant; significant movement of soils has occurred in these three areas.

4.2 Soil-Gas Survey

Twenty-eight soil-gas sampling points were installed at the locations shown on Figure 2-3. Soil-gas samples were collected and analyzed from each point. Table 4-1 presents results of this survey. Appendix D contains the raw analytical data. There were no BTEX compounds detected. Two samples, TW-SG-22 and TW-SG-25, indicated possible low levels of TCE. Subsequent resampling and reanalysis confirmed the presence of this non-target analyte. TCE is a common cleaning solvent and is not used in MGP processes. The existence of TCE was likely due to maintenance activities at the school and was not due to operations at the former MGP.

4.3 Indoor Air Monitoring

The air monitoring program consisted of the collection of five samples inside the school on August 28, 1996. Sample locations included the cafeteria, the kindergarten classroom, the mechanical room, the library, and room 13. Results of the indoor air monitoring program indicate that TCE vapors are not present within the school. All five samples were non-detect for TCE at a detection limit of 0.8 mg/m^3. The results are provided as Appendix B.

4.4 Surface-Soil Sampling

Surface soils were investigated to characterize the distribution of surficial impacts on the BVE/Valley Gas property and the school and city property. Impacted surface soils are of particular concern due to their potential impacts on human health through dermal, inhalation, and/or ingestion routes of exposure. Constituents related to MGP activities and other potential site compounds such as PCBs were evaluated. Characterization of local background soils was also performed to compare local surface-soil chemistry conditions to site conditions.

Tables 4-2 through 4-7 provide the results of surface-soil analyses and Appendix E contains the raw analytical data. Plate 3 and Figure 2-4 present a summary of the surficial soil data and include, specifically, a general summary of the compounds analyzed, results, and whether the compounds exceeded the applicable criteria. The surface soils were analyzed for VOCs, PAHs, metals and total cyanide. Samples collected in the South Landfill Area were also analyzed for PCBs. Analyses of samples collected off site did not include total cyanide. Also, although BTEX compounds were not specified for analysis, some data were reported and, as such, are presented in the tables.

The analytical data for all surface-soil samples collected were compared to regulatory criteria. Surface soil data from the school and city property and other off-site areas were compared to the residential direct exposure criteria and the GB leachability criteria. Surface-soil samples collected within the limits of the BVE and Valley Gas properties were compared to the Industrial/Commercial direct exposure criteria and the GB leachability criteria, as shown on Figure 4-1.

4.4.1 Off-site Property

Five surface-soil samples were taken off site, in the general area of Pawtucket as shown on Figure 2-4. Table 4-2 and Figures 4-2 through 4-6 present the analytical data. All five samples were analyzed for BTEX, PAHs and metals. None of the samples exceeded the residential direct exposure criteria for BTEX (all five were non-detect). Four of the five samples had one or more exceedances of the criteria for PAHs. The values for total PAHs ranged from 0.87 to 14.9 ppm. All five samples exceeded the criteria for arsenic and beryllium and one exceeded the criteria for lead. All other metals values were reported below the residential direct exposure criteria.

4.4.2 School and City Property

A total of 23 surface-soil samples were collected within the limits of the property owned by the Francis J. Varieur School and the city of Pawtucket Parks and Recreation Department athletic field. Table 4-3 and Figures 4-2 through 4-6 present the analytical data. Of the 13 samples which were analyzed for BTEX compounds, all were non-detect with the exception of SS-13 (TSS-13) which had trace levels of BTEX, but was still below the residential direct exposure criteria. All 23 samples were analyzed for PAHs, metals and total cyanide.

Analytical results were compared to the residential direct exposure criteria and the GB Leachability criteria. Nineteen of the 23 samples had one or more exceedances of the criteria for PAHs. The values for total PAHs ranged from non-detect to 38.65 ppm. All 23 samples exceeded the criteria for arsenic, 15 exceeded the criteria for beryllium, and one exceeded the criteria for lead. All other metals and total cyanide reported values below the criteria. PCBs were analyzed in two samples, both of which were non-detect.

4.4.3 BVE/Valley Gas Property

Twenty-two surface-soil samples were taken within the limits of the property owned by BVE and Valley Gas. A discussion of the results within each IU is provided below.

South Landfill Area. Six surface-soil samples were taken within the limits of the South Landfill area. Table 4-4 and Figures 4-7 through 4-11 present the analytical data. All six samples were analyzed for PAHs, metals and total cyanide. None of the three samples where BTEX was reported exceeded the criteria for BTEX. All six samples had one or more exceedances of the industrial direct exposure criteria for PAHs. The values for total PAHs ranged from 6.66 ppm to 1948 ppm. Three of the six samples exceeded the criteria for arsenic, and one exceeded the criteria for lead. All other metals and total cyanide have values below the industrial direct exposure criteria. PCBs were analyzed in three samples, all of which were non-detect.

No. 1 Station Area. Five surface-soil samples were taken within the limits of the No. 1 Station Area. Table 4-5 and Figures 4-7 through 4-11 present the analytical data. All five samples were analyzed for PAHs, metals and total cyanide. The one sample where BTEX was reported did not exceed the criteria for BTEX. Four of the five samples had one or more exceedances of the industrial direct exposure criteria for PAHs. The values for total PAHs ranged from 9.08 ppm to 203.7 ppm. All five samples exceeded the criteria for arsenic. All other metals and total cyanide have values below the industrial direct exposure criteria. PCBs were not selected for analysis in the surface soils in this area

Gas Plant Area. Six surface-soil samples were taken within the limits of the Gas Plant Area. Table 4-6 and Figures 4-7 through 4-11 present the analytical data. All six samples were analyzed for PAHs, metals and total cyanide. None of the two samples where BTEX was reported exceeded the criteria for BTEX. All six samples had one or more exceedances of the industrial direct exposure criteria for PAHs. The values for total PAHs ranged from 13.62 ppm to 510.59 ppm. Five of the six samples exceeded the criteria for arsenic. All other metals and total cyanide have values below the industrial direct exposure criteria. PCBs were not selected for analysis in the surface soils in this area.

North Landfill Area. Five surface-soil samples were taken within the limits of the North Landfill Area. Table 4-7 and Figures 4-7 through 4-11 present the analytical data. All five samples were analyzed for PAHs, metals and total cyanide. None of the two samples where BTEX was reported exceeded the criteria for BTEX. All five samples had one or more exceedances of the industrial direct exposure criteria for PAHs. The values for total PAHs ranged from 27 ppm to 8418 ppm. Four of the five samples exceeded the criteria for arsenic. All other metals and total cyanide have values below the industrial direct exposure criteria. PCBs were not selected for analysis in the surface soils in this area.

4.4.4 Discussion

In summary, none of the surface soils collected during this program had levels of BTEX, total cyanide or PCBs above the applicable criteria. In general, surface soils from all six areas discussed above (off-site properties, school and city property, South Landfill, No. 1 Station, Gas Plant and North Landfill) exceeded the applicable criteria for the same compounds. These compounds include the heavier PAH compounds, arsenic, and lead. Beryllium exceeded the criteria only in the off-site properties and the school and city property.

The concentration of individual and total PAHs, arsenic, beryllium and lead in the school and city property soils and in the off-site background soils were comparable. Although these compounds were detected at concentrations exceeding the criteria at these concentrations, the data

show that the concentrations of these compounds are no different from background soils and as such, are not due to MGP or other site operations.

PAH concentrations for the school and city property surface soils were compared with regional New England urban soils recently reported in *Background Levels of Polycyclic Aromatic Hydrocarbons and Selected Metals in New England Urban Soils* (Bradley et al., 1994). The concentrations of individual PAHs measured in the school and city soils were found to be well within the range of values reported for the same compounds in Boston, Massachusetts, Providence, Rhode Island, and Springfield, Massachusetts urban areas.

The concentration of arsenic and lead in the No. 1 Station and North Landfill Areas was slightly higher than in the other areas, while the concentration of individual and total PAHs on the four IUs within the BVE/Valley Gas property was significantly higher than in the other areas. However, beryllium concentrations were similar in all areas. In general, lead was not a concern as it only exceeded the criteria in three samples, including one sample from each of the following areas: off-site, school and city property, and the South Landfill Area. The following table shows the average concentrations of compounds of concern by IU.

	Average Concentration (ppm)						
			BVE/Valley Gas				
Compound	Off Site	School and City	South Landfill	No. 1 Station	Gas Plant	North Landfill	Total
Total PAHs	6.42	9.73	797	123.5	235.4	1762	710
Arsenic	4.1	3.6	5.2	12.5	6.5	14.3	9.3
Beryllium	0.62	0.39	0.23	0.41	0.59	0.27	0.39
Lead	81	70.1	183	136.4	82.5	76	121

4.5 Subsurface Soils

The presence of MGP residues and oil impacts in the site subsurface was identified during this investigation. This included the implementation of a soil boring and test pit program. The following sections discuss the subsurface soils based on their general location, not necessarily in how the information was obtained. As such, the subsurface soils are discussed separately for the school and city property and the BVE/Valley Gas property. The BVE/Valley Gas property is further divided into subsurface soils within each IU and tar seep/MGP structure materials. Boring and test pit logs are provided as Appendices F and G, respectively. Figures 3-2 through 3-5 show typical cross-sections of the property, and Plate 4 summarizes the lithology and visual impacts noted in each boring and test pit.

Subsurface soils were collected to characterize the distribution of constituents in the subsurface of the BVE/Valley Gas property and the school and city property. Tables 4-8 through 4-12 provide the results of subsurface-soil analyses and Appendix E contains the raw analytical data. Plate 5 presents a summary of the subsurface-soil data and includes, specifically, a general summary of the compounds analyzed, results, and whether the compounds exceeded the applicable criteria. In general, subsurface soils were analyzed for BTEX, PAHs, metals and total cyanide. However, samples collected in the South Landfill Area were also analyzed for PCBs.

The analytical data for all subsurface-soil samples collected were compared to regulatory criteria. Subsurface-soil data from the school and city property were compared to the residential direct exposure criteria and the GB leachability criteria. Subsurface-soil samples collected within the limits of the BVE and Valley Gas properties were compared to the GB leachability criteria.

4.5.1 School and City Property

Six borings were drilled on the school and city property. Table 4-8 and Figures 4-12 through 4-17 present the analytical data.

In general, the site geology of this area consists of native soils, including a well-graded material (sand to cobbles) over a stratified fine sand/silt layer. Bedrock was encountered below the sand/silt layer in two of the borings.

In general, there were no signs of subsurface-soil impacts via visual, olfactory or PID methods. However, one of the borings (B18) was drilled through the edge of the South Landfill Area. This boring, located at the eastern boundary of the city property, penetrated over 30 feet of fill material similar to the fill material identified on the BVE/Valley Gas property. Although this material did not contain visible liquid tars or oils, it did possess some moderate to strong odors from 4 to 15 feet below grade.

Subsequent investigations using geophysics provided a better definition of the edge of the landfill material, initially defined by the installation of borings B-1, B-18 and B-19. The approximate boundary of the landfill material based on the borings and the geophysical survey is shown on Figure 4-18.

Six subsurface-soil samples were taken within the boundaries of the school and city property and analyzed for BTEX, PAHs, metals and total cyanide. None of the samples exceeded the criteria for BTEX and only one sample exceeded the criteria for PAHs. This sample, collected from B-18 (TB18 8-10) was taken of the visually impacted fill material located at the eastern end of Max Read Field and had a total PAH concentration of 4011 ppm.

All six samples exceeded the criteria for arsenic, while two exceeded the criteria for beryllium. All other metals detected were below the residential direct exposure criteria. Total cyanide exceeded the criteria in one sample (TB18 8-10). With the exception of the sample from the fill material (TB18 8-10), the subsurface soils in the school and city property had concentrations of the analyzed compounds similar to the off-site surface-soil samples.

4.5.2 BVE/Valley Gas Property

Subsurface investigations included the installation of soil borings and test pits throughout the BVE/Valley Gas property. The following sections discuss results of the investigation program.

4.5.2.1 Subsurface Soils

Fourteen borings and 11 test pits were installed throughout the BVE/Valley Gas property. In general, the geology of the site consists of fill material over silt, sand and gravel over bedrock. Fill is thickest in the South Landfill Area where 35 feet of fill was noted, but it is generally 10 to 15 feet over much of the eastern half of the site. The fill appears to taper off toward the western side of the site. Bedrock was encountered in three of the borings. A description of the visual and chemical characteristics of the subsurface soils identified within each IU of the BVE/Valley Gas property is provided below.

A summary of visual and olfactory impacts is depicted on Plate 4. This information is based on all available boring and test pit information collected to date, including this investigation and previous investigations.

South Landfill Area. The South Landfill Area consists of up to 35 feet of MGP residual impacted fill material. Strong tar and purifier odors, sheening, free product tar and/or purifier woodchips were noted throughout the landfill area at depths approaching 30 feet. Impacts appear to be consistent throughout the areas tested. However, impacts appear to be less in the northern portion of the landfill area. Figure 3-5 shows subsurface-soil impacts in this area

Six subsurface-soil samples were collected from subsurface soils within the limits of the South Landfill. Table 4-9 and Figures 4-12 through 4-17 present the analytical data. Four of these samples were taken from borings while the remaining two were taken from test pits. All samples were analyzed for BTEX, PAHs, metals, total cyanide and PCBs. BTEX compounds were detected in all six samples. However, only one sample exceeded the GB Leachability criteria for BTEX compounds. The values for total PAHs ranged from 18 ppm to 23,000 ppm. Total cyanide values ranged from 18 ppm to 120 ppm. PCBs were not detected in any of the six samples collected.

No. 1 Station Area. Borings and test pits installed in this area exhibited oil and tar impacts. The limits of oil impacts extend along the eastern and southern portions of the No. 1 Station area. Tar impacts were identified, in addition to oil impacts, in the southern portion of the No. 1 Station. Oil impacts include odors (oil, fuel, petroleum), sheening and free product oil, while tar impacts include tar odors, sheening, and/or free product tar. There were no distinct sources in this area; however, there were widespread impacts. A sample from TP-5 contained the highest total BTEX and total PAH concentration of the nine subsurface-soil samples taken by Atlantic in this area. Although boring information is limited, it appears that visual impacts are limited to the top 10 feet of fill.

Nine subsurface-soil samples were collected from subsurface soils within the limits of the No. 1 Station. Table 4-10 and Figures 4-12 through 4-17 present the analytical data. Four of these samples were taken from borings while the remaining five were taken from test pits. All samples were analyzed for BTEX, PAHs, metals, and total cyanide, and the test pit samples were analyzed for PCBs. BTEX compounds were detected in all nine samples. However, none of the samples exceeded the GB Leachability criteria for BTEX compounds. The values for total PAHs ranged from 42 ppm to 7,177 ppm. Total cyanide values ranged from 1.4 ppm to 350 ppm. PCBs were not detected in any of the five samples collected.

Gas Plant Area. Borings and test pits installed in this area exhibited a tar odor. Some free product tar was noted at depths up to 34 feet. The limits of tar impacts extend throughout the former gas plant area and into a portion of the North Landfill Area. Tar impacts include tar odors, sheening and/or free product tar. The areas of greatest impacts generally focus around the structures, in particular the No. 4 relief holder and the tar well, in addition to areas around the former water gas plant and the tar handling structures. Oil impacts were observed in the southeastern portion of the Gas Plant Area. Figure 3-3 shows subsurface-soil impacts in the Gas Plant Area.

Eight subsurface-soil samples were collected from subsurface soils within the limits of the Gas Plant Area. Table 4-11 and Figures 4-12 through 4-17 present the analytical data. Five of these samples were taken from borings while the remaining three were taken from test pits. All samples were analyzed for BTEX, PAHs, metals, and total cyanide. BTEX compounds were detected in six of the eight samples. However, only two samples exceeded the GB Leachability criteria for BTEX compounds. The values for total PAHs ranged from ND to 33,799 ppm. Total cyanide values ranged from ND to 130 ppm.

North Landfill Area. Very little visual or olfactory evidence of impacts was noted in this area. A burnt odor and small tar globules were noted in one boring at 15 feet. Figure 3-2 shows subsurface-soil impacts in the North Landfill Area.

Four subsurface-soil samples were collected from subsurface soils within the limits of the North Landfill. Table 4-12 and Figures 4-12 through 4-17 present the analytical data. Three of these samples were taken from borings while the remaining sample was taken from a test pit. All samples were analyzed for BTEX, PAHs, metals, and total cyanide. BTEX compounds were detected at low concentrations in three of the four samples. None of the samples exceeded the GB Leachability criteria for BTEX compounds. The values for total PAHs ranged from 6.65 ppm to 18.92 ppm. Total cyanide values ranged from ND to 48 ppm.

4.5.2.2 Tar Seep/MGP Structure Material

Six samples were taken from material within former MGP structures and from a tar seep on the BVE/Valley Gas property. Table 4-13 and Figures 4-12 through 4-17 present the analytical data. A description of these samples is provided in the table below.

TAR SEEP/MGP STRUCTURE MATERIAL DESCRIPTIONS

Sample Location	Sample ID	Description
SS-44	TSS44	Pure hardened tar product seeping out of the bank in the large wash-out area, located in the southeastern corner of the South Landfill Area.
TP-8B	TTP8B (8-9)	Heavily impacted sample of material from just outside of a former pit gas holder.
TP-9	TTP9 (8-9)	Sample collected of visibly clean material from inside a purifier foundation.
TP-10	TTP10 (11-12)	Sample collected from inside a former pit gas holder.
TP-11	TTP11 (6-7)	Sample collected from the area of the former tar dehydration tanks.
TP-13	TTP13 (3-4)	Heavily impacted material collected from inside the former tar well.

All samples were analyzed for BTEX, PAHs, metals and total cyanide. BTEX compounds exceeded the criteria (GB Leachability) in four of the samples. These samples were taken from test pits TP-8B, TP-11, and TP-13, which were located within former gas plant structures.

4.5.2.3 Samples Analyzed for Hazardous Characteristics

Three samples were also analyzed via the TCLP method as shown on Table 4-14. These samples were collected from the worst-case material encountered on the site. This included samples from the pit gas holder (TTP8B [8-9]), the tar well (TTP13 [3-4]) and the South Landfill Area (TTP2 [1-2]). Two of these samples exceeded the regulatory limit for benzene. One sample was from material within the former tar well on the MGP site and one was collected from material from the South Landfill Area. No other compounds exceeded the TCLP limit. In addition, the other tests for determining hazardous characteristics (namely reactivity, ignitability, and corrosiveness) showed that none of the samples failed.

4.6 Sediment Samples

Six sediment/riverbank samples were collected; five were collected adjacent to the site and one was collected immediately across the river from the site. Table 4-15 and Figure 4-19 present the analytical data. Raw analytical data is provided in Appendix E. The table below describes the material encountered at each sampling location.

SEDIMENT SAMPLE MATERIAL DESCRIPTIONS	
Sample ID	**Description**
TSED1	Collected along riprap wall. Fine to medium brown sand, some silt and gravel. No odor.
TSED2	Collected along rock/debris wall in the area where a sheen was noted. Fine to medium sand to gravel with clinker. Tar odor.
TSED3	Collected from sediment material. Tan/black fine to medium sand, slight benthic odor.
TSED4	Collected from sediment material. Tan, orange and black/gray fine to coarse sand. Slight tar odor, sheen on water.
TSED5	Collected from sediment material. Tan, brown and gray silt to coarse sand, some brick and roots. Slight tar/benthic odor.
TSED6	Collected from sediment material along opposite riverbank. Brown medium sand with fine to coarse gravel, trace fines. Slight marsh/marine odor.

These samples were analyzed for BTEX, PAHs, metals, total cyanide, and PCBs. BTEX compounds were detected in five of the six samples with total BTEX concentrations of 0.28 to 18.85 ppm. PAHs were detected in all six samples with total PAH values of 20 to 3,354 ppm. Total cyanide values, ranged from 0.34 to 49 ppm. All six PCB samples were not detected.

4.7 Groundwater Sampling

Six groundwater samples were taken from the site. Table 4-16 and Figure 4-20 present the analytical data. Raw analytical data is provided in Appendix E. Four of the wells are located along the downgradient boundary (eastern) of the site, one well (MW-7) is located upgradient of the site, and one well (MW-M&E 1) is located near the former oil tanks. The table below describes the water samples collected at each well.

GROUNDWATER SAMPLE DESCRIPTIONS	
Sample ID	**Description**
MW-1	Water was clear. Strong petroleum odor. Tar noted on bailer and tubing.
MW-3	Water was clear. Strong petroleum odor and sheen noted.
MW-4	Water was black in color with strong tar odor. Thick tar product at bottom of well. Floating product noted.
MW-6	Water was yellow. Strong petroleum odor noted.
MW-7	Water was clear. No odors noted.
MW- M&E 1	Water was clear. No odors noted.

VOCs and PAH compounds were detected in MW-1, MW-3, MW-4 and MW-6. The analytical data for all groundwater samples collected were compared to the GB groundwater objectives. None of the samples exceeded the GB groundwater criteria for any of the compounds tested. This included BTEX, PAHs, metals, and total cyanide. It should be noted that the GB groundwater criteria is limited to BTEX compounds; no criteria is given for PAHs, metals or total cyanide.

5.0 CONTAMINANT FATE AND TRANSPORT

This section provides an analysis of the data presented in previous sections to provide an interpretation of the interaction between physical and chemical processes which characterize impacted areas at the Tidewater site. The analysis takes into account the physical characteristics and surroundings in the site and study area, the interaction of the surface and groundwater hydrology, the historical development of the site's industrial operations, the nature of the chemical compounds encountered during the sampling and analysis program, and any apparent trends in the distribution of these materials on or adjacent to the site. This information is used to evaluate potential pathways of migration and exposure routes to potential receptors. A clear understanding of these issues will lead to designing effective remedial actions that protect human health and the environment at the site.

5.1 Fate and Transport Characteristics

Several chemical compounds were identified during the investigation. In general, the identified chemical compounds were consistent with the historical and current site use and include volatile organics (primarily the BTEX compounds), PAHs, selected metals, and total cyanide. Therefore these compounds are the focus of this section which summarizes the chemical characteristics and expected environmental fate and transport behavior of organic and inorganic chemicals of concern on, and near, the Tidewater site. The organic constituents of concern are grouped into two classes; these are VOCs and SVOCs. Inorganics of interest consist of the priority pollutant metals and total cyanide. Sources of these site chemicals, and a brief account of their presence at the site, are discussed. Discussion of the anticipated environmental fate for the chemical class is also provided.

5.1.1 Volatile Organic Compounds (BTEX)

BTEX compounds were identified in surface soils, subsurface soils, sediment and groundwater during the site investigation. Chlorinated compounds, although not specifically identified for reporting as part of this program, were analyzed as part of the EPA Method 8260 analysis. This included the analysis of 11 subsurface-soil samples, 9 surface-soil samples, 1 sediment sample and 2 groundwater samples. No chlorinated compounds were detected in any samples. However, TCE was detected during the soil gas survey. In general, chlorinated VOCs are widely used as solvents, degreasers, dry-cleaning agents, refrigerants, and chemical intermediates, and are not associated with manufactured gas production activities. Based on their widespread use in many industrial settings, chlorinated solvents are often found in the environment, originating from numerous point and non-point sources. However, due to the low concentrations detected only in the two soil gas points, chlorinated organics are not considered a chemical of concern at the Tidewater site and therefore will not be discussed in detail.

The BTEX compounds are commonly associated constituents of MGP tars, carburetion oils and other petroleum fuels. These detected compounds are expected to be associated with the MGP and power plant residues on site.

Non-chlorinated VOCs are highly soluble in water. Therefore, surface runoff and groundwater movement are expected to be a principal fate/transport process for BTEX at the Tidewater site. Non-chlorinated VOCs are highly volatile and therefore volatilization of these compounds from near-surface areas impacted with VOCs is expected to be a significant environmental process at the site. Concentrations in groundwater and deeply buried impacted soils will not be as readily affected by this mechanism. In general, low octanol/water partition coefficient values (except for ethylbenzene) coupled with high water solubility and volatility make adsorption a relatively minor environmental fate process for these compounds compared to other mechanisms. Non-chlorinated volatile compounds do not appreciably bioaccumulate in aquatic organisms. Although certain site-specific conditions can prolong the persistence of VOCs, the VOCs associated with the site tend to be mobile and not particularly persistent in the surrounding environment due to their high volatility, low adsorption to soils, high water solubility, and limited capacity for bioaccumulation.

5.1.2 Polycyclic Aromatic Hydrocarbons

Eighteen PAHs, including naphthalene, 1-methylnaphthalene, 2-methylnaphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene were detected in surface soils, subsurface-soils, sediments and groundwater samples on site. Dibenzofuran, an SVOC, also was detected in these media at the site.

PAHs are fused-ring compounds in which at least two carbon atoms in each ring are shared by adjacent rings. Typically, the rings are fully aromatic but some may be saturated and have fewer carbon atoms, such as the compound fluorene. Major sources of PAHs include coal tars, crude oils, and products from the incomplete combustion of organic matter. Presence of PAHs on site is due, for the most part, to past MGP and power plant activities involving incidental spills, surface disposal, and/or surface and subsurface storage of process residues. Other activities which have contributed to the extent of PAH distribution on site include fuel storage and use, as well as the presence of a fuel product in the subsurface on site.

Solubilities of PAHs vary a great deal in aqueous matrices, depending upon the molecular structure and the number of rings within that molecular structure. As a general rule, a decrease in the number of rings in the parent molecule results in a higher degree of water solubility. Although there are some exceptions, most PAHs are not very soluble in aqueous matrices. Pure

component water solubilities for the PAHs detected on site range from 31.7 ppm for naphthalene to 5.00 x 10^{-4} ppm for dibenz(a,h)anthracene (EPA, 1986). PAHs exhibiting the lowest water solubility have a high degree of aromaticity (i.e., greater than four or five aromatic rings). For PAHs with relatively high water solubilities (such as naphthalene), groundwater transport of these compounds may be a significant fate/transport mechanism. Surface runoff containing dissolved PAHs is expected to be a less significant transport mechanism. For the less soluble compounds, this mechanism will be even more insignificant. However, surface runoff containing sediment impacted with PAHs likely is a significant transport process at the site.

PAHs are capable of volatilizing; the process proceeds at a much slower rate than for the lighter VOCs. However, concentrations of PAHs detected on site make volatilization likely when impacted areas are exposed. The more volatile PAHs (i.e., naphthalene, acenaphthylene, and acenaphthene) have vapor pressures greater than 2.0 x 10^{-3} mm mercury, whereas the other compounds have vapor pressures ranging from 1.03 x 10^{-10} to 7.10 x 10^{-4} mm mercury. Benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd) perylene are less likely to volatilize due to their greater molecular weight and more complex structures. Based upon their low vapor pressures (i.e., less than 1.0 x 10^{-8}) and high affinity for adsorption to particles, these PAHs would be expected to be associated more with airborne particulates (Eisenreich, et al., 1981).

In general, PAHs are only slightly susceptible to direct photolysis and/or photooxidation via hydroxyl radicals in atmospheric matrices (Clement Associates, 1985; EPA, 1979). Also, when these photolytic reactions occur, they usually proceed at a relatively slow rate. An exception to this trend may occur with dissolved PAHs in aqueous matrices subject to sunlight (i.e., surface water), which may undergo rapid photolysis under certain conditions (i.e., high surface water clarity) (EPA, 1979). Because surface water was not sampled as part of this investigation, no conclusions can be made with respect to this fate process.

Oxidation of PAHs associated with the site may occur via hydroxyl radicals in environmental matrices (EPA, 1979; Clement Associates, 1985); however, this is generally a slow transformation mechanism. The apparent quantities and concentrations of PAHs in the subsurface areas of the site would provide a significant supply of PAHs for oxidation. As a result, oxidation of PAHs at the site is not likely to reduce impacts significantly.

PAHs are not susceptible to hydrolytic reactions (Clement Associates, 1985; EPA, 1979). Therefore, hydrolysis is not considered a significant environmental fate process for PAHs associated with the site.

The PAHs associated with the site exhibit varying degrees of binding affinity to organic matter and soil particles; this affinity is dependent upon their individual molecular structures. In

general, the higher molecular weight PAHs are strongly adsorbed whereas the lighter PAHs (e.g., naphthalene) are less strongly sorbed (EPA, 1979; EPA, 1986). Therefore, adsorption to organic matter and/or soil particles likely will be a significant mechanism, especially for the higher molecular weight PAHs detected at the Tidewater site.

For PAHs, bioaccumulation is usually a transitory process since most PAHs with less than five rings are readily metabolized by higher organisms (EPA, 1979). However, no PAHs were analyzed in surface water so it is uncertain whether bioaccumulation would be a mechanism of fate and transport. However, PAH compounds were detected in the Seekonk River sediments; therefore, there is potential that these could enter the food chain.

Biodegradation is a significant long-term environmental fate process for the PAHs associated with the site. PAHs are degraded under most conditions by microbial populations and/or metabolized by higher organisms relatively rapidly (EPA, 1979). Microbial degradation rates are particularly high if the PAHs are utilized as a sole carbon source (EPA, 1979). The smaller-ringed PAHs, such as naphthalene, are more biodegradable than the larger-ringed PAHs, such as benzo(a)pyrene; therefore, biodegradation likely is occurring at the Tidewater site but probably not at a rate which would significantly diminish the areas impacted with PAHs in the short term.

With few exceptions, the PAHs associated with the site will be relatively persistent in on-site soil matrices based on the above information. This is primarily due to their generally low water solubility, resistance to photolytic, oxidative and hydrolytic degradation, and their high affinity for organic matter and soil particles.

5.1.3 Inorganic Compounds

A variety of inorganic compounds was detected in soil and aqueous samples collected during the R/I. These included metals and total cyanide. Many of the metals encountered are normal constituents of natural soils or commonly dissolved constituents in associated aqueous matrices resulting from soil leaching. However, a number of those metals identified were detected in concentrations in excess of those generally seen in New England soils. Heavy metals, the most significant in the context of this investigation as a result of their well-characterized potential human and environmental toxicities, were also detected in site soil and water samples.

Heavy metals have been identified as constituents in some MGP feedstocks and by-products. In addition, trace heavy metals, including cadmium, chromium, lead, and mercury, have been detected in process wastewaters and coal and oil ash residues (GRI, 1988). As a result, the possible presence of discarded feedstock materials (such as coal and crude oils) and residues

(such as ash) are a likely source of the heavy metals detected on site. Non-MGP site activities may also act as additional sources of metal impacts.

In general, many of the metals detected in site samples are typically persistent in the environment. This persistence is related primarily to recycling mechanisms within environmental matrices (e.g., for arsenic and lead), and removal mechanisms (precipitations, cationic exchange, adsorption, etc.) which decrease mobility and, therefore, transport. Degradation does not occur for the majority of these materials due to their elemental (or ionized) state. High solubility of some metal-based salts facilitates their migration in surface waters or groundwaters.

5.2 Sources, Pathways, and Receptors

The following section summarizes the areas of identified site impacts, the nature of the impact, the identified or postulated means for migration, and potential receptors that may be impacted by site chemicals of concern.

Although a variety of organic and inorganic compounds were detected at varying concentrations on site and off site, many of those found in significant levels at the site and within the BVE/Valley Gas property are associated with MGP and electric power generation processes (e.g., tar, purifier material and/or fuel oils).

Residuals identified during the investigation include the following:

- DNAPL tar was identified in several locations of the site in a free-phase form or as a heavy tar-saturated soil. DNAPL tars contain high concentrations of BTEX and PAHs and will remain a significant ongoing source of these constituents unless exposed to significant weathering or other transformation processes. Density of this material and the relative isolation of these materials generally preclude the rapid alteration of their chemical composition.

- LNAPL oil, a lighter, more fluid, floating phase material, was located at the water table in a number of sampling locations. The composition may include other organic compounds derived from site activities such as feedstock oil. Proximity to the surface will facilitate volatilization of the lighter organic species (VOCs and SVOCs), and interaction with aqueous media will allow dissolution of more-soluble compounds. Due to the fluidity of the material identified on site, migration may occur in concert with movement of local shallow groundwater.

- Purifier material, ash and clinker was identified at various locations throughout the site, in particular within the South Landfill Area. Purifier material can contain

elevated levels of ferric-ferrocyanide while ash and clinker may contain elevated levels of metals.

In addition, the odor of observed impacts varied greatly; naphthalene odors accompanied some samples collected in the vicinity of the former gas plant, while diesel fuel or heavy oil odors were noted in other samples. As is evident from these observations, the physical nature of the tar found on site varied greatly; the chemical composition of these tars is expected to vary as well. It is expected that such differences will affect the migration behavior of these materials.

5.2.1 Contaminant Sources

Section 4.0 presented the available information and data pertaining to the nature and extent of impacts on and adjacent to the site. From that evaluation, and based on historical information, it seems apparent that four distinct areas of impact exist on site, as follows:

- the former MGP, where both oil- and tar-impacted soils were noted (generally includes the eastern half of the North Landfill Area and Gas Plant Area IUs;
- the Pawtucket No. 1 Station, where oil-impacted soils were noted (comprised of the eastern third of the No. 1 Station IU;
- the above ground oil tank area, where oil and tar-impacted soils were noted (made up of the southwestern corner of the No. 1 Station IU); and
- the South Landfill Area where MGP residual impacted fill material was identified (includes the South Landfill Area IU).

The presence of heavily impacted soils is significant in that such zones may furnish a continual source of constituents to surrounding soils and groundwater.

5.2.2 Pathways

Chemical constituents potentially could move through a variety of environmental media. At the Tidewater site, MGP residues and other chemicals of interest have been shown to be present in surface soils, subsurface soils, sediments, and groundwater. Migration of these chemicals may occur due to the mechanisms discussed below.

- **Air.** Compounds of concern may be transported as vapor (for the volatile constituents), or as an adsorbed component of released particulates. Compounds of concern were detected in the majority of surface soils sampled; surface soils are the

most likely media to be impacted by air transport, through wind currents. Higher concentrations of VOCs and SVOCs were found in subsurface soils; however, subsurface soils must be exposed to the surface before significant air transport of vaporized compounds can take place. Monitoring of organic vapors was conducted with a PID at locations of intrusive work. Ambient air concentrations of 0 ppm were recorded until intrusive activities began. Therefore, since organic vapors were not detected prior to subsurface investigations, the air migration pathway will be of little concern as long as subsurface impacts are not exposed.

- **Surface Soils.** Site surface soils were found to have PAH impacts and low concentrations of VOCs. Constituents adsorbed to surface soils may be transported by wind or surface water, or may be dissolved into and transported by surface water or groundwater. Initially, surficial chemical compounds may have volatilized, releasing constituents to the atmosphere. Denser constituents may have migrated downward into subsurface media (soils and groundwater).

- **Surface Waters.** Surface-water runoff from the site or the study area is discharged to the Seekonk River, and ultimately, Narragansett Bay and the Atlantic Ocean. Although surface-water sampling (site runoff and the Seekonk River) was not performed as part of this project, it is generally believed that the site discharge to the Seekonk River would be minimal and insignificant due to dilution factors and the historical industrial use of the river.

- **Riverbank Soils/Sediments.** Results of riverbank survey and soils/sediment sampling in the Seekonk River generally indicate that VOCs are not a concern, with the exception of one sampling location (TSED5), and that PAHs are present In addition, two areas were noted where tar was seeping from the bank, including the large wash-out area (in the vicinity of SS-44) downgradient of the gas plant. However, due to the highly industrial nature of the river, historically and currently, it is not uncommon for these constituents to be present in the sediments.

- **Conduits.** Although numerous conduits were noted along the Seekonk River, no discharge or visible signs of impacts were observed. However, one sample was taken inside an apparent conduit, taken from TB-9 (23-24 feet). This sample had a visible sheen and petroleum odor; however, total BTEX and PAHs were at modest levels of 14 ppm and 343 ppm, respectively.

- **Subsurface Soils.** Site subsurface soils were found to contain compounds of concern. Concentrations of BTEX compounds were detected up to 999 ppm in on-site subsurface soils and up to a concentration of 2,354 ppm in a sample of tar from

within the former tar well. Total PAH concentrations of up to 33,799 ppm were detected on site, in the soils, while concentrations of up to 62,562 ppm were detected in samples of product collected from former site structures. BTEX and PAH concentrations from samples taken off site and from the school and city property were basically non-detect with the exception of a sample taken at the eastern edge of the athletic field. This sample, TB18 (8-10), was collected from fill material from the edge of the South Landfill Area and had a concentration of 4,011 ppm of total PAHs; however, it contained no BTEX compounds. The impacted subsurface areas discussed above may provide a source of constituents to other media, particularly site groundwater. In addition, DNAPL and heavy constituents may migrate downward until a physical barrier to vertical migration (i.e., less permeable material—possibly bedrock) is encountered. DNAPL and other impacts were not noted at the top of bedrock during the investigation. The permeable soils associated with existing fill and native subsurface soils identified on site are expected to provide a route for gradual movement of these tars.

- **Groundwater.** Groundwater was found to contain VOCs and PAHs in on-site monitoring wells (MW-1, MW-3, MW-4, and MW-6). In addition, subsurface-soil samples yielded evidence of VOCs and PAHs in those locations. Most notable groundwater impacts were identified downgradient of the MGP and the South Landfill Area. Groundwater movement has been determined to be generally to the east, toward the Seekonk River. Groundwater provides a migration pathway for dissolved constituents detected at the Tidewater site.

- **Bedrock.** Bedrock fracture analysis was not performed as part of this investigation. Bedrock was noted in several borings throughout the site at various depths. However, visual impacts were observed mostly within the fill material on site and, to a decreasing extent, into the native silt, sand and gravel strata below the fill. There is no evidence that impacts reach the bedrock due to the confining nature of the native soils, except perhaps via impacted groundwater.

5.2.3 Receptors

On the basis of this investigation, evidence of chemicals of concern have been detected in several site locations and media. Oily and tarry impacted areas are present on site. However, it should be noted that constituents associated with these areas are limited to the site and potentially downgradient areas (i.e., the Seekonk River). It is important to identify potential receptors due to the presence of these constituents.

Primary receptors of site-derived constituents include on-site workers such as employees or contractors working on the No. 1 Station and Valley Gas properties via direct contact with impacted surface soils or subsurface soils during on-site excavation activities. Recreational users of the Seekonk River may also be exposed to site-derived constituents which have reached the river via surface runoff from impacted surface soils, active tar seeps, and/or impacted groundwater discharge.

Evaluation of groundwater impacts at the site has identified constituents in wells on site. However, the GB groundwater objectives were not exceeded in any of the wells sampled. Also, as the site is well within a GB groundwater area, and there area no GA groundwater areas within 1 mile of the site, there are no direct receptors to the impacted groundwater.

6.0 SUMMARY AND CONCLUSIONS

The remedial investigation of the former Tidewater site included a detailed site inspection plus the sampling and analysis of a number of environmental media, including indoor air, soil gas, surface soils, subsurface soils, river sediments, groundwater, and highly tar-impacted materials inside former MGP structures. Where appropriate, the analytical results for each media were compared against certain criteria established by RIDEM. It should be noted that soil and riverbank/sediment samples were generally collected from the most-impacted material encountered based on visual, olfactory and/or PID readings, or as a default were collected directly above the groundwater table. Similarly, groundwater samples were taken from monitoring wells where worst-case samples were anticipated.

The following section summarizes the findings of the investigation. The study focused on the former industrial property owned by BVE and Valley Gas, and the properties of the adjacent school and city ball fields.

6.1 School and City Properties

For the school and city property a soil gas survey, indoor air monitoring, surface-soil sampling, and soil borings were performed. The soil gas survey did not detect any MGP-related compounds (BTEX compounds); however, low levels of TCE were detected. Indoor air monitoring confirmed that TCE vapors were not present within the school.

Surface-soil samples collected on the city and school property detected low levels of BTEX compounds, PAHs, metals and total cyanide. Most compounds were below the residential direct exposure criteria. The compounds which exceeded this criteria (several PAHs, arsenic, beryllium, and lead) were detected at levels similar to the off-site surface-soil samples collected in the general area of Pawtucket, and are therefore representative of background concentrations found in this region.

Borings drilled on the city and school property did not exhibit signs of impacts via visual, olfactory, or PID methods. Subsurface-soil samples analyzed detected low levels of BTEX compounds, PAHs, metals and total cyanide. Most compounds were below the residential direct exposure criteria. The compounds which exceeded this criteria (arsenic and beryllium) were detected at levels similar to the off-site surface-soil samples collected in the general area of Pawtucket. However, one boring, located at the eastern boundary of the city property, penetrated over 30 feet of MGP-impacted fill material. It also contained PAHs, arsenic, and total cyanide in excess of the residential standards.

6.2 BVE and Valley Gas Properties

For the BVE and Valley Gas properties a site inspection, surface-soil sampling, soil borings, test pits, sediment sampling, and groundwater sampling were performed. The site inspection noted isolated areas of impacts or residue migration along the riverbank. These impacts included a heavy sheen, a weathered tar seep, and weathered tar/asphalt located in the area of the former MGP; minor sheening, slight odors and some iron staining were noted in the South Landfill Area; and three soil wash-out areas were noted, two in the South Landfill Area, and one near the former electric power plant.

The site geology consists of fill material overlying natural silts, sands and gravel, overlying bedrock. Generally, bedrock slopes and groundwater flows toward the Seekonk River.

Surface-soil samples collected within the four IUs on the BVE/Valley Gas properties detected concentrations of PAHs, arsenic, and lead in excess of the industrial direct exposure criteria. The PAHs were detected at levels significantly higher than levels which would be considered background; however, with few exceptions, the concentrations of arsenic and lead detected in the subsurface were only slightly higher than levels which would be considered background.

Subsurface impacts were identified on the BVE/Valley Gas property. Tar impacts were identified throughout the Gas Plant Area and into a portion of the North Landfill Area. Oil impacts were also noted in the southeastern corner of the Gas Plant Area. Oil impacts were identified along the eastern and southern portions of the No. 1 Station Area while tar and oil impacts were identified in the southern portion of the No. 1 Station Area. MGP residual impacted fill was identified throughout the South Landfill Area. Three subsurface-soil samples, collected from the Gas Plant Area and the South Landfill Area, and four material samples, collected from a tar seep and former MGP structures, had concentrations of BTEX compounds in excess of the GB Leachability criteria.

Two samples collected from site materials exceeded the regulatory limit for benzene, using TCLP methods. One sample was collected from material within the former tar well on the MGP site and one was collected from material from the South Landfill Area. No other compounds exceeded the TCLP limit, nor did either sample fail the other RCRA hazardous criteria.

Several sediment/riverbank soil samples collected on the BVE/Valley Gas properties exhibited some signs of visual or olfactory impacts. These samples detected concentrations of BTEX, PAHs, and metals.

Four of the groundwater samples collected on the BVE/Valley Gas properties exhibited some signs of visual or olfactory impacts. These samples detected concentrations of BTEX, PAHs and inorganics; however, they were below applicable GB groundwater objectives. These samples were collected from the Gas Plant, No. 1 Station and South Landfill. No samples were taken from the North Landfill. The upgradient well had no visual, olfactory or chemical impacts.

Although a variety of organic and inorganic compounds were detected at varying concentrations on site and off site, many of those found in significant levels at the site and within the BVE/Valley Gas property are associated with MGP and electric power generation processes (e.g., tar, purifier material and/or fuel oils). Chemical constituents potentially could move through a variety of environmental media. At the Tidewater site, MGP residues and other chemicals of interest have been shown to be present in surface soils, subsurface soils, sediments, and groundwater. Migration of these chemicals may occur due to the following mechanisms: air, surface water, sediment conduits, subsurface soils, and groundwater.

Primary receptors of site-derived constituents include on-site workers such as employees or contractors working on the No. 1 Station and Valley Gas properties via direct contact with impacted surface soils or subsurface soils during on-site excavation activities. Recreational users of the Seekonk River may also be exposed to site-derived constituents which have reached the river via surface runoff from impacted surface soils, active tar seeps, and/or impacted groundwater discharge. There are no direct receptors to impacted groundwater

Several conclusions have been drawn based on the information gathered, and presented, in this report. They are as follows.

- The site geology consists of fill material overlying natural silts, sands, and gravel overlying bedrock. Generally, bedrock slopes, and groundwater flows, toward the Seekonk River.

- For the city and school property, it is noted that the far eastern end of Max Read Field is constructed over the South Landfill Area, where MGP residues were located below the surface. For the remainder of the city and school property, there were no MGP residues or power plant impacts. All constituents fall at or below natural background levels.

- The South Landfill Area contains fill material impacted with MGP residues, in excess of regulatory criteria. Impacts extend to depths approaching 30 feet below grade.

- Surface soils throughout the BVE and Valley Gas properties contained concentrations of compounds in excess of regulatory criteria.

- The area south of the No. 1 Station, in the area of the former above ground oil tanks, contains MGP- and fuel oil-impacted soils and fill.

- The area east of the No. 1 Station contains fuel oil-impacted soils and fill.

- The Gas Plant Area contains soil, fill and material within former subsurface structures, impacted with MGP residues, in excess of regulatory criteria. Impacts extend to depths approaching 35 feet below grade.

- Samples of material from each of the Gas Plant and South Landfill Areas were identified as RCRA characteristic hazardous waste, based on only one constituent (benzene). These samples were taken from the most highly impacted soils on site.

- Sediments/riverbank soils were collected which contained concentrations of compounds of concern. Sheens, tar odors, weathered tar seeps, and soil wash-out areas were noted along the riverbank.

- Impacted groundwater was found, but the concentrations do not exceed applicable regulatory criteria.

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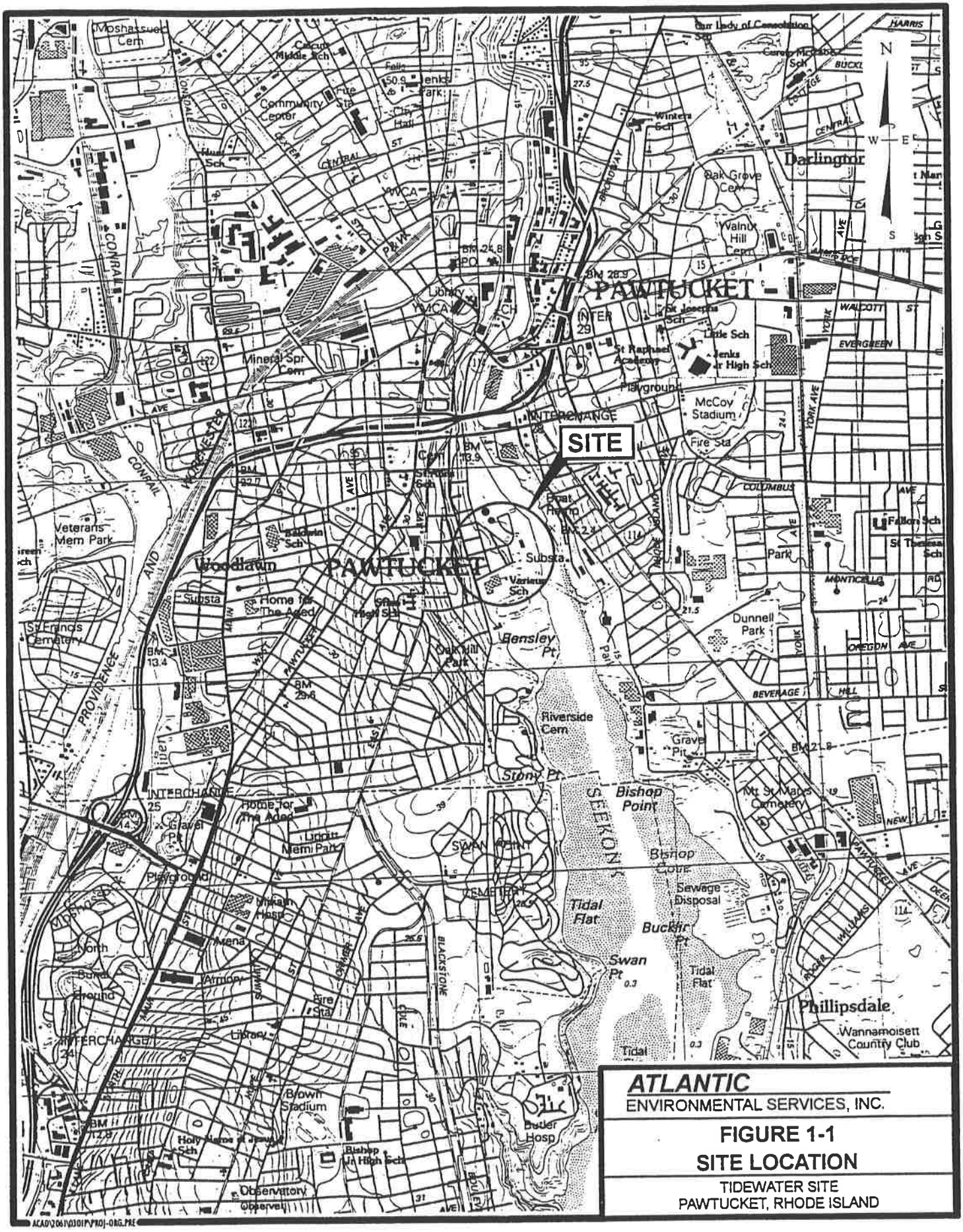
FIGURES



ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 1-1
SITE LOCATION

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

LEGEND

- ▲10 — RIDEM SOIL SAMPLE LOCATION (JULY 1986)
- ● 1 — RIDEM SOIL SAMPLE LOCATION (OCTOBER 1986)
- ⊡ SS-1 — WESTON/BLACKSTONE VALLEY ELECTRIC SEDIMENT SAMPLE LOCATION
- ▭ TP-5 — WESTON/BLACKSTONE VALLEY ELECTRIC TEST PIT AND SOIL SAMPLE LOCATION
- ▭ 8 — GZA/VALLEY GAS TEST PIT AND SOIL SAMPLE LOCATION
- ⊕ M&E MW-1 — METCALF & EDDY MONITORING WELL LOCATION (1990)
- ■W — E.R. PICKETT CO./VALLEY GAS TANK REMOVAL CONFIRMATION SAMPLE

N — S

SEEKONK RIVER

SS-2 ⊡

TOWERS

SS-1 ⊡

TP-10 ▲7 ▲6

▲8 TP-12 TP-11 CINDER DUMP LANDFILL

TP-14 ▲7

10 ▲ TP-13

▲4

▲3

BASEBALL FIELDS

▲9

MAX READ FIELD

SS-3 ⊡ TP-3

M&E MW-5 M&E MW-2

TP-2 M&E MW-4

M&E MW-1 M&E MW-3

TP-1

TP-4

TP-8

TP-6

FORMER PAWTUCKET NO. 1 STATION

SWITCHING GALLERIES

SUBSTATION

CONC. PAD

SEWAGE WET WELL

FORMER MACHINE SHOP

TP-7

TP-9

TP-5

METAL STORAGE SHED

PAD

FORMER METER ROOM

NATURAL GAS CONTROL HOUSE

MERRY STREET

THORNTON STREET

THORNTON STREET (ABANDONED)

NO. 7 GAS HOLDER 1,000,000 cuft

NO. 8 GAS HOLDER 3,000,000 cuft

TIDEWATER STREET

FRANCIS J. VARIEUR SCHOOL

PLAYSCAPE

PARKING

▲2

NURSING HOME

BOWLERS COURT

BENSLEY STREET

PLEASANT STREET

TAFT STREET

TOWER STREET

TIDEWATER

JEFFERS STREET

MERRY STREET

PLEASANT STREET

150 75 0 150 300

GRAPHIC SCALE IN FEET

061/0305/TIDEPREV

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 1-2
PREVIOUS SAMPLE LOCATIONS

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

SEEKONK RIVER

No. 1 STATION AREA

645

649 SOUTH LANDFILL AREA

647

CINDER DUMP LANDFILL

648

11

21

BASEBALL FIELDS

MAX READ FIELD

17

SCHOOL & CITY AREA

594

19

16

NURSING HOME

12

650

644

FRANCIS J. VARIEUR SCHOOL

PLAYSCAPE

646

PARKING

GAS PLANT AREA

662

NORTH LANDFILL AREA

826

FORMER PAWTUCKET NO. 1 STATION

SWITCHING GALLERIES

SUBSTATION

SEWAGE WET WELL

COOLING PAD

FORMER MACHINE SHOP

FORMER METER ROOM

METAL STORAGE SHED

TOWERS

NO. 7 GAS HOLDER 1,000,000 cuft

NO. 8 GAS HOLDER 3,000,000 cuft

THORNTON STREET (ABANDONED)

THORNTON STREET

MERRY STREET

TIDEWATER STREET

TAFT STREET

TOWER STREET

JEFFERS STREET

MERRY STREET

BENSLEY STREET

BOWLES COURT

PLEASANT STREET

PLEASANT STREET

150 75 0 150 300

GRAPHIC SCALE IN FEET

LEGEND

LOT DELINEATION

826 LOT IDENTIFICATION NUMBER

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 2-1
INVESTIGATIVE UNITS

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

061/0305/TIDEUNIT

LEGEND

- ▲SS-9 — ATLANTIC SURFACE SOIL SAMPLE LOCATION
- ⊡ TSED-8 — ATLANTIC SEDIMENT SAMPLE LOCATION
- ● SG-8 — ATLANTIC SOIL GAS SAMPLE LOCATION
- TP-3A — ATLANTIC TEST PIT LOCATION
- ○B-7 — ATLANTIC SOIL BORING LOCATION
- ⊕MW-3 — ATLANTIC MONITORING WELL LOCATION

N

SEEKONK RIVER

TSED-8 TSED-1 TSED-2 TSED-3/TSED-7 TSED-4 TSED-5

B-8/MW-8 B-8/MW-1 B-9 B-12 MW-3 B-13 MW-4 B-17 B-16 B-18 B-19 B-1 B-2 B-3 B-4 B-5 B-6 B-7/MW-2 B-10 B-11 B-14 MW-5 B-15 B-20 MW-7

TP-1 TP-2 TP-3 TP-3A TP-4 TP-5 TP-6 TP-7 TP-8 TP-8A TP-8B TP-9 TP-9A TP-10 TP-10A TP-11 TP-11A TP-12 TP-13 TP-13A TP-14 TP-15 TP-16 TP-18

SS-1 SS-2 SS-3 SS-4/SD-80 SS-5 SS-6 SS-8 SS-9 SS-10 SS-11 (APPROX.) SS-12 (APPROX.) SS-13 SS-14 SS-15 SS-16 SS-17 SS-18 SS-19 SS-23 SS-24 SS-29 SS-30 SS-34 (APPROX.) SS-39 SS-40 SS-41 SS-42 SS-43 SS-44

SG-1 SG-2 SG-3 SG-4 SG-5 SG-6 SG-7 SG-8 SG-9 SG-10 SG-11 SG-12 SG-13 SG-14 SG-15 SG-16 SG-17 SG-18 SG-19 SG-20 SG-21 SG-22 SG-23 SG-24 SG-25 SG-26 SG-27 SG-28

OB-3

FORMER PAWTUCKET NO. 1 STATION
SWITCHING GALLERIES
SUBSTATION
FORMER MACHINE SHOP
FORMER METER ROOM
SEWAGE WET WELL
CORE PAD
METAL STORAGE SHED
TOWERS
CINDER DUMP LANDFILL
MAX READ FIELD
BASEBALL FIELDS
FRANCIS J. VARIEUR SCHOOL
NURSING HOME
PARKING
CENTRAL GAS CONTROL HOUSE
NO. 7 GAS HOLDER 1,000,000 cuft
NO. 6 GAS HOLDER 3,000,000 cuft

THORNTON STREET (ABANDONED)
THORNTON STREET
MERRY STREET
TIDEWATER STREET
TAFT STREET
TOWER STREET
JEFFERS STREET
BENSLEY STREET
BOWLES COURT
PLEASANT STREET

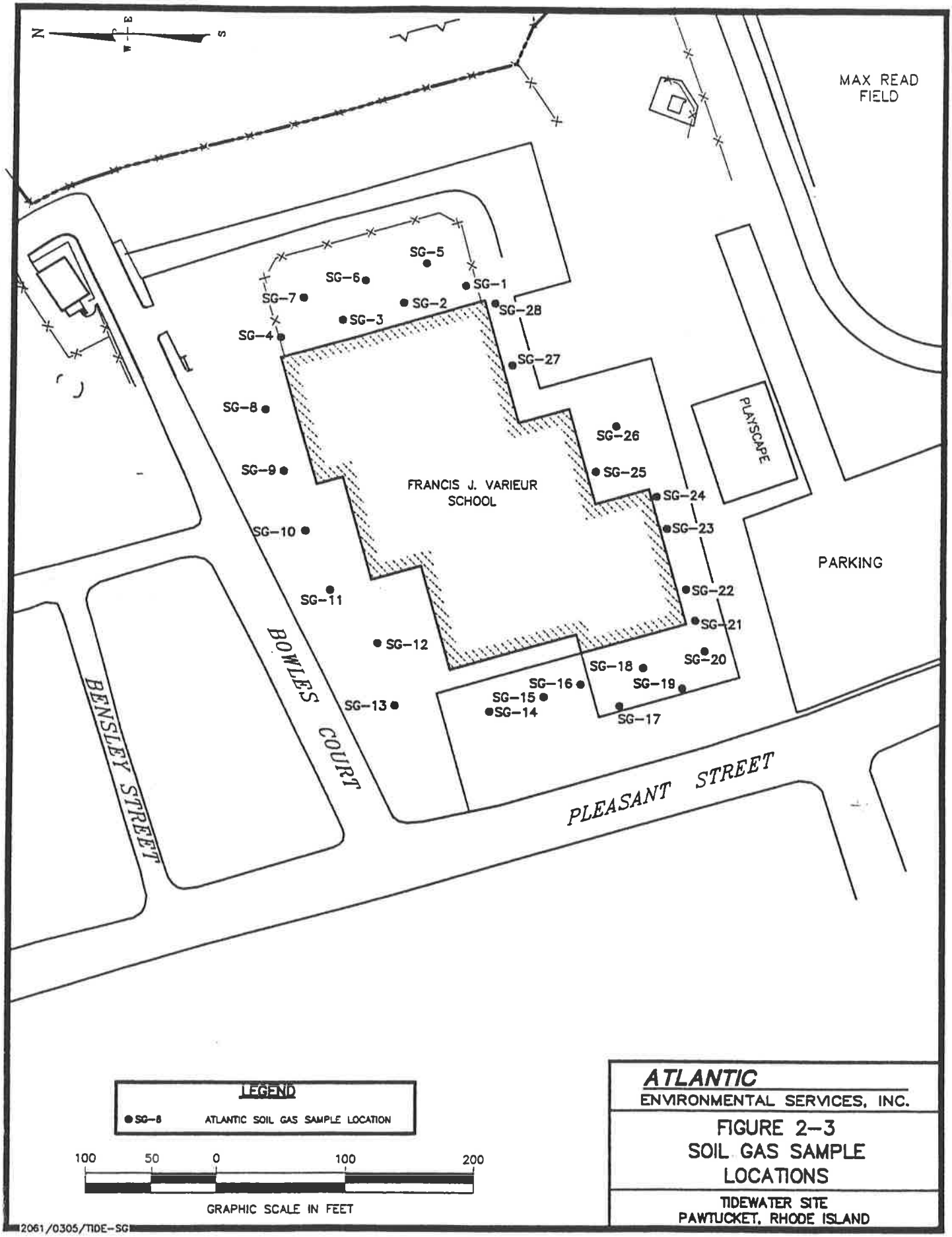
150 75 0 150 300
GRAPHIC SCALE IN FEET

2061/0305/TIDE-SA1

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 2-2
NEW SAMPLE LOCATIONS

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

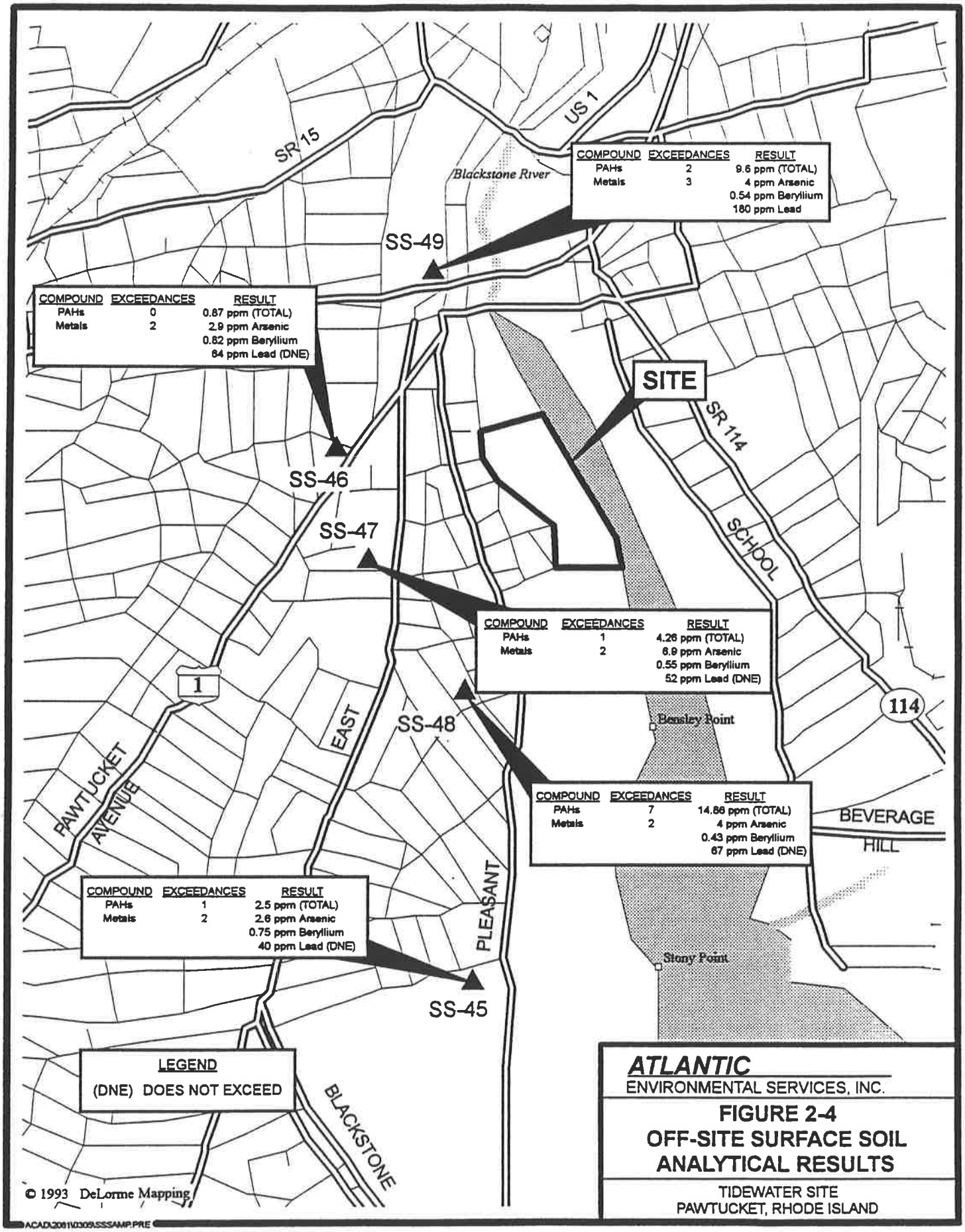


ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 2-3
SOIL GAS SAMPLE LOCATIONS

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

2061/0305/TIDE-SG


SR 15
US 1
Blackstone River
SS-49
COMPOUND EXCEEDANCES RESULT
PAHs 2 9.6 ppm (TOTAL)
Metals 3 4 ppm Arsenic
0.54 ppm Beryllium
180 ppm Lead
COMPOUND EXCEEDANCES RESULT
PAHs 0 0.87 ppm (TOTAL)
Metals 2 2.9 ppm Arsenic
0.82 ppm Beryllium
84 ppm Lead (DNE)
SITE
SR 114
SS-46
SS-47
SCHOOL
COMPOUND EXCEEDANCES RESULT
PAHs 1 4.26 ppm (TOTAL)
Metals 2 6.9 ppm Arsenic
0.55 ppm Beryllium
52 ppm Lead (DNE)
1
EAST
SS-48
Bensley Point
114
PAWTUCKET AVENUE
COMPOUND EXCEEDANCES RESULT
PAHs 7 14.66 ppm (TOTAL)
Metals 2 4 ppm Arsenic
0.43 ppm Beryllium
67 ppm Lead (DNE)
BEVERAGE HILL
PLEASANT
COMPOUND EXCEEDANCES RESULT
PAHs 1 2.5 ppm (TOTAL)
Metals 2 2.6 ppm Arsenic
0.75 ppm Beryllium
40 ppm Lead (DNE)
Stony Point
SS-45
LEGEND
(DNE) DOES NOT EXCEED
BLACKSTONE
© 1993 DeLorme Mapping
ATLANTIC
ENVIRONMENTAL SERVICES, INC.
FIGURE 2-4
OFF-SITE SURFACE SOIL
ANALYTICAL RESULTS
TIDEWATER SITE
PAWTUCKET, RHODE ISLAND
ACAD\2061\0309\SSSAMP.PRE

LEGEND

OVERLAND DRAINAGE FLOW DIRECTION

N W E S

SEEKONK RIVER

RUBBLE AND CLINKER BANK; VEGETATED (IRON STAINED SEDIMENTS, NO SHEEN, SLIGHT TAR/BENTHIC ODORS)

NATIVE BANK (IRON STAINED SEDIMENTS, NO SHEEN, SLIGHT TAR/BENTHIC ODORS)

ROUNDED RIPRAP BANK; VEGETATED (NO SHEEN, OCCASIONAL NAPHTHALENE/PHENOL ODOR)

BRICK AND LARGE CLINKER BANK; VEGETATED (NO ODOR OR SHEEN EXCEPT SLIGHT SHEEN AND ODOR OBSERVED AT TSED-4)

TSED-5

TSED-4

TSED-3/TSED-7

WASH-OUT AREAS

FLAT STONE WALL WITH VERTICAL TIMBER LAGGING AND TIMBER POSTS (NO ODOR OR SHEEN)

CONC. FLARED END OUTFALL

TOWERS

SINK HOLE/ WASH-OUT AREA

TSED-6

FLAT STONE WALL WITH STEEL SHEETPILES AND TIMBER POSTS (NO ODOR OR SHEEN)

CONC. BOX CULVERT

3' DIA. BRICK PIPE

INTAKE STRUCTURE

WEATHERED SEEP

WEATHERED TAR/ASPHALT

ROCK, RUBBLE, BRICK, DEBRIS BANK

CATCH BASIN (TYP)

CB

TSED-2 SHEEN WITH SLIGHT TAR ODOR

FLAT STONE WALL WITH TIMBER PILES (NO ODOR OR SHEEN)

TSED-1

STONE, BRICK AND RUBBLE WALL/BANK (NO ODOR OR SHEEN)

FLAT STONE WALL WITH TIMBER PILES (NO ODOR OR SHEEN)

100 YEAR FLOOD LINE (EL. 19)

150 75 0 150 300

GRAPHIC SCALE IN FEET

ATLANTIC ENVIRONMENTAL SERVICES, INC.

FIGURE 3-1
SITE INSPECTION SUMMARY

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

1061/0305/TIDE-COA

A

A'

FORMER COKE STORAGE

PILES OF FILL/DEBRIS

FORMER STOVE COKE STORAGE

TAFT STREET

MW-7/B-20
MW-5/B-14

TP-16

B-15

B-17

B-16

GROUNDWATER ELEVATION (APPROXIMATE)

SEEKONK RIVER

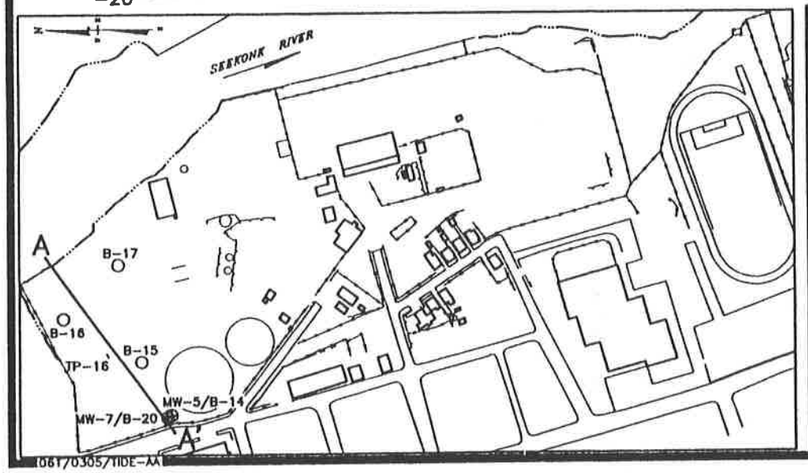
FILL

SILT, SAND AND GRAVEL

BEDROCK

RIVER'S EDGE

40
30
20
10
0
-10
-20



LEGEND

TP-16 — TEST PIT INTERVAL

ODORS NOTED

SHEEN NOTED

FREE PRODUCT NOTED

B-6 — BORING INTERVAL

WELL SCREEN INTERVAL

INFERRED CONTACT BETWEEN BEDROCK & OVERBURDEN

INFERRED CONTACT BETWEEN FILL & ALLUVIUM

50 25 0 50 100
HORIZONTAL SCALE IN FEET

10 5 0 10 20
VERTICAL SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 3-2
GEOLOGIC CROSS SECTION A-A'

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

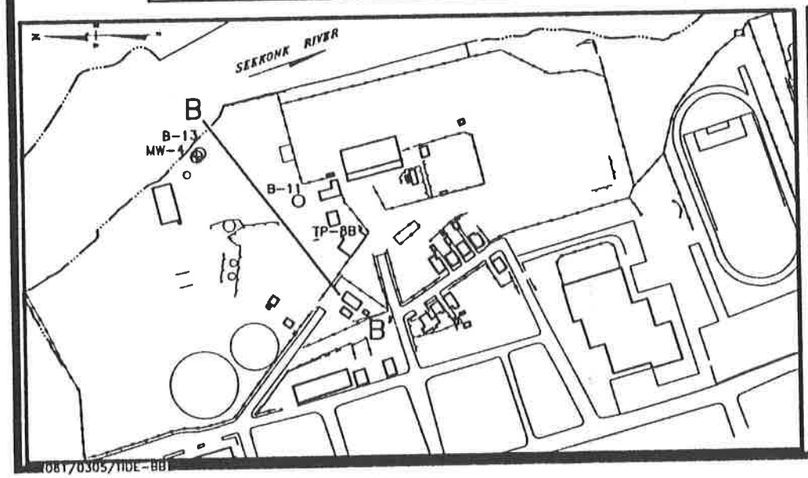
1061/0305/TIDE-AA

B

B'

30
20
10
0
-10
-20
-30

FORMER COAL SHED
FORMER CONDENSING ROOM
FORMER RETORT HOUSE
FORMER PURIFIERS
FORMER RELIEF HOLDER
GRAVEL ROAD
TAFT STREET
B-13
MW-4
B-11
TP-8B
SEEKONK RIVER
RIVER'S EDGE
GROUNDWATER ELEVATION (APPROXIMATE)
FILL
SILT, SAND AND GRAVEL
BEDROCK



LEGEND

TP-16 — TEST PIT INTERVAL

ODORS NOTED

SHEEN NOTED

FREE PRODUCT NOTED

B-6 — BORING INTERVAL

WELL SCREEN INTERVAL

INFERRED CONTACT BETWEEN BEDROCK & OVERBURDEN

INFERRED CONTACT BETWEEN FILL & ALLUVIUM

50 25 0 50 100
HORIZONTAL SCALE IN FEET

10 5 0 10 20
VERTICAL SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 3-3
GEOLOGIC CROSS SECTION B-B'

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

(081/0305/TIDE-BB)

C

C'

40
30
20
10
0
-10
-20

FORMER COAL STORAGE

TP-6

BULKHEAD WALL

RIVER'S EDGE

SEEKONK RIVER

GRAVEL ROAD

B-10

GRAVEL ROAD

RIPT SUBSTATION

GRAVEL ROAD

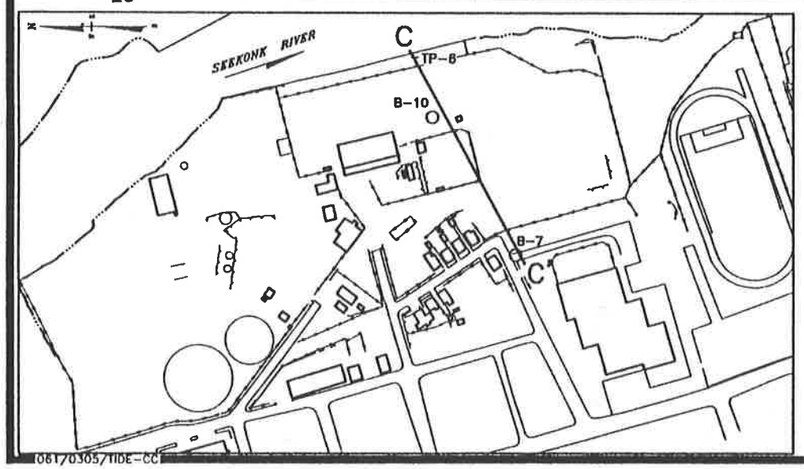
B-7

FILL

GROUNDWATER ELEVATION (APPROXIMATE)

SAND AND GRAVEL

BEDROCK



LEGEND

TP-16 — TEST PIT INTERVAL

ODORS NOTED

SHEEN NOTED

FREE PRODUCT NOTED

B-6 — BORING INTERVAL

WELL SCREEN INTERVAL

INFERRED CONTACT BETWEEN BEDROCK & OVERBURDEN

INFERRED CONTACT BETWEEN FILL & ALLUVIUM

50 25 0 50 100
HORIZONTAL SCALE IN FEET

10 5 0 10 20
VERTICAL SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 3-4
GEOLOGIC CROSS SECTION C-C'

TIDEWATER MGP SITE
PAWTUCKET, RHODE ISLAND

0817/0305/TIDE-CC

D

D'

MAX READ FIELD

B-18

B-19

B-1

TRACK

SAND AND GRAVEL

B-6/MW-1

B-5

SILT AND SAND

FILL

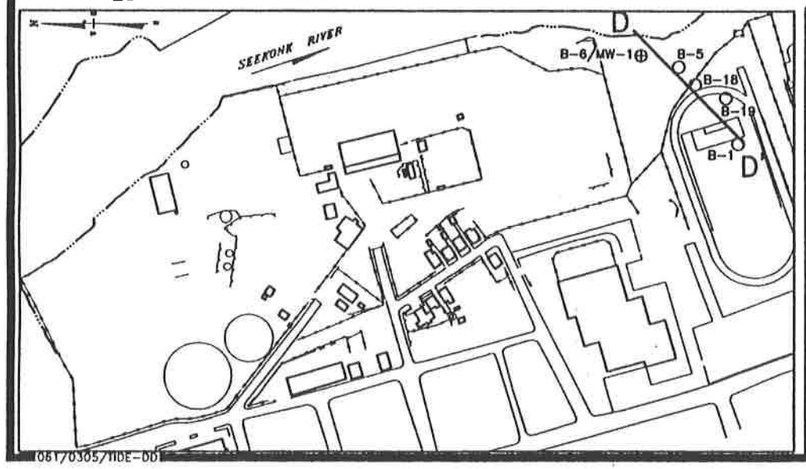
SEEKONK RIVER

GROUNDWATER ELEVATION (APPROXIMATE)

RIVER'S EDGE

BEDROCK

40
30
20
10
0
-10
-20



LEGEND

TP-16 — TEST PIT INTERVAL

ODORS NOTED

SHEEN NOTED

FREE PRODUCT NOTED

B-6 — BORING INTERVAL

WELL SCREEN INTERVAL

INFERRED CONTACT BETWEEN BEDROCK & OVERBURDEN

INFERRED CONTACT BETWEEN FILL & ALLUVIUM

50 25 0 50 100

HORIZONTAL SCALE IN FEET

10 5 0 10 20

VERTICAL SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 3-5
GEOLOGIC CROSS SECTION D-D'

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

LEGEND

- ○B-7 ATLANTIC SOIL BORING LOCATION
- ⊕MW-3 ATLANTIC MONITORING WELL LOCATION

N W E S

SEEKONK RIVER

A A' B B' C C' D D'

B-17 B-18 B-15 B-12 MW-3 B-9 B-10 B-11 MW-4 B-13 B-14 MW-5 B-20 B-8/MW-6 B-8/MW-1 B-8 B-18 B-19 B-4 B-2 B-7 B-3

TOWERS

CINDER DUMP LANDFILL

BASEBALL FIELDS

MAX READ FIELD

FORMER PAWTUCKET NO. 1 STATION

SWITCHING GALLERIES

SUBSTATION

CONC. PAD

SEWAGE WET WELL

FORMER MACHINE SHOP

FORMER METER ROOM

METAL STORAGE SHED

PAD

NATURAL GAS CONTROL HOUSE

NO. 7 GAS HOLDER 1,000,000 cuft

NO. 8 GAS HOLDER 3,000,000 cuft

THORNTON STREET (ABANDONED)

THORNTON STREET

MERRY STREET

TIDEWATER STREET

TAFT STREET

TOWER STREET

JEFFERS STREET

MERRY STREET

BENSLEY STREET

BOWLES COURT

PLEASANT STREET

FRANCIS J. VARIEUR SCHOOL

PLAYSCAPE

PARKING

NURSING HOME

150 75 0 150 300

GRAPHIC SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 3-6
LOCATION OF GEOLOGIC CROSS-SECTIONS

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

061/0305/TIDESECT

LEGEND

⊕MW-3 ATLANTIC MONITORING WELL LOCATION

(2.09) GROUNDWATER ELEVATION OBSERVED 9/4/96 (NGVD 1929 - MSL)

N

SEEKONK RIVER

MW-3 ⊕ (2.14)

MW-4 ⊕ (0.70)

⊕ B-8/MW-6 (2.11)

(2.09) ⊕ B-8/MW-1

MW-7 ⊕ (10.34) MW-5

2

4

6

8

10

150 75 0 150 300

GRAPHIC SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 3-7
GROUNDWATER SURFACE ELEVATION

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

8061/0305/TIDE-GWC

N
W
E
S

SEEKONK RIVER

INDUSTRIAL DIRECT EXPOSURE &
GB GROUNDWATER CRITERIA

RESIDENTIAL DIRECT EXPOSURE &
GB GROUNDWATER CRITERIA

150 75 0 150 300

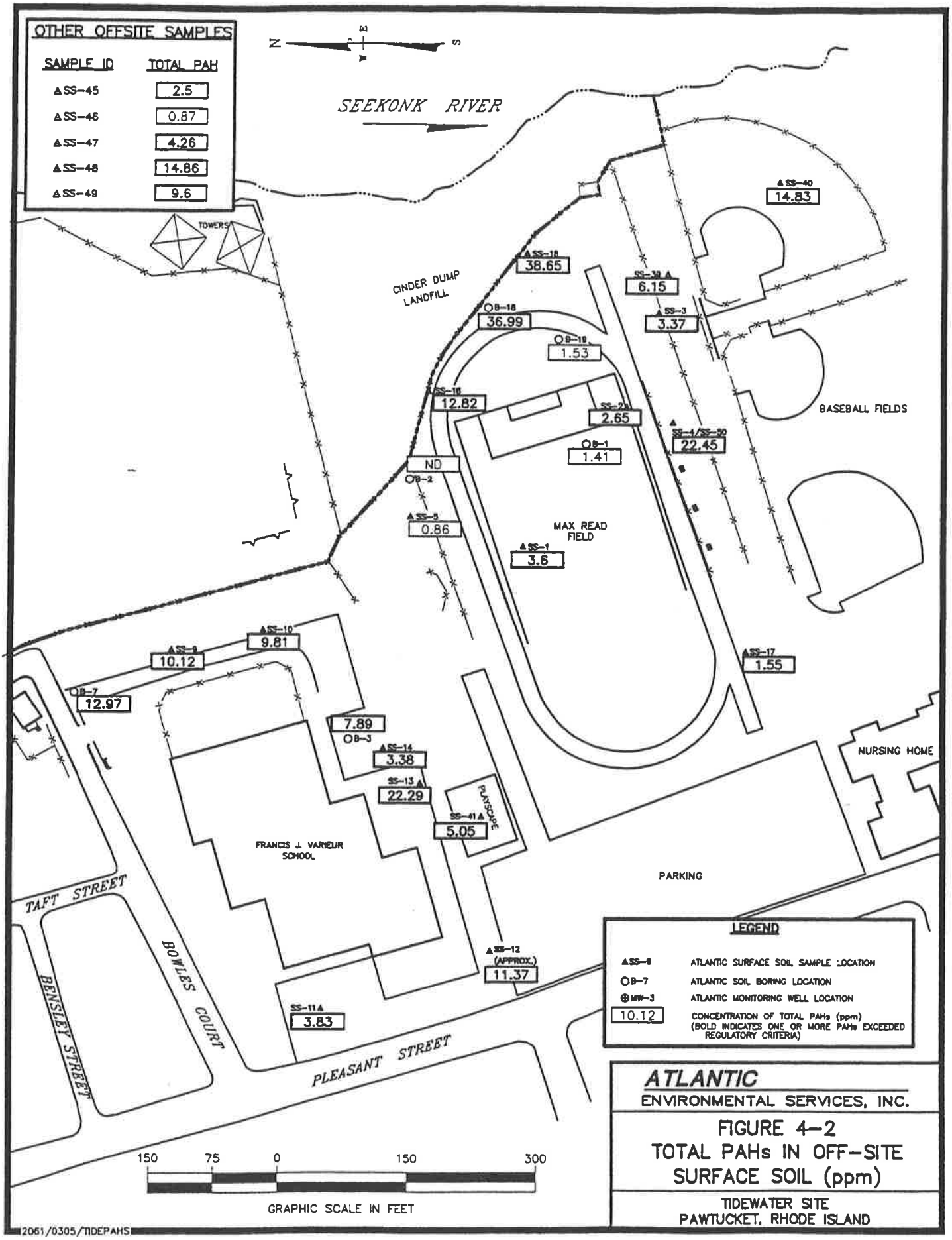
GRAPHIC SCALE IN FEET

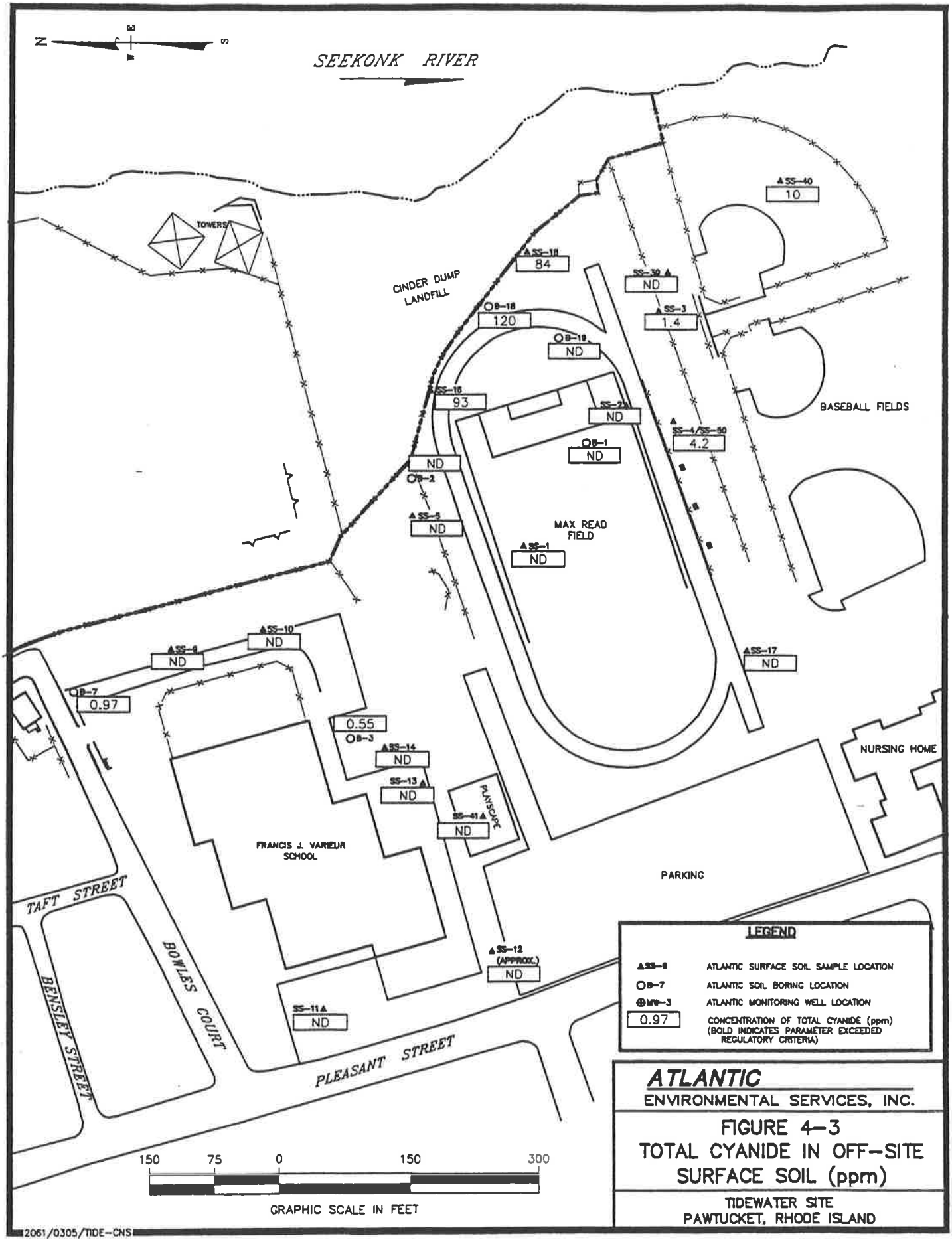
ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 4-1
AREAS OF
REGULATORY CRITERIA

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

061/0305/TIDE-REG


OTHER OFFSITE SAMPLES
SAMPLE ID
TOTAL PAH
SS-45
2.5
SS-46
0.87
SS-47
4.26
SS-48
14.86
SS-49
9.6
N
S
SEEKONK RIVER
TOWERS
CINDER DUMP LANDFILL
SS-40
14.83
SS-18
38.65
SS-39
6.15
B-16
36.99
SS-3
3.37
B-19
1.53
SS-16
12.82
SS-2
2.65
BASEBALL FIELDS
SS-1/SS-20
22.45
B-1
1.41
ND
B-2
SS-5
0.86
MAX READ FIELD
SS-1
3.6
SS-10
9.81
SS-9
10.12
SS-17
1.55
B-7
12.97
7.89
B-3
SS-14
3.38
SS-13
22.29
SS-41
5.05
PLAYSCAPE
NURSING HOME
FRANCIS J. VARIEUR SCHOOL
PARKING
TAFT STREET
BOWLES COURT
BENSLEY STREET
SS-12 (APPROX.)
11.37
SS-11
3.83
PLEASANT STREET
LEGEND
SS-8 ATLANTIC SURFACE SOIL SAMPLE LOCATION
B-7 ATLANTIC SOIL BORING LOCATION
MW-3 ATLANTIC MONITORING WELL LOCATION
10.12 CONCENTRATION OF TOTAL PAHs (ppm) (BOLD INDICATES ONE OR MORE PAHs EXCEEDED REGULATORY CRITERIA)
150 75 0 150 300
GRAPHIC SCALE IN FEET
ATLANTIC
ENVIRONMENTAL SERVICES, INC.
FIGURE 4-2
TOTAL PAHs IN OFF-SITE SURFACE SOIL (ppm)
TIDEWATER SITE
PAWTUCKET, RHODE ISLAND
2061/0305/TIDEPAHS

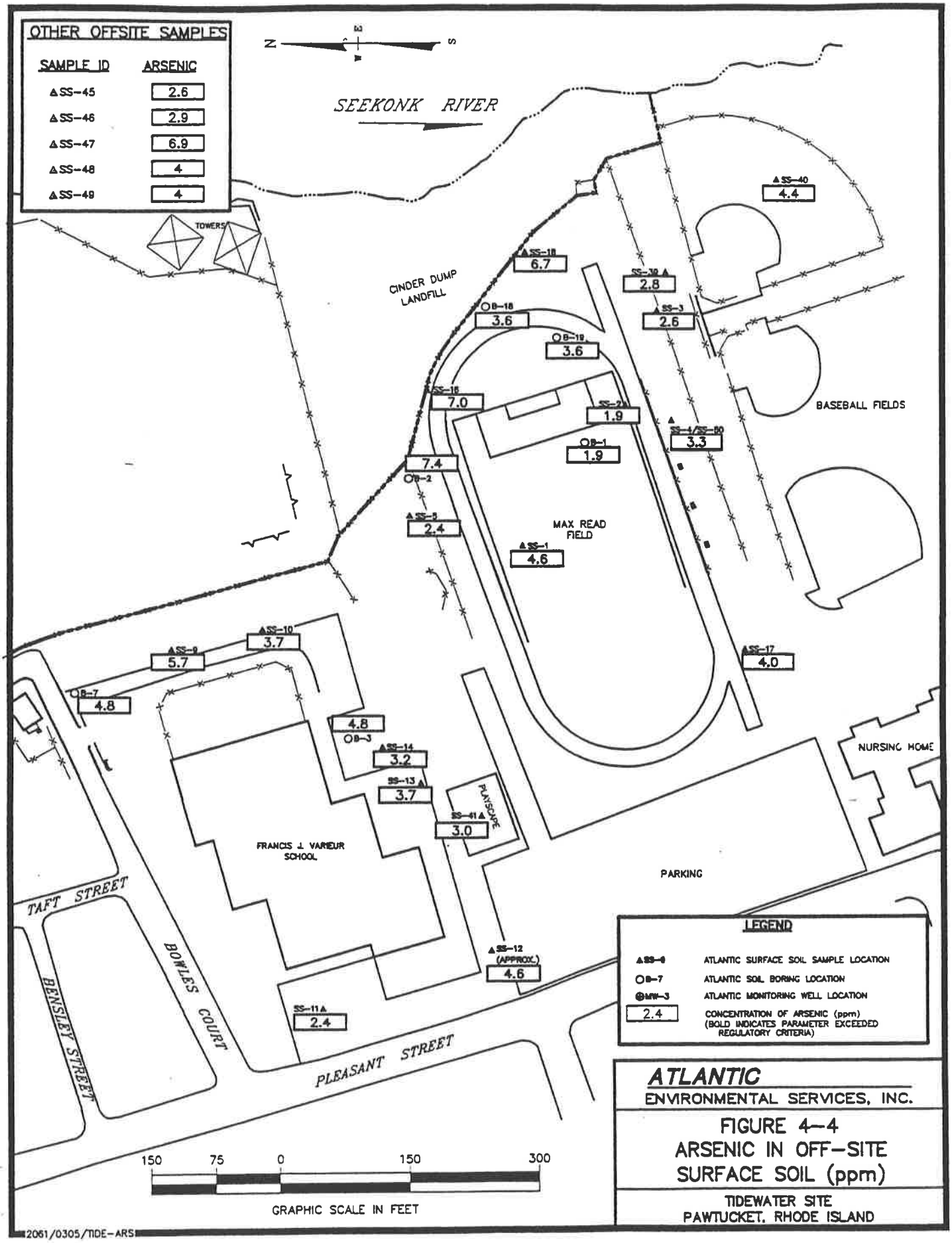


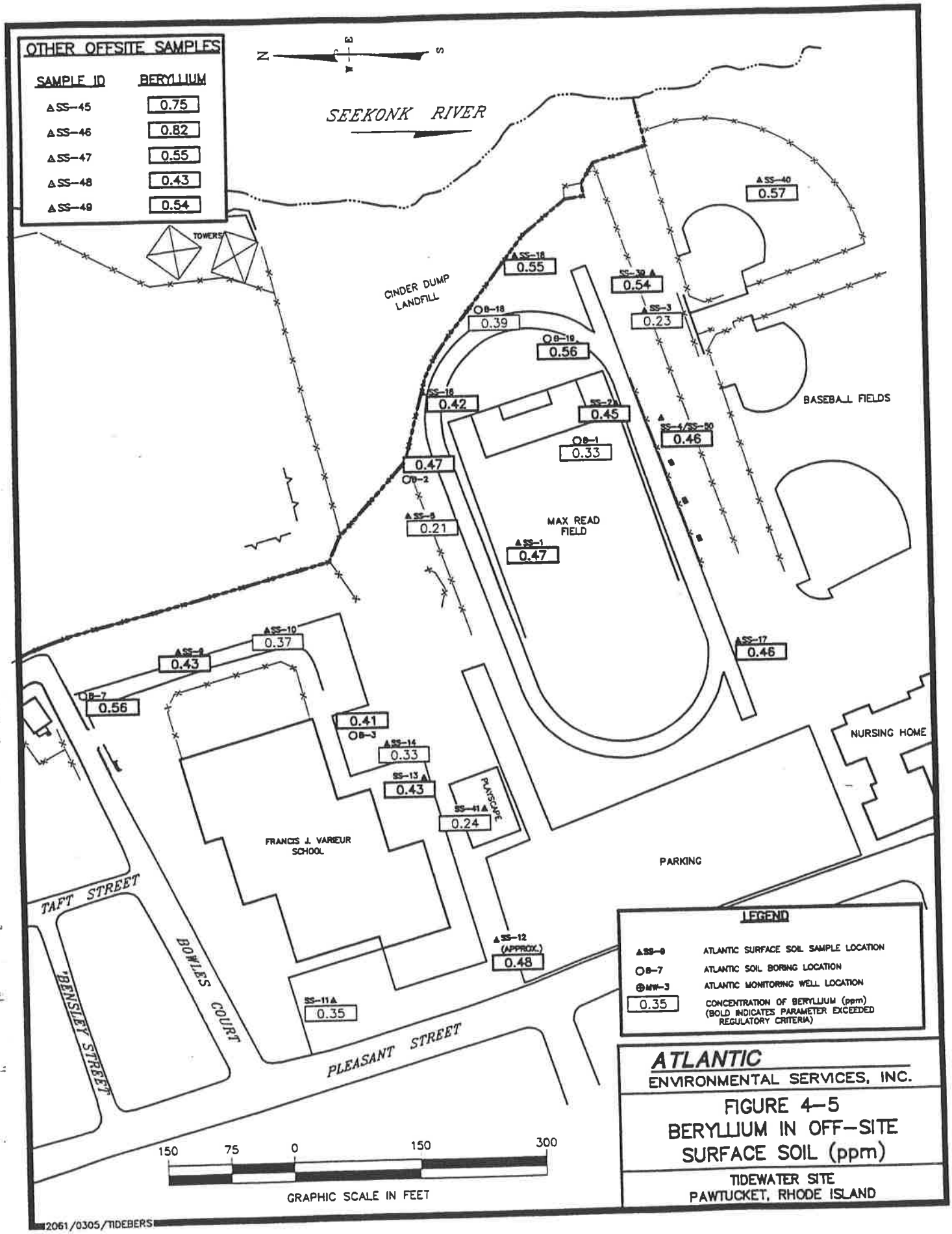
ATLANTIC
ENVIRONMENTAL SERVICES, INC.

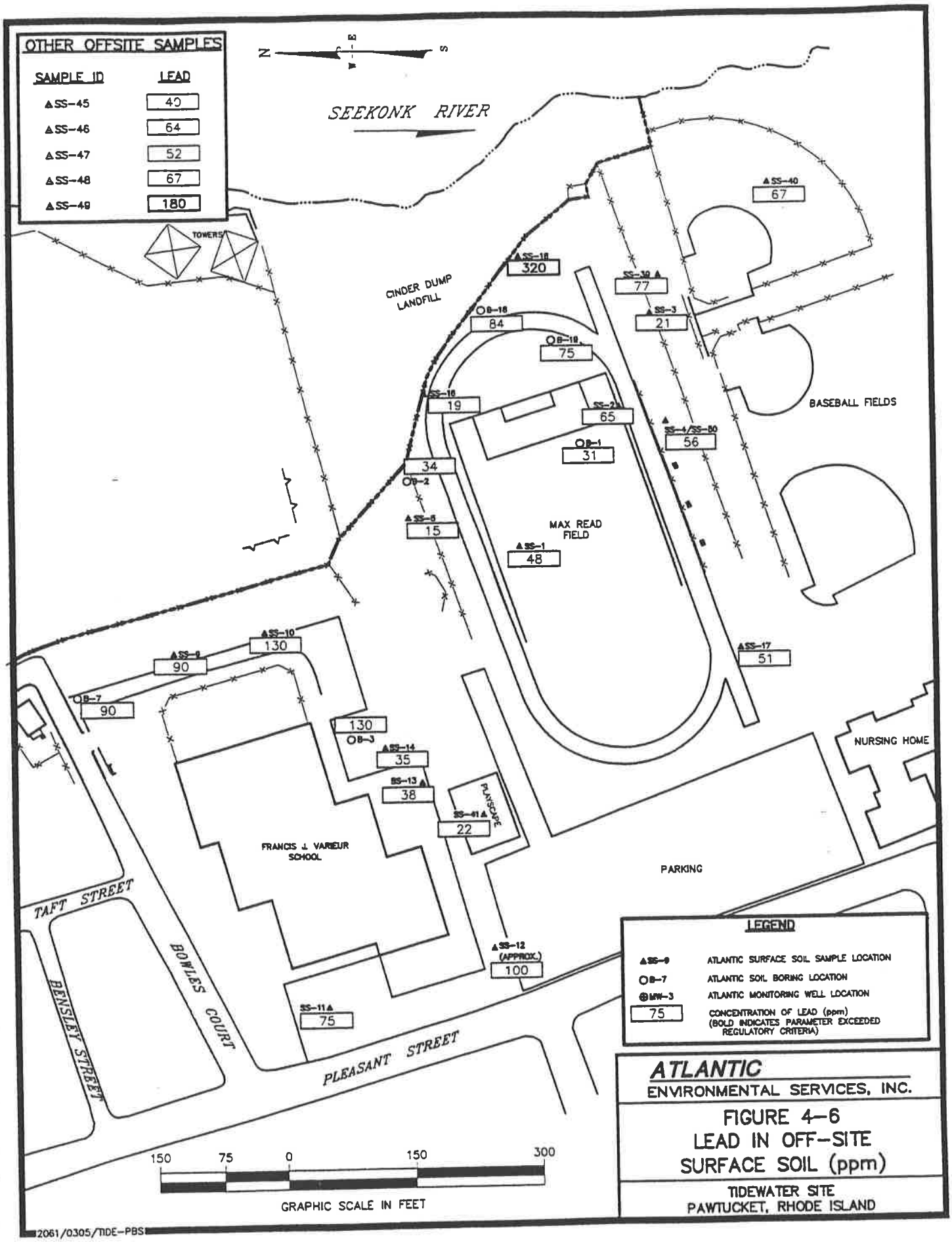
FIGURE 4-3
TOTAL CYANIDE IN OFF-SITE SURFACE SOIL (ppm)

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

2061/0305/TIDE-CNS


OTHER OFFSITE SAMPLES
SAMPLE ID ARSENIC
SS-45 2.6
SS-46 2.9
SS-47 6.9
SS-48 4
SS-49 4
N
S
SEEKONK RIVER
TOWERS
CINDER DUMP LANDFILL
SS-40 4.4
SS-18 6.7
SS-39 2.8
SS-3 2.6
B-18 3.6
B-19 3.6
SS-16 7.0
SS-2 1.9
BASEBALL FIELDS
SS-4/SS-20 3.3
B-1 1.9
7.4
B-2
SS-5 2.4
MAX READ FIELD
SS-1 4.6
SS-10 3.7
SS-9 5.7
SS-17 4.0
B-7 4.8
4.8
B-3
SS-14 3.2
SS-13 3.7
SS-41 3.0
PLAYSCAPE
NURSING HOME
FRANCIS J. VARIEUR SCHOOL
PARKING
TAFT STREET
BOWLES COURT
BENSLEY STREET
SS-12 (APPROX.) 4.6
SS-11 2.4
PLEASANT STREET
LEGEND
SS-6 ATLANTIC SURFACE SOIL SAMPLE LOCATION
B-7 ATLANTIC SOIL BORING LOCATION
MW-3 ATLANTIC MONITORING WELL LOCATION
2.4 CONCENTRATION OF ARSENIC (ppm) (BOLD INDICATES PARAMETER EXCEEDED REGULATORY CRITERIA)
150 75 0 150 300
GRAPHIC SCALE IN FEET
ATLANTIC
ENVIRONMENTAL SERVICES, INC.
FIGURE 4-4
ARSENIC IN OFF-SITE SURFACE SOIL (ppm)
TIDEWATER SITE
PAWTUCKET, RHODE ISLAND
2061/0305/TIDE-ARS


OTHER OFFSITE SAMPLES
SAMPLE ID
BERYLLIUM
SS-45
0.75
SS-46
0.82
SS-47
0.55
SS-48
0.43
SS-49
0.54
N
W
E
S
SEEKONK RIVER
TOWERS
CINDER DUMP LANDFILL
SS-40
0.57
SS-16
0.55
SS-39
0.54
SS-3
0.23
B-18
0.39
B-19
0.56
SS-18
0.42
SS-2
0.45
BASEBALL FIELDS
SS-4/SS-20
0.46
B-1
0.33
0.47
B-2
SS-5
0.21
MAX READ FIELD
SS-1
0.47
SS-10
0.37
SS-9
0.43
SS-17
0.46
B-7
0.56
0.41
B-3
SS-14
0.33
SS-13
0.43
SS-11
0.24
PLAYSCAPE
NURSING HOME
FRANCIS J. VARIEUR SCHOOL
PARKING
TAFT STREET
BENSLEY STREET
BOWLES COURT
SS-12 (APPROX.)
0.48
SS-11
0.35
PLEASANT STREET
LEGEND
SS-8 ATLANTIC SURFACE SOIL SAMPLE LOCATION
B-7 ATLANTIC SOIL BORING LOCATION
MW-3 ATLANTIC MONITORING WELL LOCATION
0.35 CONCENTRATION OF BERYLLIUM (ppm) (BOLD INDICATES PARAMETER EXCEEDED REGULATORY CRITERIA)
150 75 0 150 300
GRAPHIC SCALE IN FEET
ATLANTIC
ENVIRONMENTAL SERVICES, INC.
FIGURE 4-5
BERYLLIUM IN OFF-SITE SURFACE SOIL (ppm)
TIDEWATER SITE
PAWTUCKET, RHODE ISLAND
2061/0305/TIDEBERS


OTHER OFFSITE SAMPLES
SAMPLE ID
LEAD
SS-45
40
SS-46
64
SS-47
52
SS-48
67
SS-49
180
N
S
SEEKONK RIVER
TOWERS
CINDER DUMP LANDFILL
SS-40
67
SS-18
320
SS-39
77
B-18
84
SS-3
21
B-19
75
BASEBALL FIELDS
SS-16
19
SS-2
65
SS-4/SS-50
56
B-1
31
34
B-2
SS-5
15
MAX READ FIELD
SS-1
48
SS-17
51
SS-10
130
SS-9
90
B-7
90
130
B-3
SS-14
35
SS-13
38
SS-41
22
PLAYSCAPE
NURSING HOME
FRANCIS J. VARIEUR SCHOOL
PARKING
TAFT STREET
BENSLEY STREET
BOWLES COURT
PLEASANT STREET
SS-12
(APPROX.)
100
SS-11
75
LEGEND
SS-9
ATLANTIC SURFACE SOIL SAMPLE LOCATION
B-7
ATLANTIC SOIL BORING LOCATION
MW-3
ATLANTIC MONITORING WELL LOCATION
75
CONCENTRATION OF LEAD (ppm)
(BOLD INDICATES PARAMETER EXCEEDED REGULATORY CRITERIA)
150
75
0
150
300
GRAPHIC SCALE IN FEET
ATLANTIC
ENVIRONMENTAL SERVICES, INC.
FIGURE 4-6
LEAD IN OFF-SITE
SURFACE SOIL (ppm)
TIDEWATER SITE
PAWTUCKET, RHODE ISLAND
2061/0305/TIDE-PBS

LEGEND

- ▲SS-8 — ATLANTIC SURFACE SOIL SAMPLE LOCATION
- ○B-7 — ATLANTIC SOIL BORING LOCATION
- ⊕MW-3 — ATLANTIC MONITORING WELL LOCATION
- 113 — CONCENTRATION OF TOTAL PAHs (ppm) (BOLD INDICATES ONE OR MORE PAHs EXCEEDED REGULATORY CRITERIA)

NOTE: SS-24 IS THE ONLY SAMPLE WHICH DID NOT HAVE A PAH EXCEEDANCE

N W E S

SEEKONK RIVER

114 B-12 MW-3

B-9 142

B-8/MW-6 71

TOWERS

B-8/MW-1 1872

6.7 SS-10

B-5 74

CINDER DUMP LANDFILL

B-4 789

SS-23 204

B-10 192

SS-24 9.08

SS-43 94

SS-8 1948

BASEBALL FIELDS

MW-4 B-13 421

CONC PAD

SEWAGE WET WELL

FORMER PAWTUCKET NO. 1 STATION

SWITCHING GALLERIES

SUBSTATION

FORMER MACHINE SHOP

METAL STORAGE SHED

PAD

B-11 511

SS-30 295

FORMER METER ROOM

MAX READ FIELD

SS-29 58

113 B-17

SS-42 8418

MERRY STREET

THORNTON STREET

NATURAL GAS CONTROL HOUSE

NURSING HOME

B-19 27

NO. 7 GAS HOLDER 1,000,000 cuft

THORNTON STREET (ABANDONED)

FRANCIS J VARIEUR SCHOOL

PLAYSCAPE

PARKING

SS-34 (APPROX) 210

B-18 40

NO. 8 GAS HOLDER 3,000,000 cuft

TIDEWATER STREET

BENSLEY STREET

BOWLES COURT

PLEASANT STREET

14 B-20 MW-7 B-14 MW-5

TAFT STREET

TOWER STREET

TIDEWATER

JEFFERS STREET

MERRY STREET

PLEASANT STREET

150 75 0 150 300

GRAPHIC SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 4-7
TOTAL PAHs IN ON-SITE SURFACE SOIL (ppm)

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

G61/0305/TIDE-PAH

LEGEND

- ▲SS-9 — ATLANTIC SURFACE SOIL SAMPLE LOCATION
- ○B-7 — ATLANTIC SOIL BORING LOCATION
- ⊕MW-3 — ATLANTIC MONITORING WELL LOCATION
- 6.2 — CONCENTRATION OF TOTAL CYANIDE (ppm) (BOLD INDICATES PARAMETER EXCEEDED REGULATORY CRITERIA)

NOTE: NONE OF THE SAMPLES EXCEEDED THE REGULATORY CRITERIA

N

SEEKONK RIVER

B-8/MW-8 55

TOWERS

B-8/MW-1 26

B-5 120

CINDER DUMP LANDFILL

72 SS-10

12 B-12 MW-3

B-9 77

SS-23 340

B-10 64

SS-24 160

B-4 75

SS-43 320

SS-8 2.8

BASEBALL FIELDS

MW-4 B-13 50

FORMER PAWTUCKET NO. 1 STATION

SWITCHING GALLERIES

SUBSTATION

CONC. PAD

SEWAGE WET WELL

FORMER MACHINE SHOP

MAX READ FIELD

METAL STORAGE SHED

B-11 86

SS-30 14

FORMER METER ROOM

SS-29 60

47 B-17

SS-42 22

NATURAL GAS CONTROL HOUSE

MERRY STREET

THORNTON STREET

NURSING HOME

B-16 9.1

NO. 7 GAS HOLDER 1,000,000 cuft

THORNTON STREET (ABANDONED)

FRANCIS J. VARIEUR SCHOOL

PLAYSCAPE

PARKING

SS-34 (APPROX) 6.2

B-15 5.1

NO. 8 GAS HOLDER 3,000,000 cuft

TIDEWATER STREET

BOWLES COURT

BENSLEY STREET

PLEASANT STREET

0.8

B-20 MW-7 B-14 MW-5

TAFT STREET

TOWER STREET

TIDEWATER

JEFFERS STREET

MERRY STREET

PLEASANT STREET

150 75 0 150 300

GRAPHIC SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 4-8
TOTAL CYANIDE IN ON-SITE SURFACE SOIL (ppm)

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

061/0305/TIDE-CN

LEGEND

- ▲SS-9 — ATLANTIC SURFACE SOIL SAMPLE LOCATION
- ○B-7 — ATLANTIC SOIL BORING LOCATION
- ⊕MW-3 — ATLANTIC MONITORING WELL LOCATION
- 19 — CONCENTRATION OF ARSENIC (ppm) (BOLD INDICATES PARAMETER EXCEEDED REGULATORY CRITERIA)

N W E S

SEEKONK RIVER

B-6/MW-6 6 | B-8 19 | 7.0 B-12 MW-3 | B-13 9.8 MW-4 | B-10 16 | SS-23 13 | SS-24 8.5 | B-4 8.3 | SS-43A 3.0 | SS-8A 12 | B-8/MW-1 3.7 | B-5 3.8 | 0.19 SS-10

TOWERS

CINDER DUMP LANDFILL

BASEBALL FIELDS

MAX READ FIELD

FORMER PAWTUCKET NO. 1 STATION

SWITCHING GALLERIES

SUBSTATION

CONC PAD

SEWAGE WET WELL

FORMER MACHINE SHOP

FORMER METER ROOM

B-11 3.4 | SS-30A 3.9 | SS-29A 6.8 | 35 B-17 | SS-42A 2.6 | B-19 19 | SS-34A (APPROX.) 5.1 | B-18 9.8 | 8.1 B-20 B-14 MW-7 MW-8

METAL STORAGE SHED

PAD

NATURAL GAS CONTROL HOUSE

NO. 7 GAS HOLDER 1,000,000 cuft

NO. 8 GAS HOLDER 3,000,000 cuft

THORNTON STREET (ABANDONED)

THORNTON STREET

MERRY STREET

TIDEWATER STREET

TAFT STREET

TOWER STREET

JEFFERS STREET

BENSLEY STREET

BOWLES COURT

PLEASANT STREET

FRANCIS J. VARIEUR SCHOOL

PLAYSCAPE

PARKING

NURSING HOME

150 75 0 150 300

GRAPHIC SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 4-9
ARSENIC IN ON-SITE SURFACE SOIL (ppm)

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

061/0305/TIDE-AR

LEGEND

- ▲SS-8 — ATLANTIC SURFACE SOIL SAMPLE LOCATION
- ○B-7 — ATLANTIC SOIL BORING LOCATION
- ⊕MW-3 — ATLANTIC MONITORING WELL LOCATION
- 0.62 — CONCENTRATION OF BERYLLIUM (ppm) (BOLD INDICATES PARAMETER EXCEEDED REGULATORY CRITERIA)

NOTE: NONE OF THE SAMPLES EXCEEDED THE REGULATORY CRITERIA

N W E S

SEEKONK RIVER

B-8/MW-6 0.41
B-8/MW-1 0.24
B-5 0.29
CINDER DUMP LANDFILL
SS-19 0.19
TOWERS
B-4 ND
SS-43 ND
SS-6 0.65
SS-23 0.24
SS-24 0.25
B-9 0.58
B-12 0.65
MW-3
B-10 0.57
B-13 0.77
MW-4
PAD
CONC. PAD
SEWAGE WET WELL
FORMER PAWTUCKET NO. 1 STATION
SWITCHING GALLERIES
SUBSTATION
FORMER MACHINE SHOP
METAL STORAGE SHED
B-11 0.33
SS-30 0.63
FORMER METER ROOM
SS-29 0.56
B-17 0.41
SS-42 ND
NATURAL GAS CONTROL HOUSE
MERRY STREET
THORNTON STREET
THORNTON STREET (ABANDONED)
TIDEWATER STREET
NO. 7 GAS HOLDER 1,000,000 cuft
NO. 8 GAS HOLDER 3,000,000 cuft
B-16 0.28
SS-34 (APPROX.) 0.45
B-18 0.21
B-20 0.62
B-14
MW-7
MW-5
TAFT STREET
TOWER STREET
TIDEWATER
JEFFERS STREET
MERRY STREET
PLEASANT STREET
BENSLEY STREET
BOWLES COURT
FRANCIS J. VARIEUR SCHOOL
PLAYSCAPE
PARKING
NURSING HOME
MAX READ FIELD
BASEBALL FIELDS

150 75 0 150 300
GRAPHIC SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 4-10
BERYLLIUM IN ON-SITE SURFACE SOIL (ppm)

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

061/0305/TIDE-BER

LEGEND

- ▲SS-9 — ATLANTIC SURFACE SOIL SAMPLE LOCATION
- ○B-7 — ATLANTIC SOIL BORING LOCATION
- ⊕MW-3 — ATLANTIC MONITORING WELL LOCATION
- 54 — CONCENTRATION OF LEAD (ppm) (BOLD INDICATES PARAMETER EXCEEDED REGULATORY CRITERIA)

NOTE: B-6/MW-1 IS THE ONLY SAMPLE WHICH EXCEEDED THE REGULATORY CRITERIA

N W E S

SEEKONK RIVER

97 B-12 ⊕MW-3 — B-9 120 — B-8/MW-8 52 — TOWERS — ⊕B-6/MW-1 760 — B-5 79 — CINDER DUMP LANDFILL — 24 ▲SS-10

▲SS-23 140 — B-10 280 — ▲SS-24 90 — B-4 81 — SS-43▲ 54 — SS-8▲ 100

MW-4 ⊕B-13 20 — CONC. PAD — SEWAGE WET WELL — FORMER PAWTUCKET NO. 1 STATION — SWITCHING GALLERIES — SUBSTATION — BASEBALL FIELDS

METAL STORAGE SHED — PAD — B-11 67 — FORMER MACHINE SHOP — MAX READ FIELD

SS-30▲ 26 — FORMER METER ROOM — SS-29▲ 65 — 98 B-17 — SS-42▲ 66

NATURAL GAS CONTROL HOUSE — MERRY STREET — THORNTON STREET — NURSING HOME

B-16 54 — NO. 7 GAS HOLDER 1,000,000 cuft — THORNTON STREET (ABANDONED) — TIDEWATER STREET — FRANCIS J. VARIEUR SCHOOL — PLAYSCAPE — PARKING

SS-34▲ (APPROX.) 110 — B-15 52 — NO. 8 GAS HOLDER 3,000,000 cuft — BENSLEY STREET — BOWLES COURT — PLEASANT STREET

220 — B-20 ⊕B-14 MW-7 ⊕MW-5 — TAFT STREET — TOWER STREET — TIDEWATER STREET — JEFFERS STREET — MERRY STREET — PLEASANT STREET

150 75 0 150 300

GRAPHIC SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 4-11
LEAD IN ON-SITE SURFACE SOIL (ppm)

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

061/0305/TIDE-PB

LEGEND

- ▲SS-44 — ATLANTIC SURFACE SOIL SAMPLE LOCATION
- TP-3A — ATLANTIC TEST PIT LOCATION
- ○B-7 — ATLANTIC SOIL BORING LOCATION
- ⊕MW-3 — ATLANTIC MONITORING WELL LOCATION
- 11141.1 — CONCENTRATION OF TOTAL PAHs (ppm) (BOLD INDICATES ONE OR MORE PAHs EXCEEDED REGULATORY CRITERIA)
- 8-9 — SAMPLING INTERVAL

N W E S

SEEKONK RIVER

62.87 9-10 TP-6
42.44 6-8
343.05 23-24 B-9
734.7 6-8 B-12 MW-3
TP-15 168.83 3-4
TP-7 212 9-10
2669 10-12
33,799 14-16 B-13
MW-4
TP-12 11141.1 8-9
TP-13A
TP-13 62562 3-4
CONC. PAD
SEWAGE WET WELL
FORMER PAWTUCKET NO. 1 STATION
SWITCHING GALLERIES
SUBSTATION
B-10 47.51 11-12
FORMER MACHINE SHOP
METAL STORAGE SHED
424.99 6-7 TP-11 TP-11A
B-11 190.43 10-12
4983.6 8-9 TP-8B
FORMER METER ROOM
PAD TP-10A
TP-10 229 11-12
TP-8A TP-8
PAD TP-9A
TP-9 29.08 8-9
TP-14 0.16 12-13
NATURAL GAS CONTROL HOUSE
MERRY STREET
THORNTON STREET
B-17 6.86 18-20
B-16 8.62 10-12
NO. 7 GAS HOLDER 1,000,000 cuft
THORNTON STREET (ABANDONED)
TP-16 6.65 7-8
B-15 18.92 4-6
NO. 8 GAS HOLDER 3,000,000 cuft
ND 4-6
TIDEWATER STREET
B-20 MW-7 B-14 MW-5
TAFT STREET
TOWER STREET
TIDEWATER
JEFFERS STREET
MERRY STREET
PLEASANT STREET
BENSLEY STREET
BOWLES COURT
TOWERS
B-8/MW-5 268.63 12-14
TP-5 7177.5 8.5-9.5
TP-4 368.61 4-5
B-4 207.49 22-24
TP-1 18.05 8-9
TP-3
TP-3A 10.17 3-4
B-8/MW-1 6946 20-22
CINDER DUMP LANDFILL
22,924 1-2 TP-2
▲SS-44 58,200 SEEP
B-5 975.42 4-6
4996.57 25-26
B-18 4011 8-10
B-19 0.29 4-6
B-1 1.22 16-18
B-2 ND 12-14
BASEBALL FIELDS
MAX READ FIELD
B-7 ND 28-30
B-3 ND 18-20
FRANCIS J. VARIEUR SCHOOL
PLAYSCAPE
PARKING
NURSING HOME

150 75 0 150 300
GRAPHIC SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 4-12
TOTAL PAH IN SUBSURFACE SOIL & MGP STRUCTURES (ppm)

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

1061/0305/TIDS-PAH

LEGEND

- ▲SS-44 — ATLANTIC SURFACE SOIL SAMPLE LOCATION
- TP-3A — ATLANTIC TEST PIT LOCATION
- ○B-7 — ATLANTIC SOIL BORING LOCATION
- ⊕MW-3 — ATLANTIC MONITORING WELL LOCATION
- 0.46 — CONCENTRATION OF TOTAL CYANIDE (ppm) (BOLD INDICATES PARAMETER EXCEEDED REGULATORY CRITERIA)
- 7-8 — SAMPLING INTERVAL

N

SEEKONK RIVER

100 / 9-10 — TP-8

8.1 / 6-8 / 1.4 / 23-24 — B-9

1.3 / 6-8 — B-12, MW-3

TP-15: 1 / 3-4

TP-7: 3.2 / 9-10

B-8/MW-6: 37 / 12-14

TP-5: 22 / 8.5-9.5

TOWERS

B-8/MW-1: 31 / 20-22

18 / 1-2 — TP-2

▲SS-44: 72 / SEEP

B-8: 120 / 4-6 / 52 / 25-26

CINDER DUMP LANDFILL

B-18: 320 / 8-10

B-10: 0.67 / 4-6

BASEBALL FIELDS

B-4: 21 / 22-24

TP-1: 31 / 8-9

TP-4: 51 / 4-5

B-10: 47 / 11-12

5.7 / 14-16 — B-13, MW-4

TP-13A

TP-13: 40 / 3-4

CONC. PAD

TP-12: 31 / 8-9

SEWAGE WET WELL

FORMER PAWTUCKET NO. 1 STATION

SWITCHING GALLERIES

SUBSTATION

TP-3

TP-3A: 350 / 3-4

B-1: ND / 16-18

B-2: ND / 12-14

MAX READ FIELD

METAL STORAGE SHED

14 / 6-7 — TP-11, TP-11A

B-11: 130 / 10-12

FORMER MACHINE SHOP

75 / 8-9 — TP-8B

FORMER METER ROOM

PAD

TP-10A

TP-10: 97 / 11-12

TP-8A | TP-8

TP-9A

TP-9: ND / 8-9

TP-14: 2.8 / 12-13

NATURAL GAS CONTROL HOUSE

B-7: ND / 28-30

B-3: ND / 18-20

NURSING HOME

PLAYSCAPE

FRANCIS J. VARIEUR SCHOOL

PARKING

B-17: 0.77 / 18-20

B-16: ND / 10-12

TP-16: 0.46 / 7-8

B-15: 48 / 4-6

NO. 7 GAS HOLDER 1,000,000 cuft

NO. 8 GAS HOLDER 3,000,000 cuft

ND / 4-6 — B-20, MW-7, B-14, MW-5

MERRY STREET

THORNTON STREET

THORNTON STREET (ABANDONED)

TIDEWATER STREET

TIDEWATER

JEFFERS STREET

BENSLEY STREET

BOWLES COURT

PLEASANT STREET

TAFT STREET

TOWER STREET

150 75 0 150 300

GRAPHIC SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 4-13
TOTAL CYANIDE IN SUBSURFACE SOIL & MGP STRUCTURES (ppm)

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

1061/0305/TIDS-CN

LEGEND

- ▲SS-44 — ATLANTIC SURFACE SOIL SAMPLE LOCATION
- TP-3A — ATLANTIC TEST PIT LOCATION
- ○B-7 — ATLANTIC SOIL BORING LOCATION
- ⊕MW-3 — ATLANTIC MONITORING WELL LOCATION
- 0.05 — CONCENTRATION OF TOTAL BTEX (ppm) (BOLD INDICATES ONE OR MORE PARAMETER EXCEEDED REGULATORY CRITERIA)
- 4-8 — SAMPLING INTERVAL

N

SEEKONK RIVER

4.15 / 9-10 — TP-6

0.5 / 6-8 / 14.08 / 23-24 — B-9

9.11 / 6-8 — B-12, MW-3

TP-15: 2.89 / 3-4

TP-7: 5 / 9-10

19.66 / 10-12 / 998.7 / 14-16 — MW-4, B-13

TP-12: 238.4 / 8-9

TP-13A

TP-13: 2354 / 3-4

CONC. PAD

SEWAGE WET WELL

FORMER PAWTUCKET NO. 1 STATION

SWITCHING GALLERIES

SUBSTATION

B-10: 1.76 / 11-12

FORMER MACHINE SHOP

METAL STORAGE SHED

192.1 / 6-7 — TP-11, TP-11A

B-11: 8.43 / 10-12

367 / 8-9 — TP-8B

FORMER METER ROOM

PAD, PAD, TP-10A

TP-10: 1.09 / 11-12

TP-9A, TP-8A, TP-8

TP-9: 0.21 / 8-9

TP-14: ND / 12-13

NATURAL GAS CONTROL HOUSE

B-8/MW-8: 13.12 / 12-14

TP-5: 40.04 / 8.5-9.5

TOWERS

TP-4: 77.31 / 4-5

B-4: 2.65 / 22-24

TP-3

TP-3A: 19.89 / 3-4

719.3 / 1-2 — TP-2

B-8/MW-1: 132.47 / 20-22

▲SS-44: 111 / SEEP

B-5: 22.13 / 4-6 / 70.49 / 25-26

CINDER DUMP LANDFILL

TP-1: 0.81 / 8-9

B-18: ND / 8-10

B-19: ND / 4-6

B-1: 0.06 / 16-18

B-2: ND / 12-14

BASEBALL FIELDS

MAX READ FIELD

B-7: ND / 28-30

B-3: ND / 18-20

FRANCIS J. VARIEUR SCHOOL

PLAYSCAPE

PARKING

NURSING HOME

B-17: 0.39 / 18-20

B-16: ND / 10-12

TP-16: 0.11 / 7-8

B-15: 0.05 / 4-6

NO. 7 GAS HOLDER 1,000,000 cuft

NO. 8 GAS HOLDER 3,000,000 cuft

ND / 4-6

B-20, MW-7, B-14, MW-5

THORNTON STREET (ABANDONED)

THORNTON STREET

MERRY STREET

TIDEWATER STREET

TAFT STREET

TOWER STREET

TIDEWATER

JEFFERS STREET

MERRY STREET

BENSLEY STREET

BOWLES COURT

PLEASANT STREET

PLEASANT STREET

150 75 0 150 300

GRAPHIC SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 4-14
TOTAL BTEX IN SUBSURFACE SOIL & MGP STRUCTURES (ppm)

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

1061/0305/TIDSBTEX

LEGEND

- SS-44 — ATLANTIC SURFACE SOIL SAMPLE LOCATION
- TP-3A — ATLANTIC TEST PIT LOCATION
- B-7 — ATLANTIC SOIL BORING LOCATION
- MW-3 — ATLANTIC MONITORING WELL LOCATION
- 7.2 — CONCENTRATION OF ARSENIC (ppm) (BOLD INDICATES PARAMETER EXCEEDED REGULATORY CRITERIA)
- 4-6 — SAMPLING INTERVAL

N W E S

SEEKONK RIVER

31 / 9-10 — TP-6

20 / 6-8 / 20 / 23-24 — B-9

7.2 / 6-8 — B-12 / MW-3

TP-15: 12 / 3-4

TP-7: 4,4 / 9-10

B-8/MW-6: 6.7 / 12-14

TP-5: 5.1 / 8.5-9.5

TP-4: 2.5 / 4-5

TOWERS

B-8/MW-1: 17 / 20-22

2.8 / 1-2 — TP-2

SS-44: 1.3 / SEEP

B-5: 4.6 / 4-6 / 44 / 25-26

CINDER DUMP LANDFILL

B-4: 7.1 / 22-24

TP-1: 20 / 8-9

B-18: 24 / 8-10

B-19: 3.1 / 4-6

BASEBALL FIELDS

B-1: 2.6 / 16-18

B-2: 2.5 / 12-14

MAX READ FIELD

26 / 14-16 — B-13 / MW-4

TP-12: 10 / 8-9

TP-13A

TP-13: 8.9 / 3-4

CONC PAD

SEWAGE WET WELL

B-10: 4.7 / 11-12

FORMER PAWTUCKET NO. 1 STATION

SWITCHING GALLERIES

SUBSTATION

FORMER MACHINE SHOP

TP-3

TP-3A: 3.7 / 3-4

METAL STORAGE SHED

1.8 / 6-7 — TP-11 / TP-11A

B-11: 5 / 10-12

1.1 / 6-9 — TP-8B

FORMER METER ROOM

PAD

TP-10A

TP-10: 9.2 / 11-12

TP-8A | TP-8

TP-9A

TP-9: 4 / 8-9

TP-14: 12 / 12-13

B-7: 4.8 / 28-30

B-3: 1.7 / 18-20

PLAYSCAPE

NURSING HOME

FRANCIS J. VARIEUR SCHOOL

PARKING

B-17: 5.9 / 18-20

B-16: 4.8 / 10-12

TP-16: 3.7 / 7-8

B-15: 7.2 / 4-6

NO. 7 GAS HOLDER 1,000,000 cuft

NO. 6 GAS HOLDER 3,000,000 cuft

2.6 / 4-6

B-20 MW-7 — B-14 MW-5

NATURAL GAS CONTROL HOUSE

MERRY STREET

THORNTON STREET

THORNTON STREET (ABANDONED)

TIDEWATER STREET

JEFFERS STREET

BENSLEY STREET

BOWLES COURT

PLEASANT STREET

TAFT STREET

TOWER STREET

150 75 0 150 300

GRAPHIC SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 4-15
ARSENIC IN SUBSURFACE SOIL & MGP STRUCTURES (ppm)

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

1061/0305/TIDS-AR

LEGEND

- ▲SS-44 — ATLANTIC SURFACE SOIL SAMPLE LOCATION
- TP-3A — ATLANTIC TEST PIT LOCATION
- ○B-7 — ATLANTIC SOIL BORING LOCATION
- ⊕MW-3 — ATLANTIC MONITORING WELL LOCATION
- 0.83 — CONCENTRATION OF BERYLLIUM (ppm) (BOLD INDICATES CONSTITUENT EXCEEDED REGULATORY CRITERIA)
- 7-8 — SAMPLING INTERVAL

N

SEEKONK RIVER

1.1 / 9-10 — TP-6

0.7 / 6-8 / 1 / 23-24 — B-6

ND / 6-8 — B-12, MW-3

TP-15: 0.63 / 3-4

TP-7: 0.27 / 9-10

0.54 / 14-16 — B-13, MW-4

TP-12: 0.47 / 8-9

TP-13A

TP-13: ND / 3-4

CONC. PAD

SEWAGE WET WELL

FORMER PAWTUCKET NO. 1 STATION

SWITCHING GALLERIES

SUBSTATION

B-10: 0.75 / 11-12

FORMER MACHINE SHOP

METAL STORAGE SHED

TP-11: 0.36 / 6-7

TP-11A

B-11: 0.54 / 10-12

PAD

TP-10A

0.33 / 8-9 — TP-8B

OIL HOUSE

FORMER METER ROOM

TP-10: 0.38 / 11-12

TP-8A | TP-8

TP-9: 0.29 / 8-9

TP-14: 0.3 / 12-13

B-17: 0.37 / 18-20

B-16: 0.46 / 10-12

TP-16: 0.83 / 7-8

B-15: ND / 4-6

NO. 7 GAS HOLDER 1,000,000 cuft

NO. 8 GAS HOLDER 3,000,000 cuft

ND / 4-6 — B-20, MW-7, B-14, MW-5

NATURAL GAS CONTROL HOUSE

THORNTON STREET (ABANDONED)

THORNTON STREET

MERRY STREET

TIDEWATER STREET

TAFT STREET

TOWER STREET

TIDEWATER

JEFFERS STREET

MERRY STREET

PLEASANT STREET

BENSLEY STREET

BOWLES COURT

0.47 / 12-14 — B-8/MW-6

TP-5: 0.54 / 8.5-9.5

TOWERS

TP-4: ND / 4-5

B-4: ND / 22-24

TP-3

TP-3A: ND / 3-4

B-7: 0.54 / 28-30

B-3: 0.31 / 18-20

FRANCIS J. VARIEUR SCHOOL

PLAYSCAPE

PARKING

NURSING HOME

ND / 1-2 — TP-2

B-8/MW-1: 0.7 / 20-22

▲SS-44: ND / SEEP

B-8: 0.31 / 4-6; 0.82 / 25-26

CINDER DUMP LANDFILL

B-18: ND / 8-10

B-19: 0.32 / 4-6

TP-1: 0.6 / 8-9

B-1: 0.43 / 16-18

B-2: 0.3 / 12-14

BASEBALL FIELDS

MAX READ FIELD

150 75 0 150 300

GRAPHIC SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 4-16
BERYLLIUM IN SUBSURFACE SOIL & MGP STRUCTURES (ppm)

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

1061/0305/TIDS-BE

LEGEND

- SS-44 — ATLANTIC SURFACE SOIL SAMPLE LOCATION
- TP-3A — ATLANTIC TEST PIT LOCATION
- B-7 — ATLANTIC SOIL BORING LOCATION
- MW-3 — ATLANTIC MONITORING WELL LOCATION
- 31 — CONCENTRATION OF LEAD (ppm) (BOLD INDICATES PARAMETER EXCEEDED REGULATORY CRITERIA)
- 4-6 — SAMPLING INTERVAL

N — S

SEEKONK RIVER

95 | 9-10 — TP-6

62 | 6-8 | 360 | 23-24 — B-9

ND | 6-8 — B-12 / MW-3

TP-7: 9.5 | 9-10

TP-15: 69 | 3-4

440 | 14-16 — B-13 / MW-4

TP-12: 150 | 8-9

TP-13A

TP-13: 91 | 3-4

CONC. PAD

SEWAGE WET WELL

FORMER PAWTUCKET NO. 1 STATION

SWITCHING GALLERIES

SUBSTATION

B-10: 90 | 11-12

FORMER MACHINE SHOP

METAL STORAGE SHED

17 | 6-7 — TP-11

TP-11A

B-11: 9.9 | 10-12

PAD — TP-10A

7.9 | 8-9 — TP-8B

FORMER METER ROOM

TP-10: 82 | 11-12

TP-8A | TP-8

PAD — TP-9A

TP-9: 8.1 | 8-9

TP-14: 7.9 | 12-13

B-17: 25 | 18-20

B-16: 36 | 10-12

TP-16: 24 | 7-8

B-15: 31 | 4-6

NO. 7 GAS HOLDER 1,000,000 cuft

NO. 8 GAS HOLDER 3,000,000 cuft

ND | 4-6

B-20 / MW-7 — B-14 / MW-5

NATURAL GAS CONTROL HOUSE

TOWERS

TP-5: 20 | 8.5-9.5

B-8/MW-6: 56 | 12-14

TP-4: 80 | 4-5

B-4: 24 | 22-24

TP-3

TP-3A: 36 | 3-4

B-8/MW-1: 86 | 20-22

36 | 1-2 — TP-2

SS-44: 11 | SEEP

B-5: 68 | 4-6 | 350 | 25-26

CINDER DUMP LANDFILL

TP-1: 86 | 8-9

B-18: 60 | 8-10

B-19: 49 | 4-6

B-1: 11 | 16-18

B-2: ND | 12-14

BASEBALL FIELDS

MAX READ FIELD

B-7: 16 | 28-30

B-3: 6.9 | 18-20

FRANCIS J. VARIEUR SCHOOL

PARSONAGE

NURSING HOME

PARKING

THORNTON STREET

THORNTON STREET (ABANDONED)

MERRY STREET

BENSLEY STREET

BOWLES COURT

PLEASANT STREET

TIDEWATER STREET

JEFFERS STREET

TAFT STREET

TOWER STREET

150 75 0 150 300

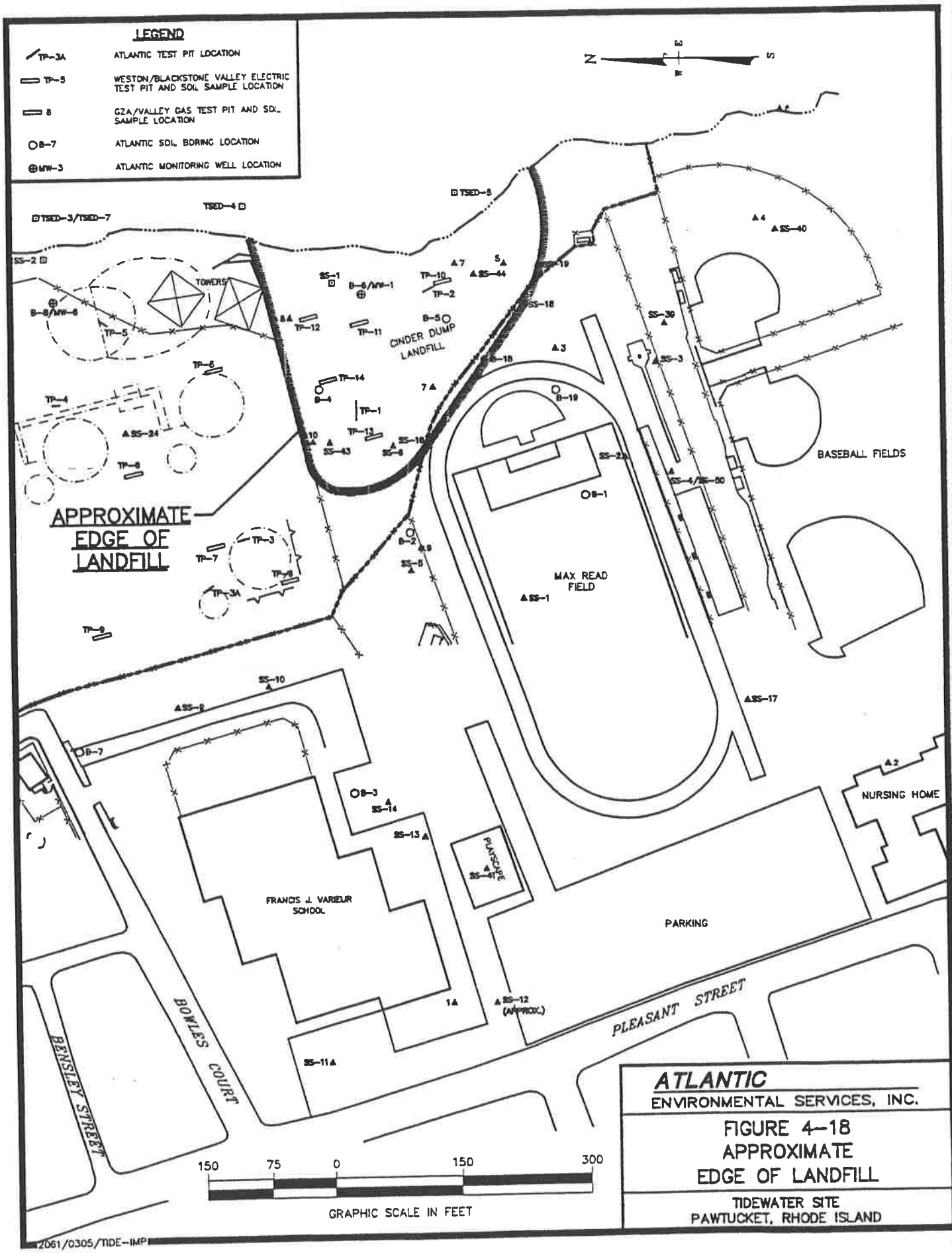
GRAPHIC SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 4-17
LEAD IN SUBSURFACE SOIL & MGP STRUCTURES (ppm)

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

1061/0305/TIDS-PB


LEGEND
TP-3A ATLANTIC TEST PIT LOCATION
TP-9 WESTON/BLACKSTONE VALLEY ELECTRIC TEST PIT AND SOIL SAMPLE LOCATION
8 GZA/VALLEY GAS TEST PIT AND SOIL SAMPLE LOCATION
B-7 ATLANTIC SOIL BORING LOCATION
MW-3 ATLANTIC MONITORING WELL LOCATION
N
APPROXIMATE EDGE OF LANDFILL
CINDER DUMP LANDFILL
TOWERS
BASEBALL FIELDS
MAX READ FIELD
FRANCIS J. VARIEUR SCHOOL
PLAYSCAPE
PARKING
NURSING HOME
PLEASANT STREET
BOWLES COURT
BENSLEY STREET
150 75 0 150 300
GRAPHIC SCALE IN FEET
ATLANTIC
ENVIRONMENTAL SERVICES, INC.
FIGURE 4-18
APPROXIMATE
EDGE OF LANDFILL
TIDEWATER SITE
PAWTUCKET, RHODE ISLAND
2061/0305/TIDE-IMP

LEGEND

⊡ TSED-6 ATLANTIC SEDIMENT SAMPLE LOCATION

N W E S

COMPOUND	RESULT
BTEX	0.28 ppm (TOTAL)
PAHs	20.14 ppm (TOTAL)
METALS	0.24 ppm ARSENIC
	0.59 ppm BERYLLIUM
	180 ppm LEAD
CYANIDE	0.34 ppm (TOTAL)
PCB	ND (TOTAL)

TSED-6

COMPOUND	RESULT
BTEX	4.51 ppm (TOTAL)
PAHs	2452 ppm (TOTAL)
METALS	4.4 ppm ARSENIC
	0.45 ppm BERYLLIUM
	55 ppm LEAD
CYANIDE	49 ppm (TOTAL)
PCB	ND (TOTAL)

TSED-2

COMPOUND	RESULT
BTEX	ND (TOTAL)
PAHs	23.9 ppm (TOTAL)
METALS	19 ppm ARSENIC
	0.88 ppm BERYLLIUM
	200 ppm LEAD
CYANIDE	6.2 ppm (TOTAL)
PCB	ND (TOTAL)

TSED-1

COMPOUND	RESULT
BTEX	3.17 ppm (TOTAL)
PAHs	168 ppm (TOTAL)
METALS	6 ppm ARSENIC
	1.6 ppm BERYLLIUM
	140 ppm LEAD
CYANIDE	10 ppm (TOTAL)
PCB	ND (TOTAL)

TSED-3/TSED-7

COMPOUND	RESULT
BTEX	11.35 ppm (TOTAL)
PAHs	344 ppm (TOTAL)
METALS	2.3 ppm ARSENIC
	0.33 ppm BERYLLIUM
	21 ppm LEAD
CYANIDE	29 ppm (TOTAL)
PCB	ND (TOTAL)

TSED-4

COMPOUND	RESULT
BTEX	18.85 ppm (TOTAL)
PAHs	3354 ppm (TOTAL)
METALS	5.1 ppm ARSENIC
	0.5 ppm BERYLLIUM
	74 ppm LEAD
CYANIDE	25 ppm (TOTAL)
PCB	ND (TOTAL)

TSED-5

SEEKONK RIVER

TOWERS

CINDER DUMP LANDFILL

BASEBALL FIELDS

MAX READ FIELD

CONC. PAD

SEWAGE WET WELL

FORMER PAWTUCKET NO. 1 STATION

SWITCHING GALLERIES

SUBSTATION

FORMER MACHINE SHOP

METAL STORAGE SHED

PAD

FORMER METER ROOM

NATURAL GAS CONTROL HOUSE

MERRY STREET

THORNTON STREET

NO. 7 GAS HOLDER 1,000,000 cuft

NO. 8 GAS HOLDER 3,000,000 cuft

TIDEWATER STREET

THORNTON STREET (ABANDONED)

FRANCIS J. VARIEUR SCHOOL

PLAYSCAPE

PARKING

NURSING HOME

BOWLES COURT

BENSLEY STREET

PLEASANT STREET

TAFT STREET

TOWER STREET

TIDEWATER

JEFFERS STREET

MERRY STREET

PLEASANT STREET

150 75 0 150 300

GRAPHIC SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 4-19
COMPOSITE OF SEDIMENT ANALYTICAL DATA

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

061/0305/TIDE-SED

LEGEND

⊕MW-3 ATLANTIC MONITORING WELL LOCATION

⊕M&E MW-1 METCALF & EDDY MONITORING WELL LOCATION (1990)

N

COMPOUND	EXCEEDANCES	RESULT
VOCs	0	ND
PAH	0	ND
METALS	0	–
CYANIDE	0	0.65 ppm (TOTAL)

COMPOUND	EXCEEDANCES	RESULT
VOCs	0	0.02 ppm (TOTAL)
PAH	0	0.07 ppm (TOTAL)
METALS	0	–
CYANIDE	0	0.068 ppm (TOTAL)

COMPOUND	EXCEEDANCES	RESULT
VOCs	0	0.5 ppm (TOTAL)
PAH	0	13.34 ppm (TOTAL)
METALS	0	–
CYANIDE	0	0.24 ppm (TOTAL)

COMPOUND	EXCEEDANCES	RESULT
VOCs	0	0.08 ppm (TOTAL)
PAH	0	0.4 ppm (TOTAL)
METALS	0	–
CYANIDE	0	0.18 ppm (TOTAL)

COMPOUND	EXCEEDANCES	RESULT
VOCs	0	0.82 ppm (TOTAL)
PAH	0	5.47 ppm (TOTAL)
METALS	0	–
CYANIDE	0	0.3 ppm (TOTAL)

COMPOUND	EXCEEDANCES	RESULT
VOCs	0	ND
PAH	0	ND
METALS	0	-
CYANIDE	0	ND

SEEKONK RIVER

B-8/MW-6

B-8/MW-1

TOWERS

CINDER DUMP LANDFILL

BASEBALL FIELDS

MAX READ FIELD

MW-3

M&E MW-5

M&E MW-2

M&E MW-4

M&E MW-1

M&E MW-3

MW-4

CONC. PAD

SEWAGE WET WELL

FORMER PAWTUCKET NO. 1 STATION

SWITCHING GALLERIES

SUBSTATION

FORMER MACHINE SHOP

FORMER METER ROOM

METAL STORAGE SHED

PAD

NATURAL GAS CONTROL HOUSE

MERRY STREET

THORNTON STREET

NO. 7 GAS HOLDER 1,000,000 cuft

NO. 8 GAS HOLDER 3,000,000 cuft

THORNTON STREET (ABANDONED)

TIDEWATER STREET

FRANCIS J. VARIEUR SCHOOL

PLAYSCAPE

PARKING

NURSING HOME

BOWLES COURT

BENSLEY STREET

PLEASANT STREET

MW-7

MW-5

TAFT STREET

TOWER STREET

TIDEWATER

JEFFERS STREET

MERRY STREET

PLEASANT STREET

150 75 0 150 300

GRAPHIC SCALE IN FEET

ATLANTIC
ENVIRONMENTAL SERVICES, INC.

FIGURE 4-20
COMPOSITE OF GROUNDWATER ANALYTICAL RESULTS

TIDEWATER SITE
PAWTUCKET, RHODE ISLAND

081/0305/TIDE-GW

TABLES

FOOTNOTES FOR TIDEWATER TABLES

--	-	No Criteria.
ND	-	Not Detected.
NA	-	Not Analyzed.
U	-	Indicates that the compound was not detected at the detection limit noted.
J⁻	-	This qualifier indicates an estimated concentration.
E	-	Analytical result exceeds linear range of instrument.
59	-	Shade/bold indicates an exceedance of the applicable regulatory criteria

TABLE 1-1
TIDEWATER SITE
DATA SUMMARY
PREVIOUS INVESTIGATION (RIDEM 1986)
SURFACE SOIL SAMPLES - SCHOOL AND CITY PROPERTY

Compound	1	2	3	4	5	6	7A	7B	7C	8A	8B	9	10	11
Base-Neutral Extractable Compounds (ppm) (partial listing)														
Acenaphthene	ND	ND	ND	ND	333	ND	131	ND	ND	ND	ND	ND	ND	ND
Benzidine	ND	ND	ND	ND	ND	ND	113	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	ND	ND	ND	ND	613	ND	231	ND	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND	ND	129	2165	76	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	ND	1478	ND	388	146	56	95	ND	ND	ND	ND
Fluorene	ND	ND	ND	ND	359	ND	115	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	ND	ND	ND	ND	766	ND	193	ND	ND	47	ND	ND	ND	ND
Pyrene	ND	ND	ND	ND	132	ND	46	ND	ND	ND	ND	ND	ND	ND
E.P. Toxicity Metals (mg/L)														
Lead					ND	0.08	0.08	0.11	ND	ND	0.05	ND	0.08	0.?
Arsenic					ND	ND	ND	ND	ND	ND	0.056	ND	ND	ND
Cadmium					ND	ND	0.3	0.3	0.02	ND	0.08	0.01	0.02	0.?
Chromium					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Other Analyses														
VOCs (ppm)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acid Extractable Compounds (ppm)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Cyanide (mg/kg)	10	2.5	44	2.5	73	5.1	226	481	367	76	42			
Free Cyanide (mg/kg)	1.9	2	0.94	0.93	1.9	0.95	2	2.9	2	1	0.99			
pH	6.4	6.9	5.9	6.3	3.9	6.1	5	3.2	3.5	4.9	4.2	4.7	4.2	5.?
PCBs (mg/kg)							ND	ND	ND	ND	1.7*	2.7*	ND	ND
Flashpoint, °F						184	170	168				>200	146	

Notes:

* as aroclor 1260

ND - not detected

? - result unreadable

TABLE 1-2
TIDEWATER SITE
DATA SUMMARY
PREVIOUS INVESTIGATIONS (RI Analytical/GZA - December 1986)
TEST PIT SOIL SAMPLES - VALLEY GAS PROPERTY

Compound	5 (Coal Tar)	5 (Soil)	Blue (Soil)*	2 (Soil)	4 (Soil)	4 (Sat. Zone)
Polycyclic Aromatic Hydrocarbons (mg/kg)						
Naphthalene	12900	167	230	ND	ND	37
Acenaphthylene	ND	ND	ND	ND	ND	ND
Acenaphthene	ND	ND	ND	ND	ND	ND
Fluorene	3700	47	400	ND	ND	3.2
Phenanthrene	4600	150	2110	4	3.9	9.8
Anthracene	1200	22	300	0.6	0.9	2.8
Fluoranthene	8900	342	3900	ND	ND	18.6
Pyrene	11950	95	4500	ND	ND	24.8
Benzo[a]anthracene	3000	65	429	ND	8.3	8.9
Chrysene	1963	66	647	ND	5.4	3.2
Benzo[b]fluoranthene	1600	100	851	ND	ND	2.3
Benzo[k]fluoranthene	ND	13	133	ND	ND	ND
Benzo[a]pyrene	488	24	261	ND	ND	ND
Dibenz[a,h]anthracene	1297	97	278	ND	ND	ND
Benzo[g,h,i]perylene	NA	NA	NA	ND	ND	ND
Indeno[1,2,3-cd]pyrene	183	95	98	ND	ND	0.8
Total PAHs	51781	1283	14137	4.6	18.5	111.4
Inorganics (mg/kg)						
Arsenic	0.23	NA	0.25	NA	NA	NA
Barium	19	NA	21	NA	NA	NA
Cadmium	0.14	NA	0.41	NA	NA	NA
Chromium	12	NA	17	NA	NA	NA
Lead	91	NA	2	NA	NA	NA
Mercury	<0.1	NA	<0.1	NA	NA	NA
Selenium	<0.1	NA	<0.1	NA	NA	NA
Silver	<0.1	NA	<0.1	NA	NA	NA
Total Cyanide	19.3	5.89	245	46.1	<0.93	<0.74

Note:

*samples taken adjacent to test pit 4

TABLE 1-3
TIDEWATER SITE
DATA SUMMARY
PREVIOUS INVESTIGATION (Weston - May 1988)
TEST PIT SOIL AND SEDIMENT SAMPLES - BVE PROPERTY

		Power Plant Area						Former Oil Storage Area (Tanks No. 1 &2)				Former Oil Storage Area (Tank No. 3)			Area West of Substation	
		TP-1		TP-2*	TP-3		TP-4*	TP-5		TP-6		TP-7*	TP-8		TP-9	
Compound	Criteria (mg/kg)	S-1	S-2	S-2	S-1	S-2	S-1	S-1	S-2	S-1	S-2	S-1	S-1	S-2	S-1	S-2
Base Neutral Analysis (mg/kg)																
Acenaphthene		ND	ND	9.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene		ND	ND	8.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene		ND	ND	53	7.3	ND	ND	ND	2.3	ND	ND	ND	ND	ND	ND	ND
Pyrene		ND	ND	ND	16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	33
Acenaphthylene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	13
Fluoranthene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	27
Benzo(a)anthracene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	16
Chrysene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	17
Benzo(a)pyrene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11
Naphthalene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenz(a,h)anthracene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total PAHs		ND	ND	70.7	23.3	ND	ND	ND	2.3	ND	ND	ND	ND	ND	ND	117
2-Methylphenol		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Di-methylphenol		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenols		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methylphenol		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Others		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Other Analyses																
Total Cyanide (ppm)		<6	<5	<6	7	<5	35	<5	18	72	34	87	160	9	23	16
pH		9.3	5.1	9.1	9.2	6.8	3.5	7.6	7.2	5.3	4.7	5.1	4.3	5	8.4	8.6
Total PCBs (ppm)		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 1-3 (continued)
TIDEWATER SITE
DATA SUMMARY
PREVIOUS INVESTIGATION (Weston - May 1988)
TEST PIT SOIL AND SEDIMENT SAMPLES - BVE PROPERTY

Compound	Criteria (mg/kg)	Former Landfill Area										Sediment Samples		
		TP-10		TP-11		TP-12		TP-13		TP-14				
		S-1	S-2	S-1	S-2	S-1	S-2	S-1	S-2	S-1	S-2	SS-1	SS-2	SS-3
Base Neutral Analysis (mg/kg)														
Acenaphthene		ND	ND	ND	ND	ND	ND	ND	ND	630	ND	ND	ND	ND
Fluorene		16	ND	ND	ND	ND	ND	ND	ND	3200	ND	ND	ND	ND
Phenanthrene		44	1.8	19	24	7.6	ND	ND	ND	7900	ND	28	ND	ND
Pyrene		52	5.4	30	29	20	27	ND	1.5	4600	3.3	37	ND	ND
Acenaphthylene		ND	ND	35	ND	10	10	ND	1.4	3700	1.2	ND	ND	ND
Fluoranthene		18	3.7	15	13	15	29	ND	1	4700	3.2	29	ND	ND
Benzo(a)anthracene		22	1.9	25	15	12	13	ND	ND	1800	2.4	23	ND	ND
Chrysene		27	1.9	36	15	19	11	ND	1.9	1300	2.1	28	ND	ND
Benzo(a)pyrene		16	1.5	19	ND	22	13	ND	1.8	1400	2.3	ND	ND	ND
Naphthalene		48	ND	ND	ND	ND	ND	ND	2.8	19000	ND	ND	ND	ND
2-Methylnaphthalene		36	ND	ND	ND	ND	ND	ND	ND	3700	ND	ND	ND	ND
Benzo(b)fluoranthene		11	1.4	26	ND	20	13	ND	1.6	1200	2.9	ND	ND	ND
Benzo(k)fluoranthene		10	1.7	24	ND	19	10	ND	1.6	1100	1.9	ND	ND	ND
Benzo(g,h,i)perylene		11	1.1	35	ND	25	11	ND	1.8	920	2.2	ND	ND	ND
Anthracene		ND	ND	13	ND	ND	ND	ND	ND	2700	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene		ND	ND	31	ND	21	10	ND	1.6	790	2.1	ND	ND	ND
Dibenz(a,h)anthracene		ND	ND	10	ND	6.6	ND	ND	0.66	ND	ND	ND	ND	ND
Total PAHs		311	20.2	318	96	197.2	147	ND	17.66	58640	23.6	145	ND	ND
2-Methylphenol		ND	ND	ND	ND	ND	ND	ND	ND	2100	ND	ND	ND	ND
2,4-Di-methylphenol		ND	ND	ND	ND	ND	ND	ND	ND	3100	ND	ND	ND	ND
Dibenzofuran		ND	ND	ND	ND	ND	ND	ND	ND	1900	ND	ND	ND	ND
Phenols		ND	ND	ND	ND	ND	ND	ND	ND	1900	ND	ND	ND	ND
4-Methylphenol		ND	ND	ND	ND	ND	ND	ND	ND	4000	ND	ND	ND	ND
Others		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Other Analyses														
Total Cyanide (ppm)		82	NA	1500	350	590	84	<5	190	620	NA	135	260	<6
pH		4.8	NA	4.2	4	4.8	8.9	4.8	4.2	6.8	NA	4.7	5	6.7
Total PCBs (ppm)		ND	ND	5	30	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

* only one sample collected for chemical analysis at this location

TABLE 1-4
TIDEWATER SITE
DATA SUMMARY
PREVIOUS INVESTIGATION (Metcalf & Eddy - May 1991)
GROUNDWATER SAMPLES

Compound	M&E MW-1	M&E MW-2	M&E MW-3	M&E MW-4	M&E MW-5
Benzene	20	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	370
Ethylbenzene	ND	ND	ND	ND	42
Xylenes	350	ND	ND	ND	ND
Acetone	ND	460	ND	ND	ND
TPH	16	2.8	ND	ND	73
Naphthalene	774	ND	ND	ND	329
2-Methylnaphthalene	98.8	ND	ND	ND	ND
Acenophthylene	40.5	ND	ND	ND	ND
Phenanthrene	45.5	ND	ND	ND	ND

Notes:

All results are reported in ug/L (ppb) with the exception of the TPH results which are reported in mg/L (ppm)

TABLE 1-5
TIDEWATER SITE
DATA SUMMARY
TANK REMOVAL (E.R. PICKETT COMPANY - JULY 1995)
CONFIRMATION SAMPLES - VALLEY GAS PROPERTY

Compound	West End Beneath Tank	East End Beneath Tank
Total Petroleum Hydrocarbons (mg/kg)		
TPH	<33	<32
VOCs 8260 (mg/kg)*		
Benzene	<0.2	<0.2
Toluene	0.3	<0.2
Ethylbenzene	0.3	<0.2
Xylenes	0.9	<0.2
Naphthalene	ND	0.3

Note:

* Hit table only, all other compounds were not detected.

TABLE 3-1
GROUNDWATER SURFACE ELEVATION DATA
TIDEWATER SITE

Primary Data

Well ID	Depth to Water	Elevation of Mark	Elevation of Water
MW-1	17.78	19.87	2.09
MW-3	9.38	11.52	2.14
MW-4	10	10.7	0.7
MW-6	11.54	13.65	2.11
MW-7	21.76	32.1	10.34

Secondary Data

Test Pit/Boring ID	Depth to Water	Elevation of Ground	Elevation of Water
TTP-1	Not Encountered (< 14 feet)	19.5	< 5.5
TTP-2	Not Encountered (< 11 feet)	18.2	< 7.2
TTP-3	10.5	11.6	1.1
TTP-4	8.5	10.7	2.2
TTP-5	10.3	12.6	2.3
TTP-6	10	9.4	-0.6
TTP-7	10	9.07	-0.93
TTP-8B	8.5	16.3	7.8
TTP-11	6	9.6	3.6
TTP-12	8.6	7.6	-1
TTP-14	13	24	11
TTP-16	11	17.5	6.5
TB-1	Not Encountered (< 22 feet)	34.28	< 12.28
TB-2	Not Encountered (< 20 feet)	37.89	< 17.89
TB-3	Not Encountered (< 20 feet)	42.06	< 22.06
TB-4	17	18.08	1.08
TB-5	18	20.44	2.44
TB-7	Not Encountered (< 35 feet)	41.84	< 6.84
TB-9	7	8.57	1.57
TB-10	8	10.29	2.29
TB-11	10	10.75	0.75
TB-15	8	19.8	11.8
TB-16	4	7.36	3.36
TB-17	6	8.16	2.16
TB-18	33	32.64	-0.36

TABLE 4-1
TIDEWATER SITE
SUMMARY OF SOIL GAS RESULTS

Sample Point	Total Peak Area (Vs)	Total BTEX TCE/PCE Area (Vs	Benzene	Toluene	Ethylbenzene	m-p Xylene	o Xylene	TCE	PCE	Category
Instrument Blank										ND
BTEX Calibration Std.										ND
Syringe Blank										ND
Equipment Blank										ND
TW-SG-14										ND
TW-SG-15										ND
TW-SG-16										ND
TW-SG-18										ND
TW-SG-4										ND
TW-SG-3										ND
TW-SG-2										ND
TW-SG-1										ND
TW-SG-19										ND
Continuing Calibration Std										ND
Instrument Blank										ND
Equipment/Syringe Blank										ND
Calibration Standard										ND
Equipment Blank										ND
TW-SG-5										ND
TW-SG-6										ND
TW-SG-28										ND
TW-SG-27										ND
TW-SG-8										ND
TW-SG-9										ND
TW-SG-10										ND
TW-SG-11										ND
TW-SG-26										ND
Tubing Standard	29.9	29.9	•	•		•	•			Low
Tubing Blank										ND
Syringe STD	72.1	72.1	•	•		•	•			Low
Equipment Blank										ND
TW-SG-22								•		Low
TW-SG-23										ND
TW-SG-24										ND
TW-SG-25								•		Low
TW-SG-17										ND
TW-SG-22 (reanalysis)								•		Low
TW-SG-25 (reanalysis)								•		Low
TW-SG-12										ND
TW-SG-13										ND
Closing Calibration Std.	36.3	36.3	•	•		•	•			Low
Equipment Blank										ND

TABLE 4-2
TIDEWATER SITE
SURFACE SOIL SAMPLES - OFF-SITE PROPERTIES

Compound	Residential Direct Exposure Criteria (mg/kg)	GB Leachability (mg/kg)	TSS45	TSS46	TSS47	TSS48	TSS49
Volatile Organic Compounds (mg/kg)							
Benzene	2.5	413	0.16 U	0.20 U	0.16 U	0.13 U	0.11 U
Toluene	190	54	0.16 UJ	0.20 UJ	0.16 UJ	0.15 UJ	0.11 UJ
Ethylbenzene	71	62	0.16 U	0.20 U	0.16 U	0.13 U	0.11 U
m/p-Xylene	110	--	0.16 U	0.20 U	0.16 U	0.13 U	0.11 U
o-Xylene	110	--	0.16 U	0.20 U	0.16 U	0.13 U	0.11 U
Total BTEX			ND	ND	ND	ND	ND
Polycyclic Aromatic Hydrocarbons (mg/kg)							
Naphthalene	54	--	0.16 U	0.20 U	0.16 U	0.21	0.16
2-Methylnaphthalene	123	--	0.19	0.20 U	0.16 U	0.15	0.11 J
1-Methylnaphthalene	--	--	0.16 U	0.20 U	0.16 U	0.08 J	0.07 J
Acenaphthylene	23	--	0.16 U	0.20 U	0.16 U	0.41	0.09 J
Acenaphthene	43	--	0.16 U	0.20 U	0.16 U	0.13 U	0.06 J
Dibenzofuran	--	--	0.16 U	0.20 U	0.16 U	0.13 U	0.10 J
Fluorene	28	--	0.16 U	0.20 U	0.16 U	0.13 U	0.19
Phenanthrene	40	--	0.11 J	0.20 U	0.4	1.13	1.04
Anthracene	35	--	0.16 U	0.20 U	0.16 U	0.21	0.29
Fluoranthene	20	--	0.19	0.20 U	0.83	2.08	1.33
Pyrene	13	--	0.23	0.20 U	0.7	1.89	1.02
Benzo[a]anthracene	0.9	--	0.16 J	0.20 U	0.34	1.16	0.7
Chrysene	0.4	--	0.12 J	0.20 U	0.38	1.35	0.86
Benzo[b]fluoranthene	0.9	--	0.19	0.20 U	0.36	1.06	0.61
Benzo[k]fluoranthene	0.9	--	0.22	0.20 U	0.24	1.19	0.67
Benzo[a]pyrene	0.4	--	0.47	0.35	0.52	1.56	0.83
Indeno[1,2,3-cd]pyrene	0.9	--	0.17	0.20 U	0.21	0.98	0.5
Dibenz[a,h]anthracene	0.4	--	0.16 U	0.20 U	0.16 U	0.26	0.19
Benzo[g,h,i]perylene	0.8	--	0.45	0.52	0.28	1.15	0.78
Total PAHs			2.5	0.87	4.26	14.86	9.6
Metals (mg/kg)							
Antimony	10	--	11U*	11U*	9.8U	9.9U	9.3U
Arsenic	1.7	--	2.6	2.9	6.9	4	4
Barium	5,500	--	42	35	22	21	84
Beryllium	0.4	--	0.75	0.82	0.55	0.43	0.54
Cadmium	39	--	1.1U	1.1U	0.98U	0.99U	1.4
Chromium	390*	--	18	17	19	10	20
Copper	3,100	--	13	23	18	14	43
Lead	150	--	40	64	52	67	180
Mercury	23.0	--	0.070U	0.081	0.060U	0.065	0.35
Nickel	1,000	--	15	22	18	12	17
Selenium	390	--	11U	11U	9.8U	9.9U	9.3U
Silver	200	--	2.3U	2.2U	2.0U	2.0U	1.9U
Thallium	5.5	--	0.24U	0.23U	0.21U	0.21U	0.19U
Zinc	6,000	--	42	64	53	57	150
Total Cyanide	200	--	N/A	N/A	N/A	N/A	N/A
Polychlorinated Biphenyls (PCBs (mg/kg)							
Total PCBs	10	10	N/A	N/A	N/A	N/A	N/A

Note:

* Detection limit is greater than the criteria.

TABLE 4-3
TIDEWATER SITE
SURFACE SOIL SAMPLES - SCHOOL AND CITY PROPERTY

Compound	Residential Direct Exposure Criteria (mg/kg)	GB Leachability (mg/kg)	SS-1	SS-2	SS-3	SS-4	SS-5	SS-9	SS-10	SS-11	SS-12	SS-13	SS-14
Volatile Organic Compounds (mg/kg)													
Benzene	2.5	413	0.15 U	0.16 U	0.17 U	0.16 UJ	0.17 UJ	0.20 UJ	0.17 UJ	0.15 UJ	0.16 UJ	0.13 UJ	0.15 U
Toluene	190	54	0.15 U	0.16 U	0.17 UJ	0.16 UJ	0.17 U	0.17 UJ	0.17 U	0.15 U	0.16 UJ	0.13 UJ	0.15 U
Ethylbenzene	71	62	0.15 U	0.16 U	0.17 U	0.06 J	0.17 U	0.17 U	0.17 U	0.15 U	0.16 U	0.08 J	0.15 U
m/p-Xylene	110	--	0.15 U	0.16 U	0.17 U	0.05 J	0.17 U	0.17 U	0.17 U	0.15 U	0.16 U	0.13 U	0.15 U
o-Xylene	110	--	0.15 U	0.16 U	0.17 U	0.16 U	0.17 U	0.17 U	0.17 U	0.15 U	0.16 U	0.13 U	0.15 U
Total BTEX			**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**0.08**	**ND**
Polycyclic Aromatic Hydrocarbons (mg/kg)													
Naphthalene	54	--	0.15 U	0.16 U	0.19	0.71	0.17 U	0.08 J	0.17 U	0.15 U	0.16 U	0.07 J	0.15 U
2-Methylnaphthalene	123	--	0.15 U	0.16 U	0.14 J	0.64	0.17 U	0.12 J	0.09 J	0.15 U	0.06 J	0.06 J	0.15 U
1-Methylnaphthalene	--	--	0.15 U	0.16 U	0.17 U	0.29	0.17 U	0.17 U	0.17 U	0.15 U	0.16 U	0.13 U	0.15 U
Acenaphthylene	23	--	0.15 U	0.16 U	0.09 J	0.61	0.17 U	0.14 J	0.11 J	0.15 U	0.08 J	0.10 J	0.15 U
Acenaphthene	43	--	0.15 U	0.16 U	0.17 U	0.06 J	0.17 U	0.07 J	0.17 U	0.15 U	0.07 J	0.09 J	0.15 U
Dibenzofuran	--	--	0.15 U	0.16 U	0.17 U	0.16 U	0.17 U	0.17 U	0.17 U	0.15 U	0.16 U	0.06 J	0.15 U
Fluorene	28	--	0.15 U	0.16 U	0.17 U	0.25	0.17 U	0.06 J	0.17 U	0.15 U	0.16 U	0.08 J	0.15 U
Phenanthrene	40	--	0.08 J	0.09 J	0.13 J	1.59	0.17 U	0.4	0.56	0.17	0.55	0.83	0.16
Anthracene	35	--	0.15 U	0.16 U	0.17 U	0.45	0.17 U	0.11 J	0.15 J	0.15 U	0.11 J	0.16	0.15 U
Fluoranthene	20	--	0.25	0.19	0.23	1.89	0.09 J	0.98	1.1	0.42	1.51	2.88	0.45
Pyrene	13	--	0.41	0.32	0.29	2.85	0.15 J	1.09	1.02	0.44	1.57	2.63	0.51
Benzo[a]anthracene	0.9	--	0.15 J	0.09 J	0.16 J	1.8	0.17 U	0.6	0.61	0.19	0.69	1.33	0.22
Chrysene	0.4	--	0.36	0.28	0.38	2.14	0.17 U	1.33	1.16	0.79	1.22	2.38	0.42
Benzo[b]fluoranthene	0.9	--	0.14 J	0.08 J	0.18	1.48	0.10 J	0.66	0.66	0.26	0.9	2.01	0.27
Benzo[k]fluoranthene	0.9	--	0.16	0.10 J	0.17	1.6	0.17 U	0.61	0.61	0.24	0.88	1.77	0.29
Benzo[a]pyrene	0.4	--	0.59	0.39	0.4	2.46	0.09 J	1.09	1.15	0.46	1.34	2.61	0.4
Indeno[1,2,3-cd]pyrene	0.9	--	0.17	0.08 J	0.24	1.32	0.21	0.55	0.49	0.17	0.78	1.56	0.21
Dibenz[a,h]anthracene	0.4	--	0.6	0.41	0.25	0.52	0.06 J	0.78	0.69	0.21	0.57	1.12	0.09 J
Benzo[g,h,i]perylene	0.8	--	0.77	0.62	0.52	1.79	0.16 J	1.45	1.41	0.48	1.04	2.55	0.36
Total PAHs			**3.6**	**2.65**	**3.37**	**22.45**	**0.86**	**10.12**	**9.81**	**3.83**	**11.37**	**22.29**	**3.38**
Metals (mg/kg)													
Antimony	10	--	9.9 U	8.9 U	8.8 U	9.3 U	9.4 U	9.3 U	9.2 U	9.4 U	9.3 U	9.1 U	9.7 U
Arsenic	1.7	--	4.6	1.9	2.6	3.3	2.4	5.7	3.7	2.4	4.6	3.7	3.2
Barium	5,500	--	40	35	24	36	11	35	47	27	43	33	28
Beryllium	0.4	--	0.47	0.45	0.23	0.46	0.21	0.43	0.37	0.35	0.48	0.43	0.33
Cadmium	39	--	0.99 U	0.89 U	0.88 U	0.93 U	0.94 U	0.93 U	0.92 U	0.94 U	0.93 U	0.91 U	0.97 U
Chromium	390*	--	18	30	8.7	16	5.5	12	8.3	8	13	12	11
Copper	3,100	--	17	17	9.1	21	6.7	16	17	8.1	18	13	9.9
Lead	150	--	48	65	21	56	15	90	130	75	100	38	35
Mercury	23.0	--	0.10 U	0.089 U	0.092 U	0.091 U	0.096 U	0.090 U	0.098 U	0.098 U	0.091 U	0.086 U	0.10 U
Nickel	1,000	--	13	16	7.5	12	7.8	8.7	8.4	5.8	11	11	11
Selenium	390	--	9.9 U	8.9 U	8.8 U	9.3 U	9.4 U	9.3 U	0.92 U	9.4 U	9.3 U	9.1 U	9.7 U
Silver	200	--	2.0 U	1.8 U	1.8 U	1.9 U	1.9 U	1.9 U	1.8 U	1.9 U	1.9 U	1.8 U	1.9 U
Thallium	5.5	--	0.20 U	0.18 U	0.18 U	0.19 U	0.19 U	0.19 U	0.18 U	0.19 U	0.19 U	0.18 U	0.19 U
Zinc	6,000	--	42	68	44	74	21	35	61	32	46	79	32
Total Cyanide	200	--	1.1 U	0.90 U	1.4	4.2	0.73 U	0.98 U	1.0 U	0.88 U	0.66 U	0.67 U	0.90 U
Polychlorinated Biphenyls (PCBs) (mg/kg)													
Total PCBs	10	10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

TABLE 4-3 (continued)
TIDEWATER SITE
SURFACE SOIL SAMPLES - SCHOOL AND CITY PROPERTY

Compound	Residential Direct Exposure Criteria (mg/kg)	GB Leachability (mg/kg)	TSS16	TSS17	TSS18	TSS39	TSS40	SS-41	TB1 (0-2)	TB2 (0-2)	TB3 (0-2)	TB7 (0-2)	TB18 (0-2)	TB19 (0-2)
Volatile Organic Compounds (mg/kg)														
Benzene	2.5	413	N/A	N/A	N/A	N/A	N/A	0.25 UJ	N/A	N/A	N/A	N/A	.0056U	N/A
Toluene	190	54	N/A	N/A	N/A	N/A	N/A	0.13 UJ	N/A	N/A	N/A	N/A	.0056U	N/A
Ethylbenzene	71	62	N/A	N/A	N/A	N/A	N/A	0.13 U	N/A	N/A	N/A	N/A	.0056U	N/A
m/p-Xylene	110	--	N/A	N/A	N/A	N/A	N/A	0.13 U	N/A	N/A	N/A	N/A	.0056U	N/A
o-Xylene	110	--	N/A	N/A	N/A	N/A	N/A	0.13 U	N/A	N/A	N/A	N/A	.0056U	N/A
Total BTEX			N/A	N/A	N/A	N/A	N/A	ND	N/A	N/A	N/A	N/A	ND	N/A
Polycyclic Aromatic Hydrocarbons (mg/kg)														
Naphthalene	54	--	0.17U	0.38 UJ	0.32	0.36 UJ	0.60	0.13 U	0.15 U	0.18U	0.19U	0.19U	0.74	0.21U
2-Methylnaphthalene	123	--	0.17U	0.19	0.19U	0.20 U	0.38	0.13 U	0.15 U	0.18U	N/A	0.19U	0.43	0.21U
1-Methylnaphthalene	--	--	N/A	0.12 U	N/A	0.20 U	0.17 U	0.13 U	0.05 U	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	23	--	0.41	0.12 U	1	0.20 U	0.44	0.13 U	0.15 U	0.18U	0.19U	0.64	1.3	0.21U
Acenaphthene	43	--	0.17U	0.12 U	0.29	0.20 U	0.17 U	0.09 J	0.05 U	0.18U	0.19U	0.19U	0.18U	0.21U
Dibenzofuran	--	--	N/A	0.12 U	N/A	0.20 U	0.17 U	0.13 U	0.15 U	N/A	N/A	N/A	N/A	N/A
Fluorene	28	--	0.17U	0.12 U	0.58	0.20 U	0.17 U	0.05 J	0.15 U	0.18U	0.19U	0.19U	0.65	0.21U
Phenanthrene	40	--	0.83	0.32	3.8	0.65	0.90	0.43	0.11 J	0.18U	0.34	0.58	3.5	0.21U
Anthracene	35	--	0.28	0.12 U	1.4	0.20 U	0.37	0.08 J	0.15 U	0.18U	0.19U	0.25	1.2	0.21U
Fluoranthene	20	--	1.6	0.22	5.3	0.84	1.38	0.9	0.15	0.18U	1.6	1.9	3.3	0.47
Pyrene	13	--	2.3	0.39	5.8	0.79	1.54	0.87	0.15	0.18U	1.6	2.1	5	0.46
Benzo[a]anthracene	0.9	--	1.7	0.12 U	4.2	0.43	1.07	0.38	0.16	0.18U	0.69	1.4	3.6	0.21U
Chrysene	0.4	--	2.1	0.43	4	0.62	1.35	0.49	0.10 J	0.18U	0.86	1.3	4	0.22
Benzo[b]fluoranthene	0.9	--	1.3	0.12 U	4.2	0.35	0.82	0.29	0.06 J	0.18U	0.78	1.3	4.1	0.21
Benzo[k]fluoranthene	0.9	--	0.94	0.12 U	2.1	0.37	0.85	0.35	0.07 J	0.18U	0.89	1.6	3.6	0.21U
Benzo[a]pyrene	0.4	--	0.76	0.12 U	3.2	1.31	3.53	0.41	0.10 J	0.053U	0.65	1.2	3	0.17
Indeno[1,2,3-cd]pyrene	0.9	--	0.32	0.12 U	1.2	0.20 U	0.89	0.31	0.24	0.18U	0.25	0.38	1.2	0.21U
Dibenz[a,h]anthracene	0.4	--	.052U	0.12 U	0.16	0.20 U	0.29	0.12 J	0.04 J	0.053U	0.058U	0.057U	0.17	0.062U
Benzo[g,h,i]perylene	0.8	--	0.28	0.12 U	1.1	0.79	1.02	0.28	0.23	0.18U	0.23	0.32	1.2	0.21U
Total PAHs			12.82	1.55	38.65	6.15	14.83	5.05	1.41	ND	7.89	12.97	36.99	1.53
Metals (mg/kg)														
Antimony	10	--	9.2U	9.5 U	10U	9.2 U	9.5 U	10 U	9.2U	9.3U	9.4U	9.6U	9.6U	10U
Arsenic	1.7	--	7	4	6.7	2.8	4.4	3	1.9	7.4	4.8	4.8	3.6	3.6
Barium	5,500	--	47	30	100	47	41	24	33	30	52	40	50	62
Beryllium	0.4	--	0.42	0.46	0.55	0.54	0.57	0.24	0.33	0.47	0.41	0.56	0.39	0.56
Cadmium	39	--	0.92U	0.95 U	1.0U	0.92 U	0.95 U	10 U	0.92U	0.93U	0.94U	0.96U	0.96U	1.0U
Chromium	390*	--	21	8.3	14	8.8	14	8.2	18	13	12	14	16	34
Copper	3,100	--	35	16	66	15	18	11	19	9.4	17	22	50	28
Lead	150	--	19	51	320	77	67	22	31	34	130	90	84	75
Mercury	23.0	--	0.10U	0.091	0.099U	0.090 U	0.10 U	0.99 U	0.096U	0.14	0.10U	0.10U	0.10U	0.11U
Nickel	1,000	--	16	8.2	19	10	11	8.1	13	12	10	12	15	19
Selenium	390	--	9.2U	9.5 U	10U	9.2 U	9.5 U	10 U	9.2U	9.3U	9.4U	9.6U	9.6U	10U
Silver	200	--	1.8U	1.9 U	2.0 U	1.8 U	1.9 U	2.0 U	1.8 U	1.9 U	1.9 U	1.9 U	1.9 U	2.1U
Thallium	5.5	--	0.18U	0.18 U	0.18 U	0.18 U	0.18 U	0.20 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Zinc	6,000	--	38	56	170	50	49	58	41	34	50	69	46	66
Total Cyanide	200	--	93	0.41 U	84	0.33 U	10	0.75 U	0.29U	0.40U	0.55	0.97	120	0.39U
Polychlorinated Biphenyls (PCBs) (mg/kg)														
Total PCBs	10	10	0.540U	N/A	0.560U	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

TABLE 4-4
TIDEWATER SITE
SURFACE SOIL SAMPLES - SOUTH LANDFILL AREA

Compound	Ind/Comm Direct Exposure Criteria (ppm)	GB Leachability (mg/kg)	SS-6	TSS19	TSS43	TB4 (0-2)	TB5 (0-2)	TB6 (0-2)
Volatile Organic Compounds (mg/kg)								
Benzene	200	413	1.39 U	N/A	0.005U	0.0056U	N/A	N/A
Toluene	10,000	54	1.98 U	N/A	0.005U	0.0056U	N/A	N/A
Ethylbenzene	10,000	62	1.06	N/A	0.005U	0.0056U	N/A	N/A
m/p-Xylene	10,000	--	1.79	N/A	0.005U	0.0056U	N/A	N/A
o-Xylene	10,000	--	0.13 U	N/A	0.005U	0.0056U	N/A	N/A
Total BTEX			**2.85**	**N/A**	**ND**	**ND**	**N/A**	**N/A**
Polycyclic Aromatic Hydrocarbons (mg/kg)								
Naphthalene	10,000	--	8.0U	0.31 UJ	5.8U	4.85	1.66	120
2-Methylnaphthalene	10,000	--	N/A	0.84	5.8U	3.11	1.74	103
1-Methylnaphthalene	--	--	N/A	0.16 U	N/A	2.31	0.72	77.2
Acenaphthylene	10,000	--	88.2	0.35	9.2	21.7	2.46	122
Acenaphthene	10,000	--	15.6	0.37	5.8U	1.68	0.41	15.1
Dibenzofuran	--	--	28.6	0.16 U	N/A	5.81	0.22	9.53
Fluorene	10,000	--	45.4	0.16 U	5.8U	5.44	1	104
Phenanthrene	10,000	--	330	0.19	12	114	6.2	285
Anthracene	10,000	--	99.1	0.16 U	5.8U	30.8	1.98	123
Fluoranthene	10,000	--	301	0.24	17	153	7.62	150
Pyrene	10,000	--	272	1.03	16	124	9.14	220
Benzo[a]anthracene	7.8	--	159	0.16 U	7.6	77	6.79	139
Chrysene	780	--	160	0.16 U	23	66.3	6.82	137
Benzo[b]fluoranthene	7.8	--	96.7	0.52	9	54.3	4.17	71.3
Benzo[k]fluoranthene	78	--	105	0.42	5.8U	50	5.78	75.8
Benzo[a]pyrene	0.8	--	130	1.12	5.8U	47.7	7.27	92.4
Indeno[1,2,3-cd]pyrene	7.8	--	68	0.40	5.8U	13.9	4	12.8
Dibenz[a,h]anthracene	0.8	--	6.87	0.16 U	3.2U*	3.15	1.27	5.32
Benzo[g,h,i]perylene	10,000	--	42.8	1.18	5.8U	10.3	4.74	10
Total PAHs			**1948.27**	**6.66**	**93.8**	**789.35**	**73.99**	**1872.45**
Metals (mg/kg)								
Antimony	820	--	9.7 U	9.5 U	8.9U	10U	8.9U	9.8U
Arsenic	3.8	--	12	0.19	3	8.3	3.8	3.7
Barium	10,000	--	46	21	31	64	58	190
Beryllium	1.3	--	0.65	0.19	0.18U	0.20U	0.29	0.24
Cadmium	1,000	--	0.97 U	0.95 U	0.89U	1.0U	0.89U	1.5
Chromium	10000*	--	13	2.3	7.1	17	25	81
Copper	10,000	--	30	2.3	43	49	30	52
Lead	500	--	100	24	54	81	79	760
Mercury	610	--	0.097 U	0.095 U	0.084U	0.10U	0.091U	0.098U
Nickel	10,000	--	13	2.3	8.6	17	19	16
Selenium	10,000	--	9.7 U	9.5 U	8.9U	10U	8.9U	9.8U
Silver	10,000	--	1.9 U	1.9 U	1.8U	2.4	1.8U	2.9
Thallium	140	--	0.19 U	0.18 U	0.18U	0.18U	0.18U	0.18U
Zinc	10,000	--	37	22	25	24	73	150
Total Cyanide	10,000	--	2.8	72	320	75	120	26
Polychlorinated Biphenyls (PCBs) (mg/kg)								
Total PCBs	10	10	N/A	N/A	N/A	0.560U	0.500U	0.520U

TABLE 4-5
TIDEWATER SITE
SURFACE SOIL SAMPLES - NO. 1 STATION AREA

Compound	Ind/Comm Direct Exposure Criteria (ppm)	GB Leachability (mg/kg)	TSS23	TSS24	TB8 (0-2)	TB9 (0-2)	TB10 (0-2)
Volatile Organic Compounds (mg/kg)							
Benzene	200	413	N/A	N/A	0.0056U	N/A	N/A
Toluene	10,000	54	N/A	N/A	0.0056U	N/A	N/A
Ethylbenzene	10,000	62	N/A	N/A	0.0056U	N/A	N/A
m/p-Xylene	10,000	--	N/A	N/A	0.0056U	N/A	N/A
o-Xylene	10,000	--	N/A	N/A	0.0056U	N/A	N/A
Total BTEX			N/A	N/A	ND	N/A	N/A
Polycyclic Aromatic Hydrocarbons (mg/kg)							
Naphthalene	10,000	--	3.7	0.23	3.31	3.82	3.73
2-Methylnaphthalene	10,000	--	2.7	0.21	4.58	3.70	3.58
1-Methylnaphthalene	--	--	N/A	N/A	2.96	2.01	1.55
Acenaphthylene	10,000	--	8.6	0.97	2.28	3.27	10.1
Acenaphthene	10,000	--	1.8U	.018U	2.14	1.91	0.96
Dibenzofuran	--	--	N/A	N/A	1.35	0.95	0.86
Fluorene	10,000	--	3	.018U	1.86	2.03	1.56
Phenanthrene	10,000	--	12	0.46	4.79	12.20	9.61
Anthracene	10,000	--	4.9	0.24	1.16	3.49	5.97
Fluoranthene	10,000	--	23	0.81	5.45	18.50	16.3
Pyrene	10,000	--	42	0.8	7.71	17.70	25
Benzo[a]anthracene	7.8	--	20	0.6	4.56	12.3	16.5
Chrysene	780	--	24	0.87	4.41	12.40	16.8
Benzo[b]fluoranthene	7.8	--	16	1.2	3.5	8.83	12
Benzo[k]fluoranthene	78	--	20	1.2	4.51	10.70	17.9
Benzo[a]pyrene	0.8	--	14	0.65	5.09	11.3	20.6
Indeno[1,2,3-cd]pyrene	7.8	--	5.2	0.46	3.71	7.25	12.1
Dibenz[a,h]anthracene	0.8	--	0.54U	0.055U	0.98	2.01	3.19
Benzo[g,h,i]perylene	10,000	--	4.6	0.38	6.58	7.34	14
Total PAHs			**203.7**	**9.08**	**70.93**	**141.71**	**192.31**
Metals (mg/kg)							
Antimony	820	--	9.0U	9.5U	9.5U	9.4U	9.6U
Arsenic	3.8	--	13	8.5	6	19	16
Barium	10,000	--	120	39	44	100	140
Beryllium	1.3	--	0.24	0.25	0.41	0.58	0.57
Cadmium	1,000	--	0.90U	0.95U	0.95U	0.94U	0.96U
Chromium	10000*	--	14	9.3	8.4	20	16
Copper	10,000	--	64	37	25	62	110
Lead	500	--	140	90	52	120	280
Mercury	610	--	0.099	0.099U	0.22	0.099U	0.027
Nickel	10,000	--	20	9.1	15	40	22
Selenium	10,000	--	9.0U	9.5U	9.5U	9.4U	9.6U
Silver	10,000	--	1.8U	9.8	1.9U	1.9U	1.9U
Thallium	140	--	0.18 U	0.18 U	0.18U	0.18U	0.18U
Zinc	10,000	--	28	20	74	190	160
Total Cyanide	10,000	--	340	160	55	77	64
Polychlorinated Biphenyls (PCBs) (mg/kg)							
Total PCBs	10	10	N/A	N/A	N/A	N/A	N/A

TABLE 4-6
TIDEWATER SITE
SURFACE SOIL SAMPLES - GAS PLANT AREA

Compound	Ind/Comm Direct Exposure Criteria (ppm)	GB Leachability (mg/kg)	TSS29	TSS30	TB11 (0-2)	TB12 (0-2)	TB13 (0-2)	TB14 (0-2)
Volatile Organic Compounds (mg/kg)								
Benzene	200	413	N/A	N/A	0.0054U	N/A	0.006U	N/A
Toluene	10,000	54	N/A	N/A	0.0054U	N/A	0.006U	N/A
Ethylbenzene	10,000	62	N/A	N/A	0.0054U	N/A	0.006U	N/A
m/p-Xylene	10,000	--	N/A	N/A	0.0054U	N/A	0.006U	N/A
o-Xylene	10,000	--	N/A	N/A	0.0054U	N/A	0.006U	N/A
Total BTEX			N/A	N/A	ND	N/A	ND	N/A
Polycyclic Aromatic Hydrocarbons (mg/kg)								
Naphthalene	10,000	--	1	1.59	2.71	2.45	4.63	0.14 J
2-Methylnaphthalene	10,000	--	0.97U	1.04	2.47	3.34	3.21	0.16
1-Methylnaphthalene	--	--	N/A	0.52	1.23	1.89	1.83	0.07 J
Acenaphthylene	10,000	--	4	6.24	12.7	1.51	8.8	0.14 J
Acenaphthene	10,000	--	0.97U	2.24	1.52	1.28	0.77	0.18
Dibenzofuran	--	--	N/A	1.05	1.41	1.13	1.01	0.07 J
Fluorene	10,000	--	1.1	2.2	1.75	1.44	2.16	0.16
Phenanthrene	10,000	--	5.1	19.7	21.1	15.9	13.1	1.52
Anthracene	10,000	--	2.3	7.48	8.21	2.95	4.43	0.34
Fluoranthene	10,000	--	7	41.3	48.4	13.7	31.4	1.86
Pyrene	10,000	--	9.3	51.7	85.8	15.2	57.4	1.89
Benzo[a]anthracene	7.8	--	4.6	31.6	48.4	9.22	41.7	0.78
Chrysene	780	--	4.9	28.5	45.2	9.41	35	1.06
Benzo[b]fluoranthene	7.8	--	5.7	22.7	40.9	7.4	30.8	0.86
Benzo[k]fluoranthene	78	--	5.4	20.4	40.3	6.39	30.8	0.89
Benzo[a]pyrene	0.8	--	4.4	33.1	62.9	8.85	54.1	1.09
Indeno[1,2,3-cd]pyrene	7.8	--	1.9	11.4	38.8	5	37.7	0.67
Dibenz[a,h]anthracene	0.8	--	0.29U	2.79	6.99	0.98	3.23	0.64
Benzo[g,h,i]perylene	10,000	--	1.6	9.75	39.8	6.06	58.6	1.1
Total PAHs			58.3	295.3	510.59	114.1	420.67	13.62
Metals (mg/kg)								
Antimony	820	--	10U	8.9U	9.3U	9.7 U	10U	10U
Arsenic	3.8	--	6.8	3.9	3.4	7	9.8	8.1
Barium	10,000	--	43	41	46	260	55	61
Beryllium	1.3	--	0.56	0.63	0.33	0.65	0.77	0.62
Cadmium	1,000	--	1.0U	0.89U	0.93U	0.97 U	1.0U	1.0U
Chromium	10000*	--	14	14	13	11	8.6	35
Copper	10,000	--	19	30	23	41	32	62
Lead	500	--	65	26	67	97	20	220
Mercury	610	--	0.095U	0.10U	0.1	0.10 U	0.1U	0.1U
Nickel	10,000	--	19	22	12	25	68	30
Selenium	10,000	--	10U	8.9U	9.3U	9.7 U	10U	10U
Silver	10,000	--	2.1U	1.8U	1.9U	1.9 U	2.0U	2.1U
Thallium	140	--	0.18 U	0.18 U	0.19U	0.2	0.20U	0.21U
Zinc	10,000	--	51	55	33	130	25	98
Total Cyanide	10,000	--	60	14	86	12	50	0.8
Polychlorinated Biphenyls (PCBs) (mg/kg)								
Total PCBs	10	10	N/A	N/A	N/A	N/A	N/A	N/A

TABLE 4-7
TIDEWATER SITE
SURFACE SOIL SAMPLES - NORTH LANDFILL AREA

Compound	Ind/Comm Direct Exposure Criteria (ppm)	GB Leachability (mg/kg)	TSS34	TSS42	TB15 (0-2)	TB16 (0-2)	TB17 (0-2)
Volatile Organic Compounds (mg/kg)							
Benzene	200	413	N/A	2.1U	0.0053U	N/A	N/A
Toluene	10,000	54	N/A	2.1U	0.0053U	N/A	N/A
Ethylbenzene	10,000	62	N/A	2.1U	0.0053U	N/A	N/A
m/p-Xylene	10,000	--	N/A	2.1U	0.0053U	N/A	N/A
o-Xylene	10,000	--	N/A	2.1U	0.0053U	N/A	N/A
Total BTEX			N/A	ND	ND	N/A	N/A
Polycyclic Aromatic Hydrocarbons (mg/kg)							
Naphthalene	10,000	--	3.00	400	1.85	2.33	2.67
2-Methylnaphthalene	10,000	--	2.1	1000	1.14	2.24	2.42
1-Methylnaphthalene	--	--	1.55	N/A	0.57	1.28	1.47
Acenaphthylene	10,000	--	6.61	370	1.2	1.19	4.37
Acenaphthene	10,000	--	0.94	72	0.34	1.33	0.81
Dibenzofuran	--	--	3.52	N/A	0.21	0.53	0.49
Fluorene	10,000	--	1.34	380	0.45	1.51	2.22
Phenanthrene	10,000	--	33.7	1900	3.41	2.9	12.3
Anthracene	10,000	--	7.88	330	0.89	0.56	2.94
Fluoranthene	10,000	--	31.9	740	4.48	1.22	12.6
Pyrene	10,000	--	29.6	1400	5.69	1.36	15.4
Benzo[a]anthracene	7.8	--	15.2	540	2.91	0.54	9.06
Chrysene	780	--	14.3	470	3.33	1.81	9.83
Benzo[b]fluoranthene	7.8	--	11.4	300	3.08	1.25	8.19
Benzo[k]fluoranthene	78	--	11.2	100	2.58	0.76	7.94
Benzo[a]pyrene	0.8	--	15	230	2.84	1.45	8.38
Indeno[1,2,3-cd]pyrene	7.8	--	9.57	90	1.85	1.41	5.38
Dibenz[a,h]anthracene	0.8	--	2.46	33U*	0.73	0.33	1.84
Benzo[g,h,i]perylene	10,000	--	11.7	96	2.05	2.92	4.98
Total PAHs			**209.97**	**8418**	**39.6**	**26.92**	**113.29**
Metals (mg/kg)							
Antimony	820	--	9.6 U	9.1U	9.2U	9.8U	9.6U
Arsenic	3.8	--	5.1	2.6	9.8	19	35
Barium	10,000	--	44	22	74	50	48
Beryllium	1.3	--	0.45	0.18U	0.21	0.28	0.41
Cadmium	1,000	--	0.96 U	0.91U	0.92U	0.98U	0.96U
Chromium	10000*	--	12	2.2U	12	9.7	8.7
Copper	10,000	--	27	13	29	22	27
Lead	500	--	110	66	52	54	98
Mercury	610	--	0.094 U	0.51U	0.094U	0.1U	0.091U
Nickel	10,000	--	15	4.2	11	10	7.4
Selenium	10,000	--	9.6 U	9.1U	9.2U	9.8U	9.6U
Silver	10,000	--	1.9 U	1.8U	1.8U	2.0U	1.9U
Thallium	140	--	0.18 U	0.23	0.18U	0.20U	0.19U
Zinc	10,000	--	82	74	14	20	16
Total Cyanide	10,000	--	6.2	22	51	9.1	47
Polychlorinated Biphenyls (PCBs) (mg/kg)							
Total PCBs	10	10	N/A	N/A	N/A	N/A	N/A

TABLE 4-8
TIDEWATER SITE
SUBSURFACE SOIL SAMPLES - SCHOOL AND CITY PROPERTIES

Compound	Residential Direct Exposure Criteria (ug/kg)	GB Leachability (mg/kg)	TB1 (16-18)	TB2 (12-14)	TB3 (18-20)	TB7 (28-30)	TB18 (8-10)	TB19 (4-6)
Volatile Organic Compounds (mg/kg)								
Benzene	25	413	0.22 UJ	0.0052U	0.0055U	0.0058U	150U	0.0053U
Toluene	190	54	0.06 J	0.0052U	0.0055U	0.0058U	150U	0.0053U
Ethylbenzene	71	62	0.22 U	0.0052U	0.0055U	0.0058U	150U	0.0053U
m/p-Xylene	110	--	0.22 U	0.0052U	0.0055U	0.0058U	150U	0.0053U
o-Xylene	110	--	0.22 U	0.0052U	0.0055U	0.0058U	150U	0.0053U
Total BTEX			0.06	ND	ND	ND	ND	ND
Polycyclic Aromatic Hydrocarbons (mg/kg)								
Naphthalene	54	--	0.22 U	0.190U	0.190U	0.18U	1200	0.18U,J
2-Methylnaphthalene	123	--	0.66	0.190U	0.190U	0.18U	550	0.18U,J
1-Methylnaphthalene	--	--	0.29	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	23	--	0.07 J	0.190U	0.190U	0.18U	93	0.18U,J
Acenaphthene	43	--	0.22 U	0.190U	0.190U	0.18U	60U*	0.18U,J
Dibenzofuran	--	--	0.22 U	N/A	N/A	N/A	N/A	N/A
Fluorene	28	--	0.22 U	0.190U	0.190U	0.18U	150	0.18U,J
Phenanthrene	40	--	0.20 J	0.190U	0.190U	0.18U	480	0.18U,J
Anthracene	35	--	0.22 U	0.190U	0.190U	0.18U	140	0.18U,J
Fluoranthene	20	--	0.22 U	0.190U	0.190U	0.18U	280	0.18J
Pyrene	13	--	0.22 U	0.190U	0.190U	0.18U	450	0.18U,J
Benzo[a]anthracene	0.9	--	0.22 U	0.190U	0.190U	0.18U	180	0.18U,J
Chrysene	0.4	--	0.22 U	0.190U	0.190U	0.18U	190	0.18U,J
Benzo[b]fluoranthene	0.9	--	0.22 U	0.190U	0.190U	0.18U	91	0.18U,J
Benzo[k]fluoranthene	0.9	--	0.22 U	0.190U	0.190U	0.18U	97	0.18U,J
Benzo[a]pyrene	0.4	--	0.22 U	0.056U	0.056U	0.054U	110	0.11J
Indeno[1,2,3-cd]pyrene	0.9	--	0.22 U	0.190U	0.190U	0.18U	60U*	0.18U,J
Dibenz[a,h]anthracene	0.4	--	0.22 U	0.056U	0.056U	0.054U	18U*	0.053U,J
Benzo[g,h,i]perylene	0.8	--	0.22 U	0.190U	0.190U	0.18U	60U*	0.18U,J
Total PAHs			1.22	ND	ND	ND	4011	0.29
Metals (mg/kg)								
Antimony	10	--	11U*	9.3U	9.4U	9.6U	13U*	8.9U
Arsenic	1.7	--	2.6	2.5	1.7	4.8	24	3.1
Barium	5,500	--	25	24	18	32	49	42
Beryllium	0.4	--	0.43	0.3	0.31	0.54	0.26U	0.32
Cadmium	39	--	1.1U	0.93U	0.94U	0.96U	1.3U	0.89U
Chromium	390*	--	9.1	7.9	5.1	20	78	16
Copper	3,100	--	11	7.5	6.6	25	200	39
Lead	150	--	11	4.7U	6.9	16	60	49
Mercury	23.0	--	0.10U	0.093U	0.10U	0.11U	0.13U	0.098U
Nickel	1,000	--	10	7.5	6.7	23	79	12
Selenium	390	--	11U	9.3U	9.4U	9.6U	13U	8.9U
Silver	200	--	2.1U	1.9U	1.9U	1.9U	6.6	1.8U
Thallium	5.5	--	0.21U	0.18U	0.18U	0.18U	0.18U	0.18U
Zinc	6,000	--	27	21	15	46	*91	84
Total Cyanide	200	--	0.45U	0.27U	0.42U	0.38U	320	0.67
Polychlorinated Biphenyls (PCBs) (mg/kg)								
Total PCBs	10	10	N/A	N/A	N/A	N/A	N/A	N/A

Note:
* Detection limit is greater than the criteria.

TABLE 4-9
TIDEWATER SITE
SUBSURFACE SOIL SAMPLES - SOUTH LANDFILL AREA

Compound	GB Leachability (mg/kg)	TB4 (22-24)	TB5 (4-6)	TB5 (25-26)	TB6 (20-22)	TTP1 (8-9)	TTP2 (1-2)
Volatile Organic Compounds (mg/kg)							
Benzene	413	0.59	1.79	12	10.1	0.21 UJ	116
Toluene	54	0.69	5.37	15	26.9	0.20 J	254
Ethylbenzene	62	0.68	1.99	13	9.37	0.45	71.9
m/p-Xylene	---	0.49	8.29	23.7	61	0.16	182
o-Xylene	---	0.2	4.69	6.79	25.1	0.21 U	95.4
Total BTEX		**2.65**	**22.13**	**70.49**	**132.47**	**0.81**	**719.3**
Polycyclic Aromatic Hydrocarbons (mg/kg)							
Naphthalene	---	20.5	267	1240	1870	1.06	6950
2-Methylnaphthalene	---	12.9	56.6	270	434	2.11	2970
1-Methylnaphthalene	---	11.1	32.8	117	237	0.36	1980
Acenaphthylene	---	1.67	21.6	110	436	1.19	1310
Acenaphthene	---	21.7	8.01	116	134	0.24	176
Dibenzofuran	---	1.18	25.2	191	229	0.07 J	116
Fluorene	---	10.9	24.3	199	343	0.24	1030
Phenanthrene	---	40.1	141	812	886	1.18	2640
Anthracene	---	14.4	30.6	276	304	0.40	728
Fluoranthene	---	15.7	104	520	610	1.20	778
Pyrene	---	21.3	87.5	405	416	1.95	1170
Benzo[a]anthracene	---	8.31	40.2	208	229	0.78	755
Chrysene	---	7.18	37.7	158	234	1.88	717
Benzo[b]fluoranthene	---	2.78	23.3	116	116	1.05	237
Benzo[k]fluoranthene	---	4.25	29.5	70.9	140	1.16	392
Benzo[a]pyrene	---	6.7	27	123	157	1.35	519
Indeno[1,2,3-cd]pyrene	---	2.44	8.99	28.4	77.7	0.79	177
Dibenz[a,h]anthracene	---	0.65	2.55	6.97	17	0.23	69.6
Benzo[g,h,i]perylene	---	3.73	7.57	29.3	76.3	0.81	209
Total PAHs		**207.49**	**975.42**	**4996.57**	**6946**	**18.05**	**22923.6**
Metals (mg/kg)							
Antimony	---	12U	10U	16U	12U	11U	9.8U
Arsenic	---	7.1	4.6	44	17	20	2.8
Barium	---	38	56	89	35	58	14
Beryllium	---	0.24U	0.31	0.82	0.7	0.6	0.20U
Cadmium	---	1.2U	1.0U	1.6U	1.2U	1.1U	0.98U
Chromium	---	20	15	440	43	5.3	4
Copper	---	61	44	1200	96	80	19
Lead	---	24	68	350	86	86	36
Mercury	---	0.13U	0.10U	2.7	0.11	0.49	0.095U
Nickel	---	11	15	80	41	8.6	5.4
Selenium	---	12U	10U	16U	12U	11U	9.8U
Silver	---	2.4U	2.0U	3.2U	2.7	2.1U	2.0U
Thallium	---	0.18U	0.18U	0.18U	0.18U	0.4	0.20U
Zinc	---	78	58	600	79	130	15
Total Cyanide	---	21	120	52	31	31	18
Polychlorinated Biphenyls (PCBs) (mg/kg)							
Total PCBs	10	0.70U	0.36U	0.87U	0.66U	0.62U	0.56U

TABLE 4-10
TIDEWATER SITE
SUBSURFACE SOIL SAMPLES - NO. 1 STATION AREA

Compound	GB Leachability (mg/kg)	TB8 (12-14)	TB9 (6-8)	TB9 (23-24)	TB10 (11-12)	TTP3A (3-4)	TTP4 (4-5)	TTP5 (8.5-9.5)	TTP6 (9-10)	TTP7 (9-10)
Volatile Organic Compounds (mg/kg)										
Benzene	413	2.97	0.15 UJ	6.22	0.6	2.40 UJ	2.51	3.18 UJ	0.13 UJ	0.15 UJ
Toluene	54	2.92	0.18	2.05	0.58	3.47	11.2	4.53	0.9	0.11 J
Ethylbenzene	62	1.63	0.15 U	2.51	0.16 J	11.7	31.6	4.71	0.43	1.32
m/p-Xylene	--	4	0.19	2.47	0.33	4.72	19.7	17.5	1.65	1.51
o-Xylene	--	1.6	0.13 J	0.83	0.09 J	2.40 U	12.3	13.3	1.17	2.06
Total BTEX		**13.12**	**0.5**	**14.08**	**1.76**	**19.89**	**77.31**	**40.04**	**4.15**	**5**
Polycyclic Aromatic Hydrocarbons (mg/kg)										
Naphthalene	--	40.2	1.82	14.8	10.2	21.8	9.74	1310	2.83	25.3
2-Methylnaphthalene	--	5.2	1.21	10.4	0.50	91.2	32.1	354	3.34	25.5
1-Methylnaphthalene	--	7.4	0.65	6.55	0.53	36.5	18	258	2.21	15.5
Acenaphthylene	--	11.1	0.59	6.4	0.15 J	2.40 U	26.2	518	0.54	33.7
Acenaphthene	--	5.71	0.27	9.38	0.65	7.51	14.4	132	1.63	17.8
Dibenzofuran	--	10.4	0.3	1.79	0.65	2.40 U	2.53	241	0.52	4.85
Fluorene	--	15.5	0.38	7.42	0.78	2.40 U	6.46	370	1.1	15
Phenanthrene	--	27.1	2.76	36.6	2.40	41.1	12.3	875	2.94	9.01
Anthracene	--	9	0.75	13.8	0.96	0.74	26.8	307	0.44	3.76
Fluoranthene	--	20.9	4.91	43.2	5.25	12.8	10.5	790	5.01	3.83
Pyrene	--	20.5	4.62	45.3	4.24	76.4	34	560	4.78	9.97
Benzo[a]anthracene	--	12.3	3.26	31.2	3.00	2.40 U	8.78	311	4.75	3.91
Chrysene	--	11.9	3.12	26.2	2.42	44.9	25.8	246	4.28	37
Benzo[b]fluoranthene	--	10.9	2.85	13.2	2.05	9.74	14.6	190	4.43	1.32
Benzo[k]fluoranthene	--	11.8	3.52	16.1	2.31	41	18.7	203	4.75	1.39
Benzo[a]pyrene	--	16.6	4.24	20.2	3.51	15.5	18.7	248	7.2	2.28
Indeno[1,2,3-cd]pyrene	--	13.3	3.13	8.24	2.99	4.01	25.7	126	4.86	0.67
Dibenz[a,h]anthracene	--	2.32	0.71	2.47	0.48	4.03	10.5	24.5	0.86	0.25
Benzo[g,h,i]perylene	--	16.5	3.35	29.8	4.44	2.94	52.8	114	6.4	0.98
Total PAHs		**268.63**	**42.44**	**343.05**	**47.51**	**410.17**	**368.61**	**7177.5**	**62.87**	**212.02**
Metals (mg/kg)										
Antimony	--	13U	9.7U	18U	11U	9.1U	11U	12U	15U	9.9U
Arsenic	--	6.7	20	20	4.7	3.7	2.5	5.1	31	4.4
Barium	--	41	29	150	41	42	17	43	37	20
Beryllium	--	0.47	0.7	1	0.75	0.18U	0.22U	0.54	1.1	0.27
Cadmium	--	1.3U	0.97U	3.3	1.1U	0.91U	1.1U	1.2U	1.5U	0.99U
Chromium	--	59	15	260	57	6.4	11	11	160	9.3
Copper	--	95	35	820	59	78	16	21	150	15
Lead	--	56	62	360	90	36	80	20	95	9.5
Mercury	--	0.28	0.095U	1.3	0.26	0.76	1.9	0.12U	0.16U	0.10U
Nickel	--	12	17	25	16	27	6.7	12	15	11
Selenium	--	13U	9.7U	1.8U	11U	9.1U	11U	12U	15U	9.9U
Silver	--	2.7U	1.9U	3.5U	2.3U	1.8U	2.2U	2.5U	3.1U	2.0U
Thallium	--	0.18U	0.18U	0.18U	0.18U	0.18U	0.22U	0.25U	0.31U	0.2U
Zinc	--	60	45	780	71	8.1	18	33	64	27
Total Cyanide	--	37	8.1	1.4	47	350	51	22	100	3.2
Polychlorinated Biphenyls (PCBs) (mg/kg)										
Total PCBs	10	N/A	N/A	N/A	N/A	1.1U	0.61U	0.69U	0.89U	0.63U

TABLE 4-11
TIDEWATER SITE
SUBSURFACE SOIL SAMPLES - GAS PLANT AREA

Compound	GB Leachability (mg/kg)	TB11 (10-12)	TB12 (6-8)	TB13 (10-12)	TB-13 (14-16)	TB14 (4-6)	TTP12 (8-9)	TTP14 (12-13)	TTP-15 (3-4)
Volatile Organic Compounds (mg/kg)									
Benzene	413	0.12 UJ	0.16 UJ	1.98 J	89.7	0.11 UJ	8.79 UJ	0.19 UJ	0.46
Toluene	54	0.16 UJ	0.3	1.82 J	242	0.11 UJ	33.5	0.10 UJ	0.67
Ethylbenzene	62	2.27	2.77	10.5	323	0.11 U	99	0.10 U	0.26
m/p-Xylene	---	3.23	4.96	3.54 J	235	0.11 U	59.2	0.10 U	0.83
o-Xylene	---	2.93	1.08	1.82	109	0.11 U	46.7	0.10 U	0.67
Total BTEX		**8.43**	**9.11**	**19.66**	**998.7**	**ND**	**238.4**	**ND**	**2.89**
Polycyclic Aromatic Hydrocarbons (mg/kg)									
Naphthalene	---	43.4	84.7	80.3	7560	0.11 U	2000	0.16	4.69
2-Methylnaphthalene	---	20.8	102	98.9	3940	0.11 U	778	0.10 U	3.88
1-Methylnaphthalene	---	30	27.7	189	2520	0.11 U	1050	0.10 U	2.09
Acenaphthylene	---	9.81	155	188	288	0.11 U	454	0.10 U	4.72
Acenaphthene	---	1.82	118	199	3590	0.11 U	346	0.10 U	1.34
Dibenzofuran	---	3.28	6.54	17.3	296	0.11 U	72.3	0.10 U	0.71
Fluorene	---	6.08	24.4	98.9	1560	0.11 U	487	0.10 U	1.81
Phenanthrene	---	21.8	22.4	284 EJ	4650	0.11 U	1630	0.10 U	16.1
Anthracene	---	5.94	92.1	146	2910	0.11 U	493	0.10 U	4.76
Fluoranthene	---	8.41	16.7	293 EJ	1310	0.11 U	643	0.10 U	17.4
Pyrene	---	13.1	33.8	404 EJ	1890	0.11 U	1070	0.10 U	33.7
Benzo[a]anthracene	---	6.38	9.53	176	846	0.11 U	497	0.10 U	15.8
Chrysene	---	5.65	15.3	171	788	0.11 U	451	0.10 U	12.1
Benzo[b]fluoranthene	---	2.2	3.82	57.9	235	0.11 U	167	0.10 U	7.5
Benzo[k]fluoranthene	---	2.97	5.95	90.7	380	0.11 U	260	0.10 U	10.4
Benzo[a]pyrene	---	4.59	8.52	133	564	0.11 U	416	0.10 U	15.1
Indeno[1,2,3-cd]pyrene	---	1.82	3.39	17.8	188	0.11 U	129	0.10 U	7.03
Dibenz[a,h]anthracene	---	0.54	0.64	6.52	47.9	0.11 U	46.8	0.10 U	1.79
Benzo[g,h,i]perylene	---	1.84	4.21	17.6	236	0.11 U	151	0.10 U	7.91
Total PAHs		**190.43**	**734.7**	**2668.9**	**33799**	**ND**	**11141**	**0.16**	**168.83**
Metals (mg/kg)									
Antimony	---	10U	9.5 U	N/A	13U	10U	11U	9.1U	9.0U
Arsenic	---	5	7.2	N/A	26	2.6	10	12	12
Barium	---	19	21	N/A	120	25	40	13	45
Beryllium	---	0.54	0.19 U	N/A	0.54	0.20U	0.47	0.3	0.63
Cadmium	---	1.0U	0.95 U	N/A	13U	1.0U	1.1U	0.91U	0.90U
Chromium	---	9	4.9	N/A	250	4.4	17	5.8	13
Copper	---	9.9	5.3	N/A	620	4.3	170	11	43
Lead	---	9.9	4.8 U	N/A	440	5.0U	150	7.9	69
Mercury	---	0.10U	0.099 U	N/A	2.2	0.099U	0.26	0.95U	0.98
Nickel	---	11	6.9	N/A	19	6.1	45	8.5	26
Selenium	---	10U	9.5 U	N/A	13U	10U	21	9.1U	9.0U
Silver	---	2.1U	1.9 U	N/A	2.7 U	2.0U	2.2U	1.8U	1.8U
Thallium	---	0.21U	0.19 U	N/A	1.1	0.20U	0.55	0.18U	0.18U
Zinc	---	23	17	N/A	360	15	110	22	88
Total Cyanide	---	130	1.3		5.7	0.46U	31	2.8	1
Polychlorinated Biphenyls (PCBs) (mg/kg)									
Total PCBs	10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

TABLE 4-13
TIDEWATER SITE
TAR SEEP/MGP STRUCTURE MATERIAL

Compound	GB Leachability (mg/kg)	TSS44	TTP8B (8-9)	TTP9 (8-9)	TTP10 (11-12)	TTP11 (6-7)	TTP13 (3-4)
Volatile Organic Compounds (mg/kg)							
Benzene	413	31U	19.5 UJ	0.23 UJ	0.45 UJ	1.86 UJ	389
Toluene	54	59	26.2 J	0.11 UJ	0.51	1.68 UJ	542
Ethylbenzene	62	31U	165	0.07 J	0.25	122	114
m/p-Xylene	--	52	121	0.14	0.33	46.3	704
o-Xylene	--	31U	54.8	0.11 U	0.13 U	23.8	605
Total BTEX		111	367	0.21	1.09	192.1	2354
Polycyclic Aromatic Hydrocarbons (mg/kg)							
Naphthalene	--	14000	1930	0.39	2.39	200	18700
2-Methylnaphthalene	--	7400	796	0.2	2.4	56.5	4520
1-Methylnaphthalene	--	N/A	630	0.07 J	1.08	33.3	2710
Acenaphthylene	--	4400	77.6	0.7	9.12	4.49	3130
Acenaphthene	--	670U	117	0.08 J	1.28	20.5	1810
Dibenzofuran	--	N/A	20.7	0.08 J	1.1	1.97	2420
Fluorene	--	3400	215	0.12	2.24	10.5	3020
Phenanthrene	--	11000	416	0.98	18.3	23.7	7330
Anthracene	--	3400	81.8	0.46	6.25	7.05	1910
Fluoranthene	--	2900	124	2.4	24.2	11.9	4990
Pyrene	--	4600	205	3.21	33	15.5	3340
Benzo[a]anthracene	--	2500	97	2.3	20.6	8.01	1880
Chrysene	--	2000	87.3	2.19	22	7.09	1500
Benzo[b]fluoranthene	--	1200	25.7	2.63	15.7	3.71	953
Benzo[k]fluoranthene	--	670U	46.3	2.73	18.9	5.82	1120
Benzo[a]pyrene	--	1400	70	4.1	23.3	7.27	1300
Indeno[1,2,3-cd]pyrene	--	670U	19.2	2.73	12	3.75	874
Dibenz[a,h]anthracene	--	360U	5.83 J	0.65	2.89	0.67 J	195
Benzo[g,h,i]perylene	--	670U	25	3.06	12.1	3.93	860
Total PAHs		58200	4983.6	29.08	228.85	424.99	62562
Metals (mg/kg)							
Antimony	--	11U	10U	8.6U	10U	9.8U	12U
Arsenic	--	1.3	1.1	4	9.2	1.8	8.9
Barium	--	11	13	12	52	19	17
Beryllium	--	0.22U	0.33	0.29	0.38	0.36	0.24U
Cadmium	--	1.1U	1.0U	0.86U	1.0U	0.98U	1.2U
Chromium	--	4.3	7.2	5.2	53	7.5	4.5
Copper	--	8.4	5.6	11	200	12	19
Lead	--	11	7.9	8.1	82	17	91
Mercury	--	0.11U	0.11U	0.095U	4	0.11U	0.11U
Nickel	--	3.8	9.2	6.2	81	9.6	7.5
Selenium	--	11U	10U	8.6U	10U	9.8U	12U
Silver	--	2.2U	2.0U	1.7U	2.0U	2.0U	2.4U
Thallium	--	0.22U	0.20U	0.17U	0.2U	0.20U	2.4
Zinc	--	11	20	17	63	25	130
Total Cyanide	--	72	75	0.36U	97	14	40
Polychlorinated Biphenyls (PCBs) (mg/kg)							
Total PCBs	10	N/A	N/A	N/A	N/A	N/A	N/A

TABLE 4-14
TIDEWATER SITE
HAZARDOUS CHARACTERISTICS ANALYSIS

Compound	Regulatory Limit (mg/L)	TTP8B (8-9)	TTP13 (3-4)	TTP2 (1-2)
TCLP Volatiles (mg/L)				
Benzene	0.5	0.48	5.6	0.64
2-Butanone (MEK)	200	0.20 U	0.20 U	0.20 U
Carbon tetrachloride	0.5	0.20 U	0.20 U	0.20 U
Chlorobenzene	100.0	0.20 U	0.20 U	0.20 U
Chloroform	6.0	0.20 U	0.20 U	0.20 U
1,4-Dichlorobenzene	7.5	0.20 U	0.20 U	0.20 U
1,2-Dichloroethane	0.5	0.20 U	0.20 U	0.20 U
1,1-Dichloroethene	0.7	0.20 U	0.20 U	0.20 U
Tetrachloroethene	0.7	0.20 U	0.20 U	0.20 U
Trichloroethene (TCE)	0.5	0.20 U	0.20 U	0.20 U
Vinyl chloride	0.2	0.20 U	0.20 U	0.20 U
TCLP Semivolatiles (mg/L)				
2,4-Dinitrotoluene	0.13	0.01 U	1.0 U	0.01 U
Hexachlorobenzene	0.13	0.001 U	0.1 U	0.01 U
Hexachlorobutadiene	0.5	0.01 U	1.0 U	0.01 U
Hexachloroethane	3.0	0.01 U	1.0 U	0.01 U
2-Methylphenol	--	0.01 U	13	0.013
3- & 4-Methylphenols	--	0.01 U	21	0.02
Nitrobenzene	2.0	0.01 U	1.0 U	0.01 U
Pentachlorophenol	100.0	0.001 U	0.1 U	0.001 U
Pyridine	5.0	0.02 U	2.0 U	0.02 U
2,4,5-Trichlorophenol	400.0	0.01 U	1.0 U	0.01 U
2,4,6-Trichlorophenol	2.0	0.01 U	1.0 U	0.01 U
TCLP Metals (mg/L)				
Mercury	0.2	0.00046 U	0.00046 U	0.00046 U
Arsenic	5.0	0.24	0.32	0.32
Barium	100.0	0.61	0.5	0.45
Cadmium	1.0	0.010 U	10.010 U	0.010 U
Chromium	5.0	0.024 U	0.024 U	0.024 U
Lead	5.0	0.050 U	0.069	0.050 U
Selenium	1.0	0.10 U	0.10 U	0.10 U
Silver	5.0	0.020 U	0.020 U	0.020 U
TCLP Herbicides/Pesticides (mg/L)				
gamma-BHC (Lindane)	0.4	0.0002 U	0.0002 U	0.0002 U
Chlordane	0.03	0.0004 U	0.0004 U	0.0004 U
Endrin	0.025	0.0002 U	0.0002 U	0.0002 U
Heptachlor	0.008	0.0004 U	0.0004 U	0.0004 U
Heptachlor epoxide	0.008	0.0004 U	0.0004 U	0.0004 U
Methoxychlor	10.0	0.0002 U	0.0002 U	0.0002 U
Toxaphene	0.5	0.01 U	0.01 U	0.01 U
2,4-D (2,4-Dichlorophenoxyacetic acid)	10.0	0.004 U	0.004 U	0.004 U
2,4,5-TP (Silvex)	1.0	0.004 U	0.004 U	0.004 U
Hazardous Characteristics				
Cyanide, Reactive (mg/kg)	250	0.71	0.68 U	0.58 U
Sulfide, Reactive (mg/kg)	500	120	13	0.58 U
Ignitability (Flashpoint) (F)	< 140	> 160	> 160	> 160
pH	< 2 or > 12.5	8.3	7.1	5.0

TABLE 4-15
TIDEWATER SITE
SEDIMENT SAMPLES

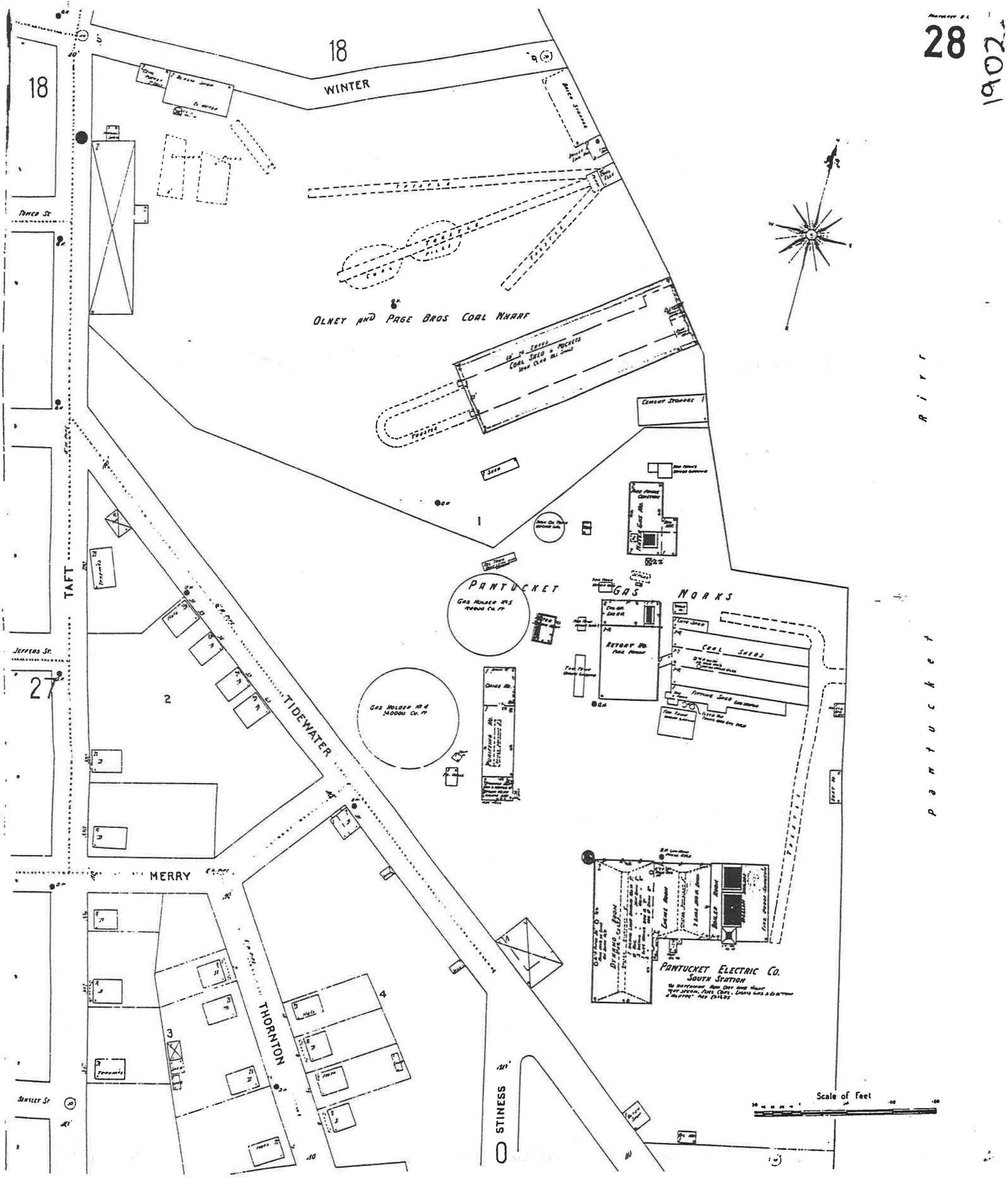
Compound	TSED1	TSED2	TSED3	TSED4	TSED5	TSED6
Volatile Organic Compounds (mg/kg)						
Benzene	0.21 U	0.85	0.72	2.26	5.16	0.10 J
Toluene	0.21 U	1.14	0.96	2.98	5.15	0.18 J
Ethylbenzene	0.21 U	1.22	0.5	1.2	4.03	0.20 U
m/p-Xylene	0.21 U	1.3	0.99	3.78	4.51	0.20 U
o-Xylene	0.21 U	0.29 U	0.27 U	1.13	3.86 U	0.20 U
Total BTEX	**ND**	**4.51**	**3.17**	**11.35**	**18.85**	**0.28**
Polycyclic Aromatic Hydrocarbons (mg/kg)						
Naphthalene	1.30 UJ	22.3	6.2	22.4	64.4	0.93 UJ
2-Methylnaphthalene	0.59	21.6	3.8	5.04	38.7	0.51
1-Methylnaphthalene	0.28	18.1	1.85	2.63	21.5	0.22
Acenaphthylene	0.50	127	6.5	6.94	103	0.52
Acenaphthene	0.21 U	18.4	1.82	3.17	21.3	0.17 J
Dibenzofuran	0.21 U	8.78	1.09	3.77	53.1	0.10 J
Fluorene	0.31	16.4	2.47	2.74	42.6	0.24
Phenanthrene	1.66	79	13.7	14.6	558	1.36
Anthracene	0.52	66.7	4.8	12.1	132	0.62
Fluoranthene	2.42	225	19.7	44.8	606	2.36
Pyrene	2.42	371	21.9	51.9	422	2.18
Benzo[a]anthracene	1.63	226	14.3	26.5	240	1.68
Chrysene	3.05	218	15.6	27.7	237	1.98
Benzo[b]fluoranthene	1.52	198	9.96	12.4	175	1.23
Benzo[k]fluoranthene	1.21	116	1.35	16.2	188	1.19
Benzo[a]pyrene	4.41	363	17.7	27.5	190	2.89
Indeno[1,2,3-cd]pyrene	1.44	165	9.21	13.4	131	1.1
Dibenz[a,h]anthracene	0.44	42.7	2.21	3.15	27.0 J	0.29
Benzo[g,h,i]perylene	1.5	149	13.7	46.9	130	1.5
Total PAHs	**23.9**	**2451.98**	**167.86**	**343.84**	**3353.6**	**20.14**
Metals (mg/kg)						
Antimony	15 U	11 U	16 U	11 U	13 U	12 U
Arsenic	19	4.4	6	2.3	5.1	0.24
Barium	51	20	66	25	57	21
Beryllium	0.88	0.45	1.6	0.33	0.5	0.59
Cadmium	1.5 U	1.1 U	1.6 U	1.1 U	1.3 U	1.2 U
Chromium	120	21	56	21	26	64
Copper	130	91	97	25	54	110
Lead	200	55	140	21	74	180
Mercury	0.16 U	0.12 U	0.18 U	0.11 U	0.14 U	0.44
Nickel	31	21	26	7	9.1	13
Selenium	15 U	11 U	16 U	11 U	13 U	12 U
Silver	3.1 U	2.3 U	3.2 U	2.3 U	2.5 U	2.4 U
Thallium	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Zinc	120	66	100	16	20	86
Total Cyanide	6.2	49	10	29	25	0.34
Polychlorinated Biphenyls (PCBs) (mg/kg)						
Total PCBs	0.860 U	0.700 U	0.990 U	0.660 U	0.750 U	0.660 U

TABLE 4-16
TIDEWATER SITE
GROUNDWATER ANALYSIS

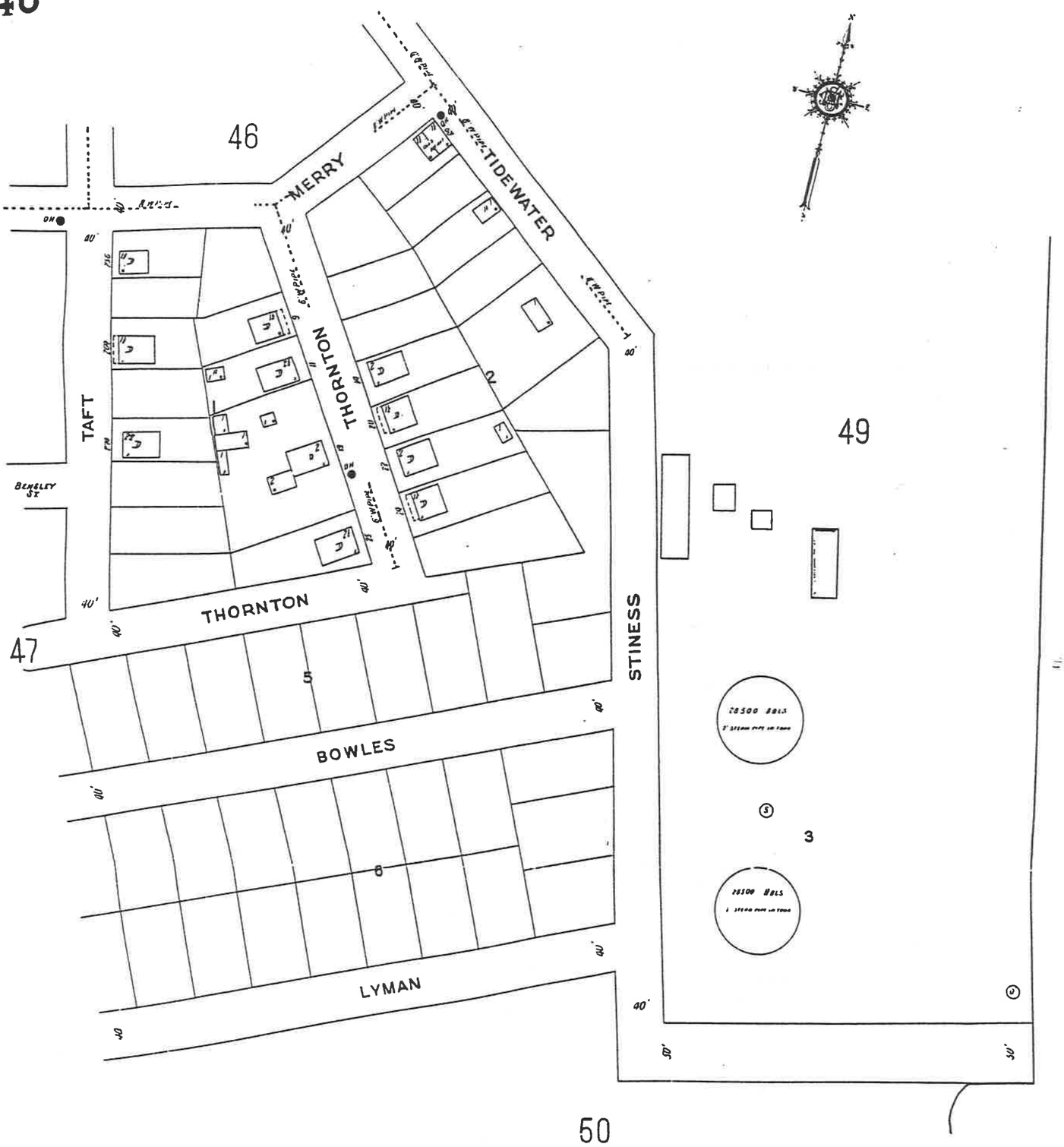
Compound	GB Groundwater Objective (mg/L)	MW-1	MW-3	MW-4	MW-6	MW-7	MW-M+E1
Volatile Organic Compounds (mg/L- MSE)							
Benzene	0.14	0.09	0.01 J	0.05	0.02	0.02 U	0.01 U
Toluene	1.7	0.16	0.01 U	0.04	0.02 U	0.02 U	0.01 U
Ethylbenzene	1.6	0.03	0.01 U	0.02 J	0.03	0.02 U	0.01 U
m/p-Xylene	--	0.25	0.01 U	0.07	0.02 U	0.02 U	0.01 U
Styrene	--	0.01 U	0.01 U	0.02 J	0.02 U	0.02 U	0.01 U
o-Xylene	--	0.15	0.01 U	0.05	0.02	0.02 U	0.01 U
1,2,4-Trimethylbenzene	--	0.14	0.01 J	0.25 J	0.01 J	0.02 U	0.01 U
Total MAHs		**0.82**	**0.02**	**0.5**	**0.08**	**ND**	**ND**
Polycyclic Aromatic Hydrocarbons (mg/L - MSE)							
Naphthalene	--	3.72	0.01 J	0.32	0.02 U	0.02 U	0.01 U
2-Methylnaphthalene	--	0.37	0.01 U	1.83 J	0.04	0.02 U	0.01 U
1-Methylnaphthalene	--	0.23	0.02	0.83 J	0.01 J	0.02 U	0.01 U
Acenaphthylene	--	0.23	0.02	1.09 J	0.13	0.02 U	0.01 U
Acenaphthene	--	0.06	0.01 J	1.85 J	0.04	0.02 U	0.01 U
Dibenzofuran	--	0.15	0.01 U	0.25 J	0.04	0.02 U	0.01 U
Fluorene	--	0.11	0.01 U	0.45 J	0.03	0.02 U	0.01 U
Phenanthrene	--	0.13	0.01 U	0.51 J	0.04	0.02 U	0.01 U
Anthracene	--	0.08	0.01 J	0.58 J	0.02 U	0.02 U	0.01 U
Fluoranthene	--	0.05	0.01 U	1.2 J	0.02 U	0.02 U	0.01 U
Pyrene	--	0.3	0.01 U	1.62 J	0.01 J	0.02 U	0.01 U
Benzo[a]anthracene	--	0.02	0.01 U	0.64 J	0.06	0.02 U	0.01 U
Chrysene	--	0.01 U	0.01 U	0.63 J	0.02 U	0.02 U	0.01 U
Benzo[b]fluoranthene	--	0.01 U	0.01 U	0.21 J	0.02 U	0.02 U	0.01 U
Benzo[k]fluoranthene	--	0.01 U	0.01 U	0.3 J	0.02 U	0.02 U	0.01 U
Benzo[a]pyrene	--	0.01 J	0.01 U	0.43 J	0.02 U	0.02 U	0.01 U
Indeno[1,2,3-cd]pyrene	--	0.01 J	0.01 U	0.21 J	0.02 U	0.02 U	0.01 U
Dibenz[a,h]anthracene	--	0.01 U	0.01 U	0.08 J	0.02 U	0.02 U	0.01 U
Benzo[g,h,i]perylene	--	0.01 U	0.01 U	0.31 J	0.02 U	0.02 U	0.01 U
Total PAHs		**5.47**	**0.07**	**13.34**	**0.4**	**ND**	**ND**
Metals (mg/L)							
Antimony	--	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Arsenic	--	0.01	0.0027	0.0020 U	0.002 U	0.0020 U	0.0020 U
Barium	--	0.028	0.049	0.036	0.23	0.017	0.024
Beryllium	--	0.0074	0.0020 U	0.0020 U	0.002 U	0.002 U	0.0020 U
Cadmium	--	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Chromium	--	0.025	0.024 U	0.024 U	0.024 U	0.024 U	0.024 U
Copper	--	0.12	0.024 U	0.024 U	0.024 U	0.024 U	0.024 U
Lead	--	0.24	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Mercury	--	0.00020 U	0.0002 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
Nickel	--	0.25	0.024 U	0.024 U	0.024 U	0.024 U	0.024 U
Selenium	--	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Silver	--	0.020 U	0.20 U	0.020 U	0.020 U	0.020 U	0.020 U
Thallium	--	0.002 U	0.002 U	0.0020 U	0.0020 U	0.0020 U	0.002 U
Zinc	--	0.95	0.025	0.028	0.023	0.023	0.016
Total Cyanide	--	0.3	0.068	0.24	0.18	0.020 U	0.68

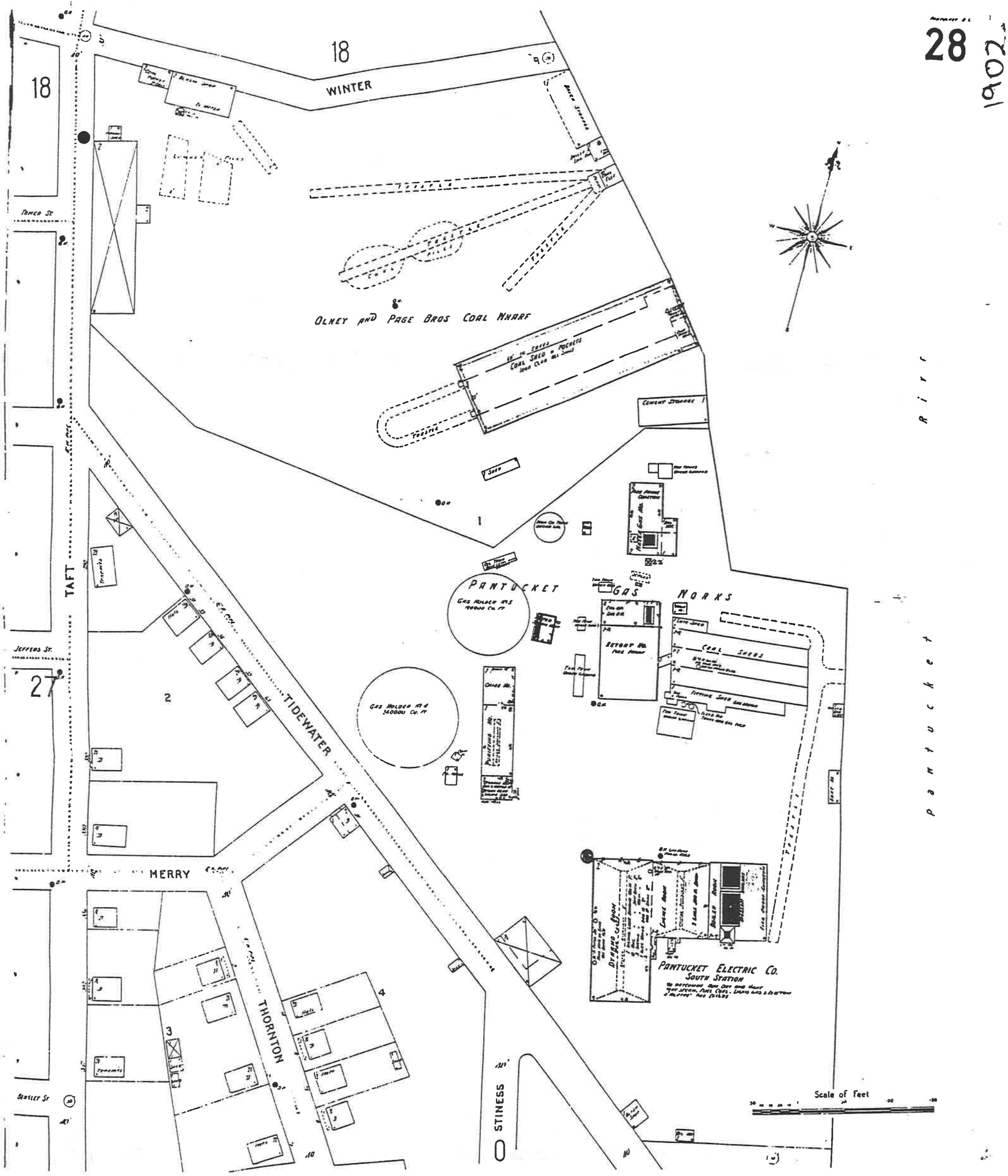
APPENDIX A

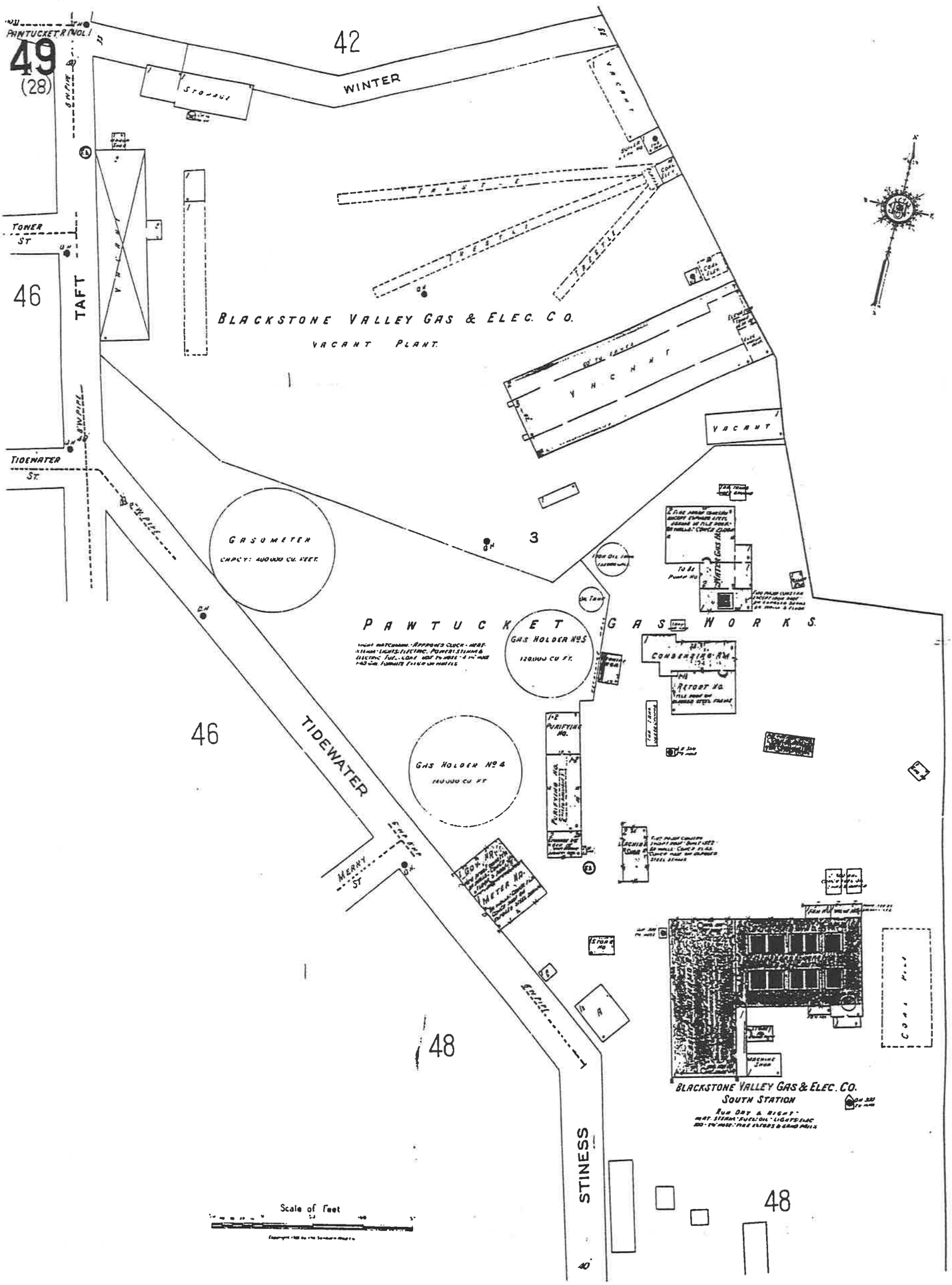
SANBORN MAPS


18
WINTER
18
TOWER St.
OLNEY AND PAGE BROS COAL WHARF
CEMENT STORAGE
PAWTUCKET GAS WORKS
GAS HOLDER NO 4
34000 Cu. Ft.
TAFT
JEFFERS St.
27
TIDEWATER
MERRY
THORNTON
STINESS
PAWTUCKET ELECTRIC CO.
SOUTH STATION
Scale of Feet
Pawtucket River

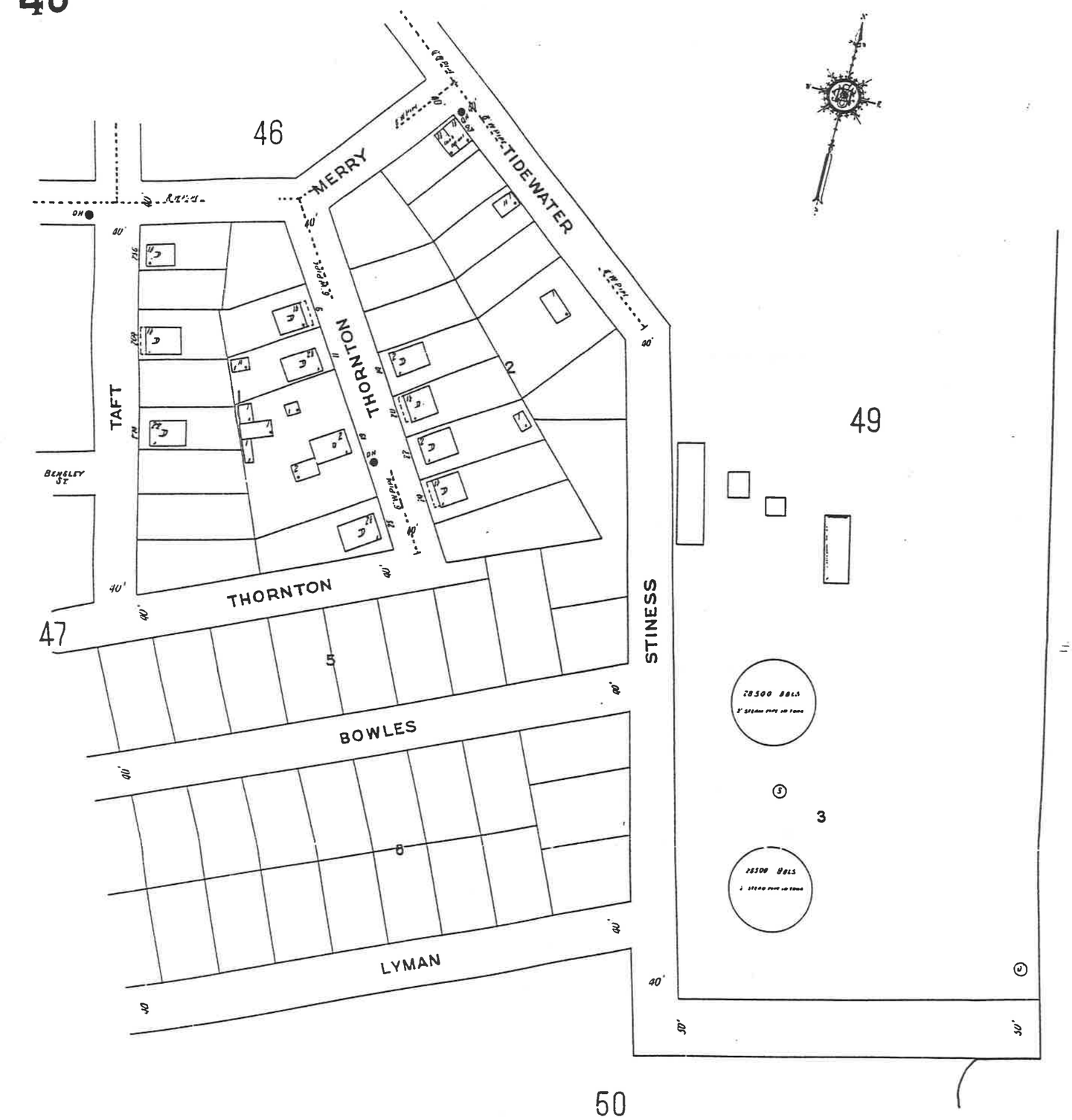
PAWTUCKET RI VOL 1 (1923)
48
(28)
1923

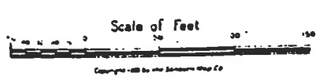


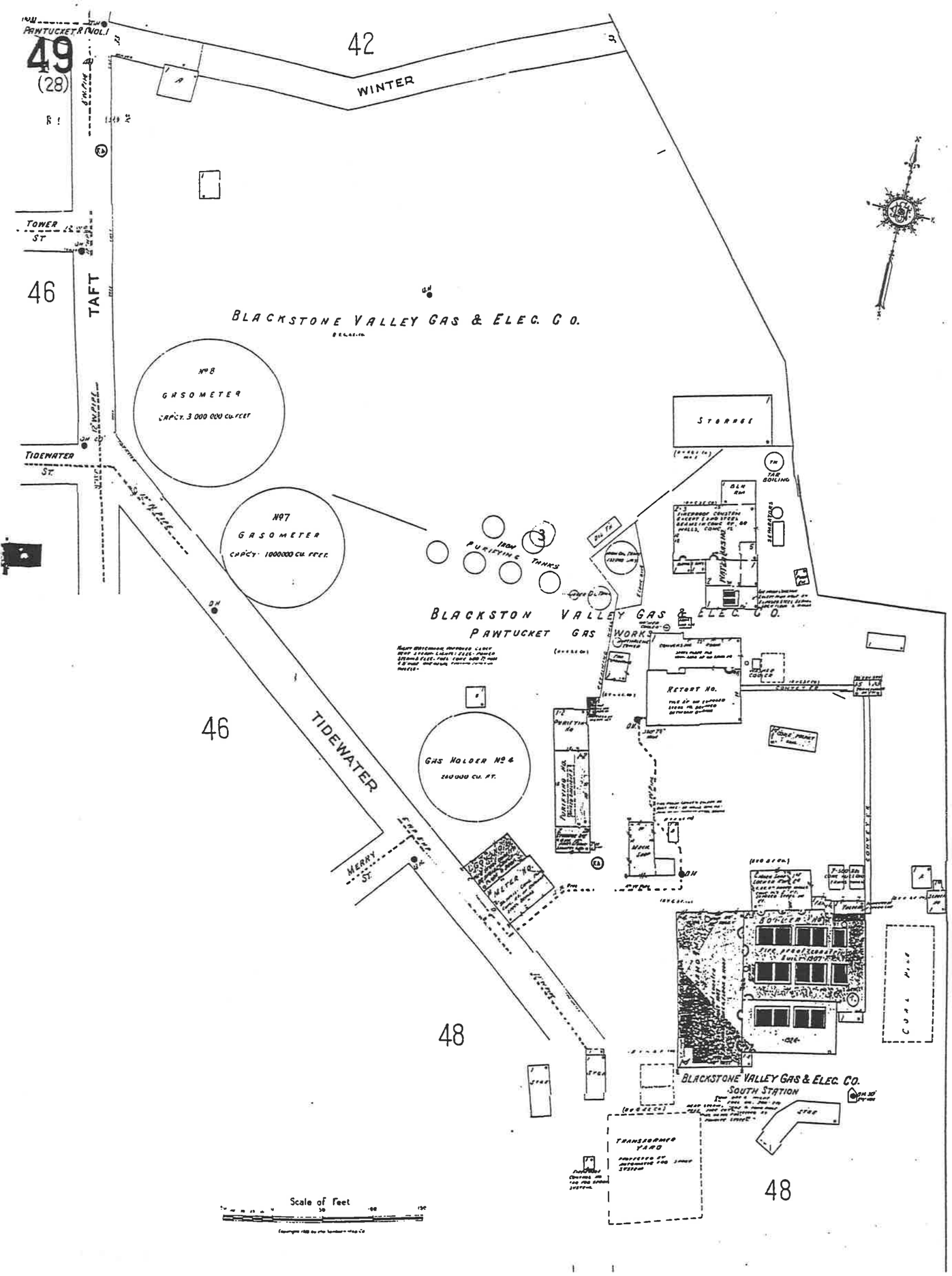

18
WINTER
18
TOWER ST.
TAFT
JEFFERS ST.
27
OLNEY AND PAGE BROS COAL WHARF
COAL SHED & POCKETS
CEMENT STORAGE
SAND
PANTUCKET GAS WORKS
GAS HOLDER NO 5
GAS HOLDER NO 4
TIDEWATER
MERRY
THORNTON
STINESS
STANLEY ST
PANTUCKET ELECTRIC CO.
SOUTH STATION
Scale of Feet
Pantucket River


49
(28)
PAWTUCKET R.(NOL.)
42
WINTER
STORAGE
VACANT
TOWER ST
46
TAFT
BLACKSTONE VALLEY GAS & ELEC. CO.
VACANT PLANT
VACANT
TIDEWATER ST
GASOMETER
CAPCY: 400000 CU. FEET
3
PAWTUCKET GAS WORKS
GAS HOLDER No 5
120,000 CU FT.
CONDENSING RM.
PETTOT No.
GAS HOLDER No 4
140,000 CU FT
TIDEWATER
MERRY ST
48
STINESS
BLACKSTONE VALLEY GAS & ELEC. CO.
SOUTH STATION
Scale of Feet
40'
Pawtucket River

PAWTUCKET RI VOL I (1923)
48
(28)
1923



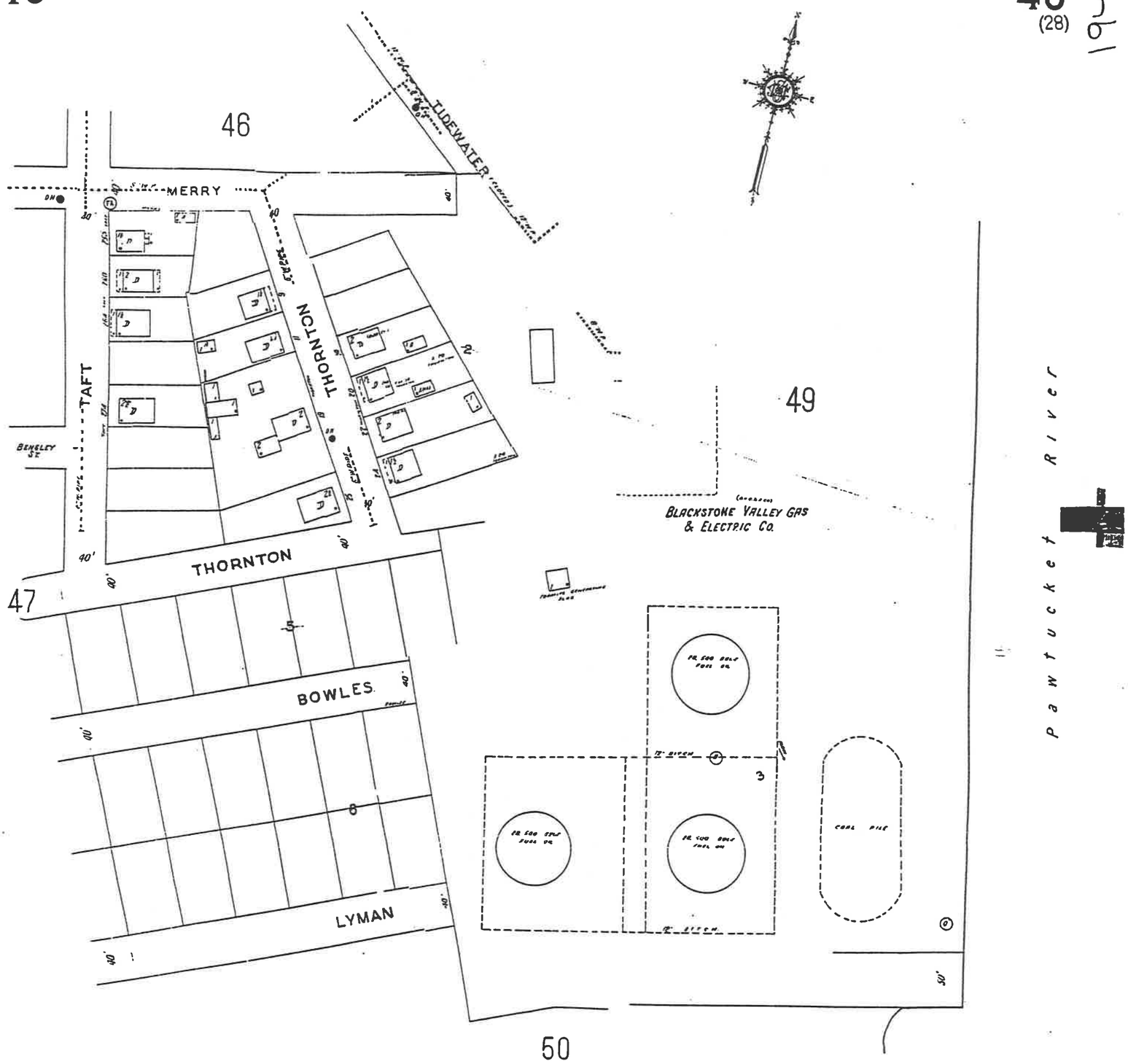


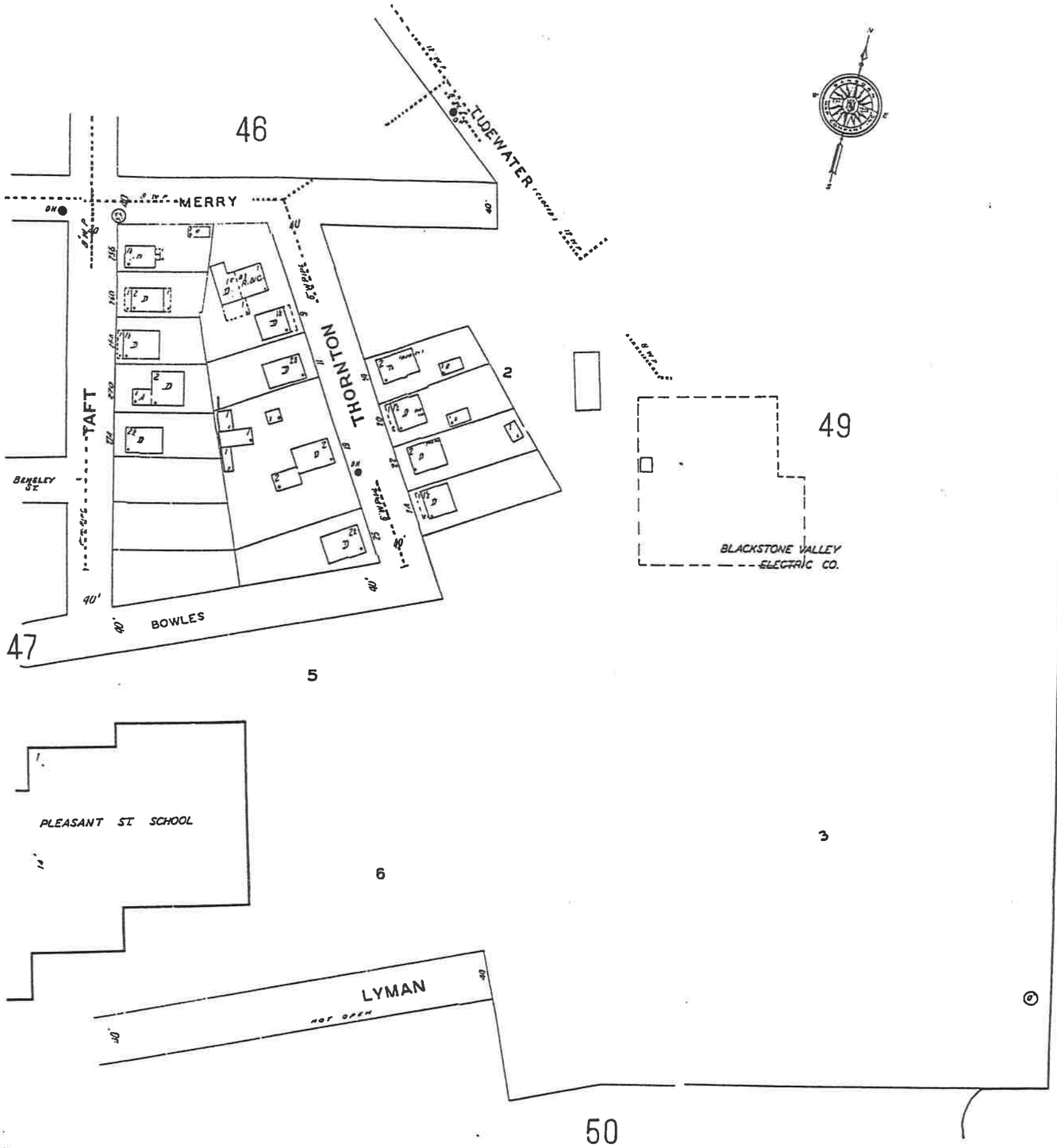

49
(28)
42
WINTER
TOWER ST
46
TAFT
BLACKSTONE VALLEY GAS & ELEC. CO.
No 8
GASOMETER
CAPCY. 3 000 000 CU FEET
No 7
GASOMETER
CAPCY. 1000000 CU FEET
TIDEWATER ST
STORAGE
PURIFYING
TANKS
BLACKSTON VALLEY GAS & ELEC CO.
PAWTUCKET GAS WORKS
RETORT No.
GAS HOLDER No 6
240 000 CU. FT.
46
TIDEWATER
MERRY ST
METER No.
48
BLACKSTONE VALLEY GAS & ELEC. CO.
SOUTH STATION
COAL PILE
TRANSFORMER YARD
48
Scale of Feet
Pawtucket River

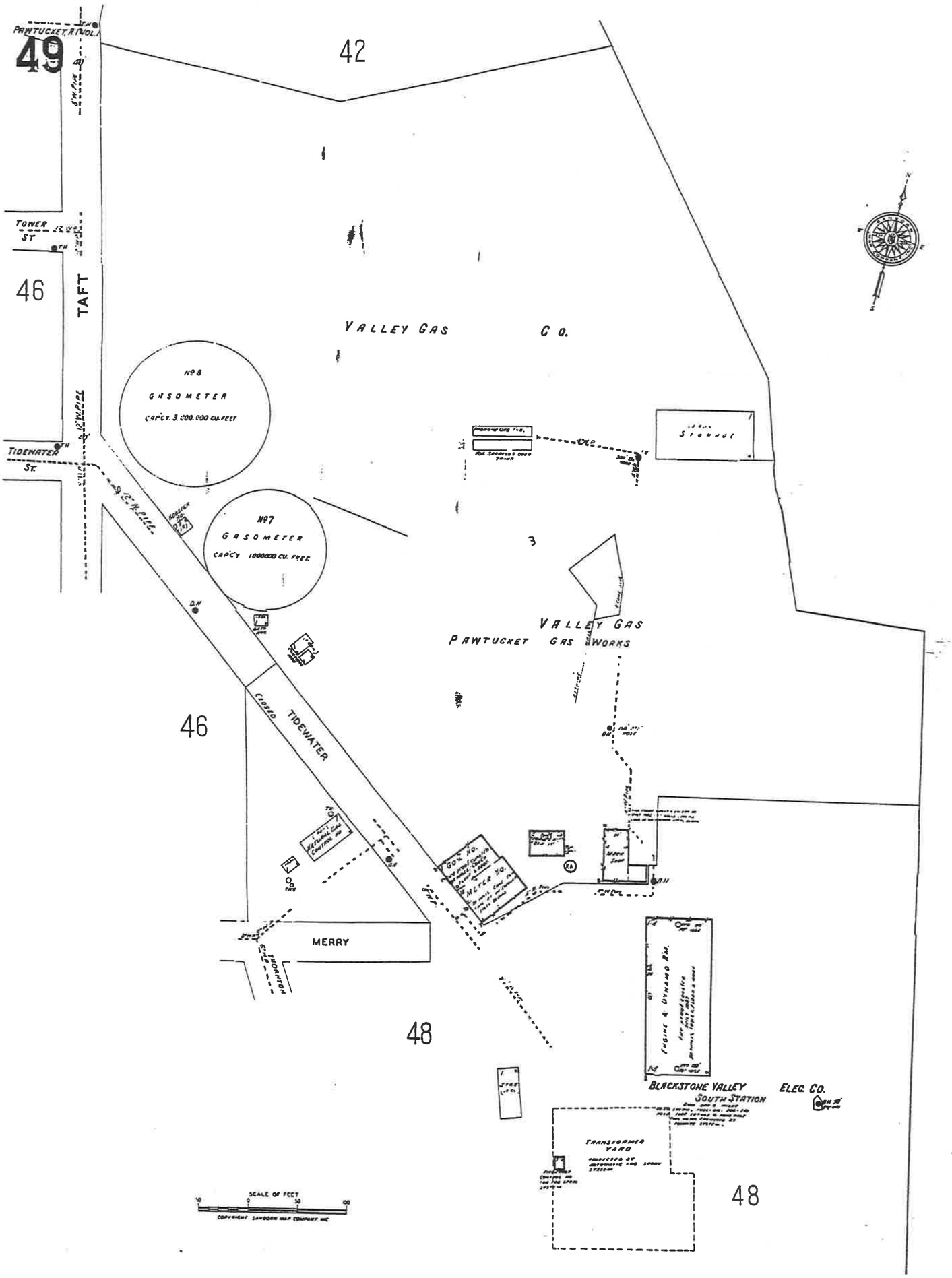
49

96

PAWTUCKET R I VOL I
48
(28)
1916






PAWTUCKET, R.I. VOL. I
49
42
TOWER ST
46
TAFT
VALLEY GAS CO.
No 8
GASOMETER
CAP'CY. 3,000,000 CU. FEET
TIDEWATER ST
No 7
GASOMETER
CAP'CY 1000000 CU. FEET
VALLEY GAS
PAWTUCKET GAS WORKS
CLOSED TIDEWATER
46
MERRY
48
BLACKSTONE VALLEY ELEC. CO.
SOUTH STATION
TRANSFORMER YARD
48
PAWTUCKET RIVER
SCALE OF FEET
0 50 100

APPENDIX B

RESULTS OF THE INDOOR AIR MONITORING

R.I. Analytical

Specialists in Environmental Services

CERTIFICATE OF ANALYSIS

R.I. Analytical Laboratories, Inc.
Attn: Mr. Steve McDonagh
41 Illinois Avenue
Warwick, RI 02888

DATE RECEIVED: 08/29/96
DATE REPORTED: 08/30/96
P.O. #:
INVOICE #: A5259

DESCRIPTION: Five (5) air samples collected 8/28/96 @ Varieur School, Pawtucket, RI

Subject sample, collected by RIAL personnel, has been analyzed by our laboratory with the following results:

SAMPLE ID	TRICHLOROETHYLENE	DETECTION LIMIT
Cafeteria	ND	0.8
Kindergarden	ND	0.8
Mechanical Room	ND	0.8
Library	ND	0.8
Room 13	ND	0.8

Results reported in mg/m^3

Reference: NIOSH Manual of analytical Methods, U.S. Department of Health and Human Services, 3rd., February 1984. Method 1022

If you have any questions regarding this work, or if we may be of further assistance, please contact us.

Approved by:

James E. Mich
Vice President

eamikah

Kellie Mulligan
Qualtiy Control Coordinator

APPENDIX C

QA/QC RESULTS

DATA VALIDATION

In-house data validation was performed by a qualified chemist on all analytical results received from the laboratory to ensure that:

- data packages are complete;
- holding times have been met;
- blanks are reviewed;
- data are qualified if validation indicates the sample results do not meet strict quality assurance objectives; and
- generally, that the analytical data is complete, reliable, and of high quality.

This approach ensures the overall quality and completeness of the projects analytical program. All analytical results received from Laboratory Resources, Inc. (LRI) were received in both hard copy form and in digital format. Analytical result tables were generated electronically from the digital data to minimize the risks associated with the transcription process. All final tables were cross checked with original hard copy data to ensure completeness.

As part of the reduced deliverable data validation procedure the following volatile data requirements for the data deliverables were evaluated.

I. **Holding Times.** All samples were analyzed within required holding times.

II. **GC and GC/MS Instrument Performance Check.** Acceptable.

III. **Initial and Continuing Calibration.** All required minimum Relative Response Factors (RRFs) and Maximum %Relative Standard Deviation (RSD) calibration requirements have been met for all LRI analytical data in accordance with the methodologies. Calibration data was not provided for META data.

IV. **Blanks.** Volatile method blank sample qualification is summarized below all corresponding sample results were qualified following guidelines listed in USEPA CONTRACT LABORATORY PROGRAM (CLP) NATIONAL FUNCTIONAL GUIDELINES FOR ORGANIC DATA REVIEW (1994).

VOLATILE BLANK SUMMARY (META DATA)								
	AT960705-SB		AT960712-SB		AT960717-SB		AT960719-AB	
Compound	Result (ug/Kg)	Action Level (ug/Kg)	Result (ug/Kg)	Action Level (ug/Kg)	Result (ug/Kg)	Action Level (ug/Kg)	Result (ug/Kg)	Action Level (ug/Kg)
Benzene	80 J	400	100 J	500	50 J	250	10 U	none
Toluene	60 J	300	70 J	350	150 U	none	10 U	none
	AT960719-SB		AT960802-SB		AT960807-AB		AT960816-SB	
Compound	Result (ug/Kg)	Action Level (ug/Kg)	Result (ug/Kg)	Action Level (ug/Kg)	Result (ug/Kg)	Action Level (ug/Kg)	Result (ug/Kg)	Action Level (ug/Kg)
Benzene	100 J	500	140 U	none	10 U	none	60 J	300
Toluene	160 U	none	140 U	none	10 U	none	40 J	200
	AT960909-SB		AT960909-AB					
Compound	Result (ug/Kg)	Action Level (ug/Kg)	Result (ug/Kg)	Action Level (ug/Kg)				
Benzene	160 U	none	10 U	none				
Toluene	110 J	550	10 U	none				
Action levels listed above do not include dilution factors.								

V. **System Monitoring Compounds.** All system monitoring compound percent recoveries were acceptable.

VI. **Matrix Spike/ Matrix Spike Duplicates (MS/MSD).** MS/MSD results were all acceptable

VII. **Internal Standards.** All reported within acceptable limits. Primary analysis for sample E607210-17; TB-9 (6-8) indicated one internal standard area less than 50 percent recovery for volatile scan 8260. All other internal standards were within acceptable limits. Reanalysis of this sample showed similar results. No action was taken; results are presented without qualification.

Semivolatiles

As part of the reduced deliverable data validation procedure the following semivolatile data requirements were evaluated.

I. **Holding Times.** All samples were analyzed within required holding times.

II. **GC/MS Instrument Performance Check.** BFTPP % relative abundance acceptable.

III. **Initial and Continuing Calibration.** All required minimum Relative Response Factors (RRFs) and Maximum %Relative Standard Deviation (RSD) calibration requirements have been met in accordance with the methodologies for LRI results. No data was provided for META analysis.

IV. **Blanks.** Semivolatile method blank sample qualification is summarized below all corresponding sample results were qualified following guidelines listed in USEPA CONTRACT LABORATORY PROGRAM (CLP) NATIONAL FUNCTIONAL GUIDELINES FOR ORGANIC DATA REVIEW (1994).

SEMIVOLATILE BLANK SUMMARY (META DATA)

Compound	AT960717-SB		AT960802-SB		AT960816-SB	
	Result (ug/Kg)	Action Level (ug/Kg)	Result (ug/Kg)	Action Level (ug/Kg)	Result (ug/Kg)	Action Level (ug/Kg)
1-Methylnaphthalene	80 J	400	140 U	none	80 U	none
Phenanthrene	100 J	500	140 U	none	60 J	300
Naphthalene	150 U	none	370 J	1850	60 J	300

Action levels listed above do not include dilution factors.

V. **System Monitoring Compounds.** Sample E607139-11; TTP8B (8-9) showed low recovery of surrogate 2-Fluorobiphenyl. EPA Functional Guidelines allow for one surrogate to be outside specification as long as the remaining surrogates are of acceptable recovery. No action was taken. Sample E607262-04; TB19 (4-6) showed low recovery of surrogates nitrobenzene and 2-fluorobiphenyl. All positive results were estimated J and all nondetected compounds were flagged U,J estimated nondetects.

VI. **Matrix Spike/Matrix Spike Duplicates (MS/MSD).** Data not available.

VII. **Internal Standards (IS).** All responses and retention times fell within acceptable limits.

Inorganics

As part of the reduced deliverable data validation procedure the following inorganic data requirements were evaluated;

I. **Holding Times.** All samples were analyzed within required holding times.

II. **Initial and Continuing Calibration.** Acceptable.

III. **Blanks.** Blank samples were reviewed. Blank sample contamination was not found to require sample qualification.

IV. **ICP Interference Check Sample (ICS).** All ICS results were within acceptable % recoveries.

V. **Laboratory Control Sample.** All system monitoring compound percent recoveries were acceptable.

VI. **Duplicate Sample.** Acceptable.

APPENDIX D

SOIL GAS RAW ANALYTICAL DATA

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: Calibration Standar
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Ga
Location: Tidewater Former MGP Pawtucket, R

Date: July 3, 1996
Analysis #: 3
Weather: Partly Cloudy occasional rain/thunder storms
Sample Depth: 3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume:

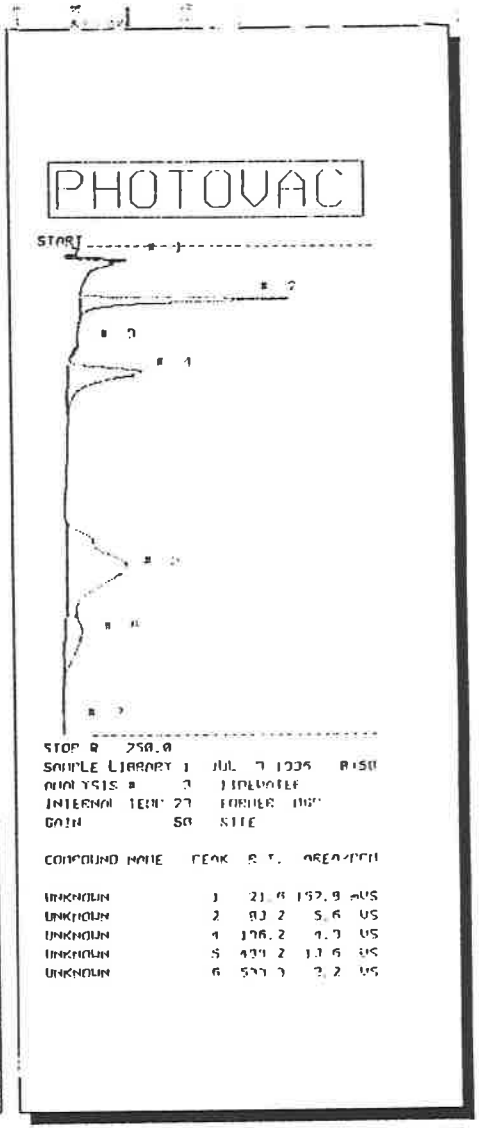
Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____



GC Background
Syringe Background

Total VOC's
VOC's w/ Background

Chemist: _____

Assistant: _____

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: Syringe Blank
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, RI

Date: July 2, 1996
Analysis #: 3
Weather: Sunny
Sample Depth: 3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	200 µl								
Gain	50								
Retention Time	81.8 Sec	191.2 Sec	444.8 Sec	482.3 Sec	580.3 Sec	N/S Sec	N/S Sec		
Response	18.7 Vs	11.7 Vs	7 Vs	29.8 Vs	10.9 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: ~~300 µl~~ 400µl

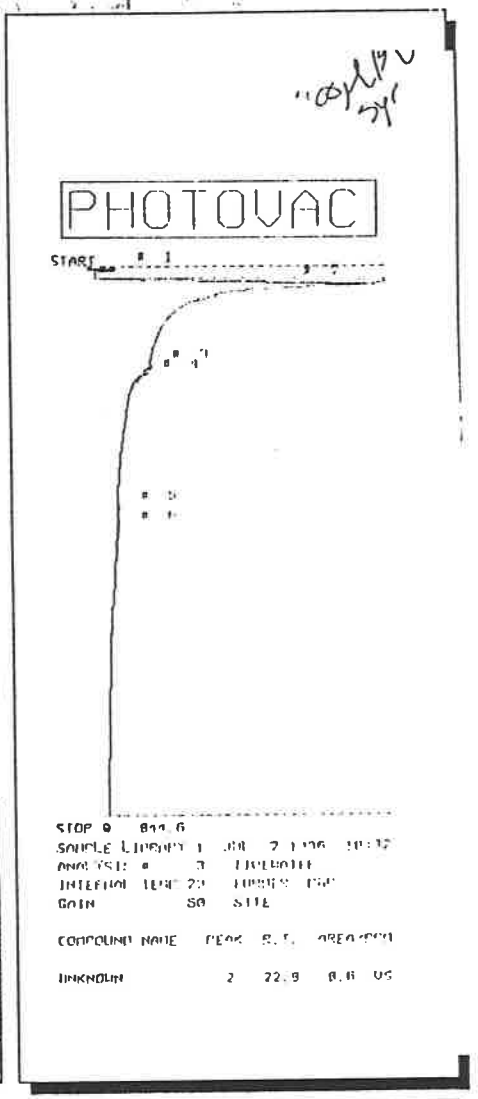
Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
	~~400 µl~~								
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: Syringe Background only



GC Background: None
Syringe Background: 8.6 Vs
Total VOC's: 0
VOC's w/ Background:

Chemist:

Assistant:

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: Equipment Blank
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, RI

Date: July 2, 1996
Analysis #: 4
Weather: Sunny
Sample Depth: 3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	200 µl								
Gain	50								
Retention Time	81.8 Sec	191.2 Sec	444.8 Sec	482.3 Sec	580.3 Sec	N/S Sec	N/S Sec		
Response	18.7 Vs	11.7 Vs	7 Vs	29.8 Vs	10.9 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

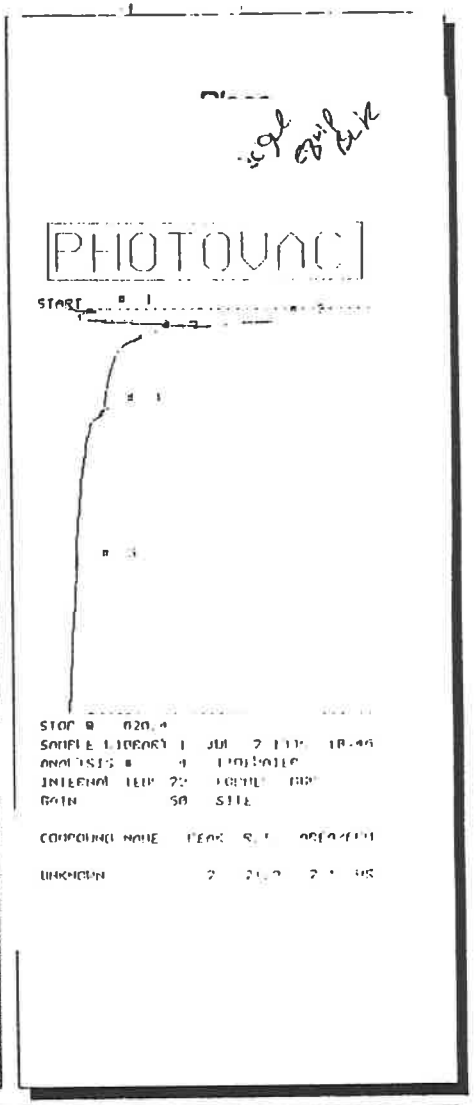
Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____



GC Background: none
Syringe Background: 2.1 VS

Total VOC's
VOC's w/ Background

Chemist: _____

Assistant: _____

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: BTEX CALIBRATION STD
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, RI

Date: July 2, 1996
Analysis #: 2
Weather: Sunny
Sample Depth: 3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	200 µl								
Gain	50								
Retention Time	81.8 Sec	191.2 Sec	444.8 Sec	482.3 Sec	580.3 Sec	N/S Sec	N/S Sec		
Response	18.7 Vs	11.7 Vs	7 Vs	29.8 Vs	10.9 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

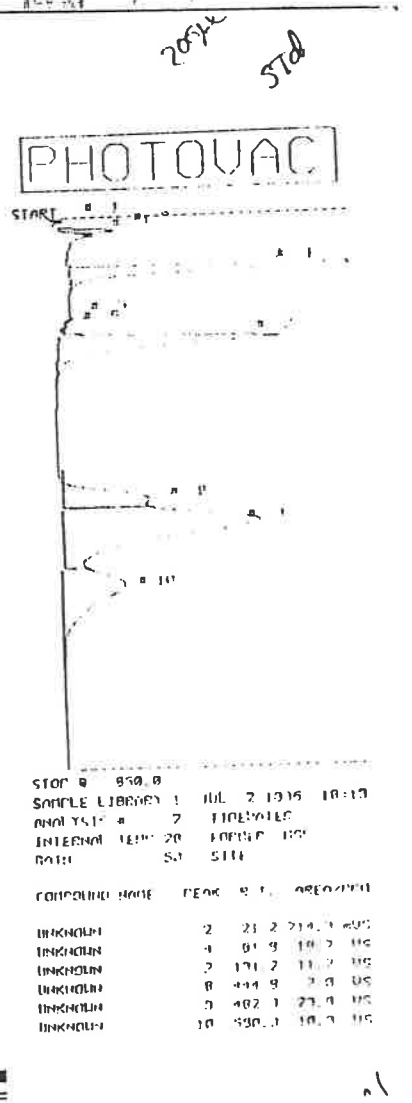
Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: initial Calibration Standard passed QC.



GC Background
Syringe Background

Total VOC's
VOC's w/ Background

Chemist:

Assistant:

ATLANTIC Environmental Services, Inc.
SOIL GAS SURVEY

Sample Identification:	Instrument Blank	Date:	July 2, 1996
Project Number:	2061-03-01	Analysis #:	1
Client Name:	Blackstone Valley Electric/Valley Gas	Weather:	Sunny
Location:	Tidewater Former MGP Pawtucket, RI	Sample Depth:	3 feet

STANDARD INFORMATION

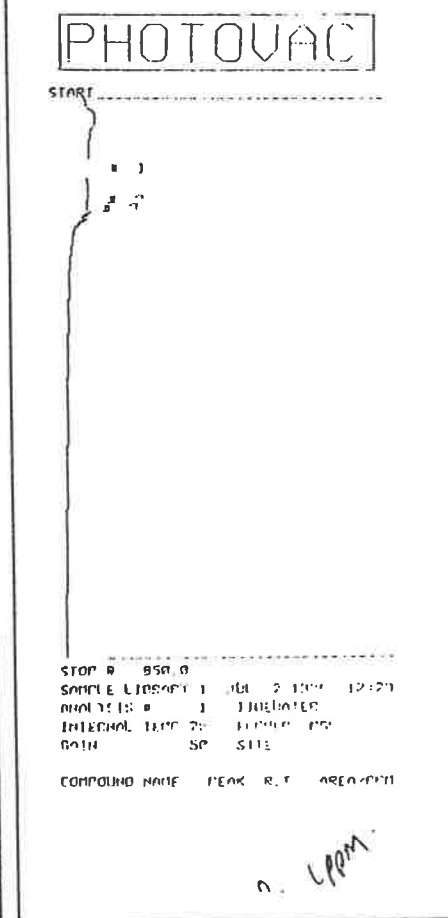
	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume									
Gain									
Retention Time									
Response									
Concentration									

SAMPLE INFORMATION

Sample Injection Volume: ~~300 µl~~
Gain : 50

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									



Unidentified Peaks

Peak #						
Retention Time						
Response						

GC Background	
Syringe Background	
Total VOC's	
VOC's w/ Background	

Chemist: ______

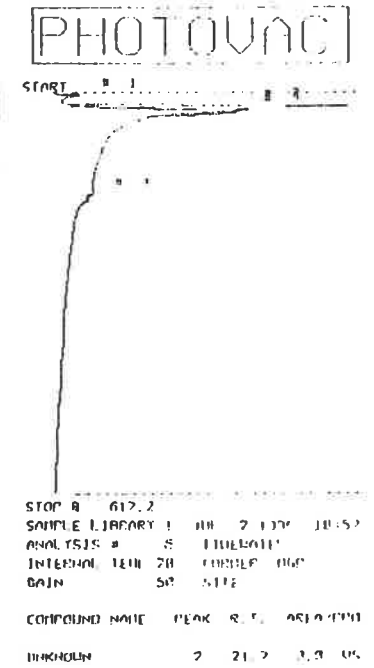
Assistant: ______

Comments: Instrument Blank run prior to initial Standard.

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification:	TW-SG-14	Date:	July 2, 1996
Project Number:	2061-03-01	Analysis #:	5
Client Name:	Blackstone Valley Electric/Valley Gas	Weather:	Sunny
Location:	Tidewater Former MGP Pawtucket, RI	Sample Depth:	3 feet



STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	200 µl								
Gain	50								
Retention Time	81.8 Sec	191.2 Sec	444.8 Sec	482.3 Sec	580.3 Sec	N/S Sec	N/S Sec		
Response	18.7 Vs	11.7 Vs	7 Vs	29.8 Vs	10.9 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

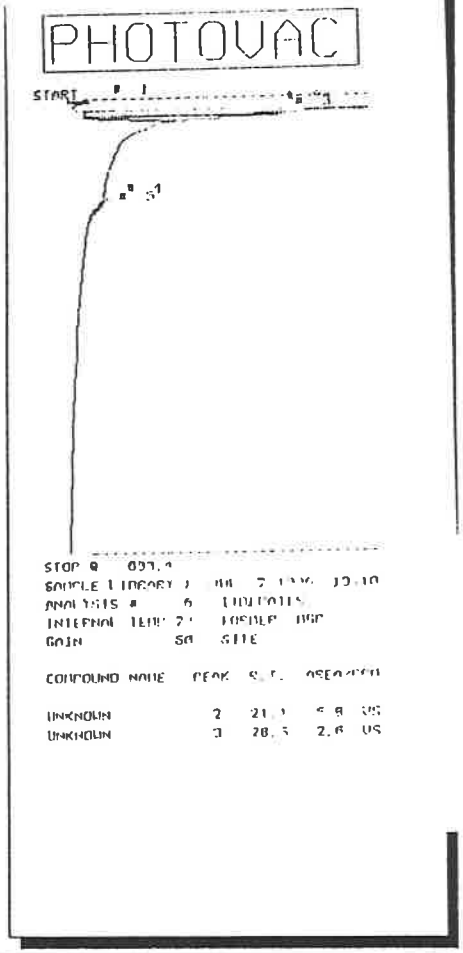
Comments: _____

GC Background	None	Chemist:	
Syringe Background	3.0 Vs		
Total VOC's		Assistant:	
VOC's w/ Background			

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification:	TW-SG-15	Date:	July 2, 1996
Project Number:	2061-03-01	Analysis #:	6
Client Name:	Blackstone Valley Electric/Valley Gas	Weather:	Sunny
Location:	Tidewater Former MGP Pawtucket, RI	Sample Depth:	3 feet



STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	200 µl								
Gain	50								
Retention Time	81.8 Sec	191.2 Sec	444.8 Sec	482.3 Sec	580.3 Sec	N/S Sec	N/S Sec		
Response	18.7 Vs	11.7 Vs	7 Vs	29.8 Vs	10.9 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

Identified Peaks

		Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

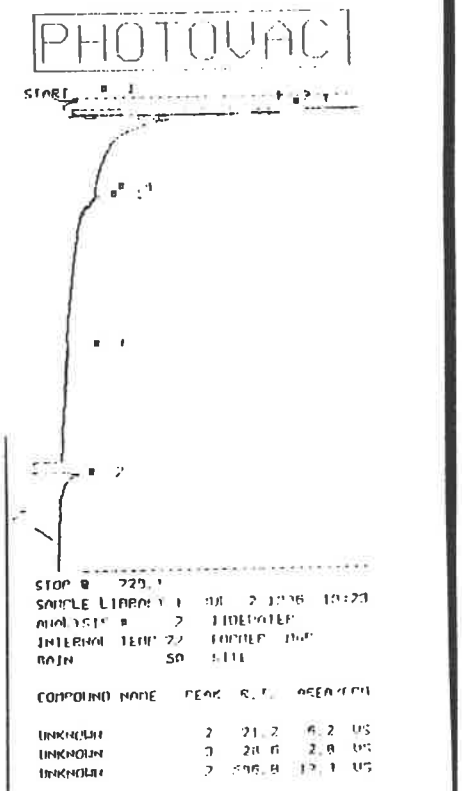
Comments: _____

GC Background		Chemist:	
Syringe Background			
Total VOC's		Assistant:	
VOC's w/ Background			

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification:	TW-SG-16	**Date:**	July 2, 1996
Project Number:	2061-03-01	**Analysis #:**	7
Client Name:	Blackstone Valley Electric/Valley Gas	**Weather:**	Sunny
Location:	Tidewater Former MGP Pawtucket, RI	**Sample Depth:**	3 feet



STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	200 µl								
Gain	50								
Retention Time	81.8 Sec	191.2 Sec	444.8 Sec	482.3 Sec	580.3 Sec	N/S Sec	N/S Sec		
Response	18.7 Vs	11.7 Vs	7 Vs	29.8 Vs	10.9 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____

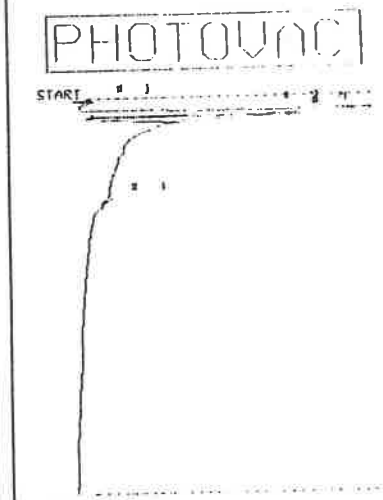
GC Background		Chemist:	
Syringe Background			
Total VOC's		Assistant:	
VOC's w/ Background			

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: TW-SG-18
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, RI

Date: July 2, 1996
Analysis #: 8
Weather: Sunny
Sample Depth: 3 feet



STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	200 µl								
Gain	50								
Retention Time	81.8 Sec	191.2 Sec	444.8 Sec	482.3 Sec	580.3 Sec	N/S Sec	N/S Sec		
Response	18.7 Vs	11.7 Vs	7 Vs	29.8 Vs	10.9 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____

GC Background _____
Syringe Background _____

Total VOC's _____
VOC's w/ Background _____

Chemist: _____

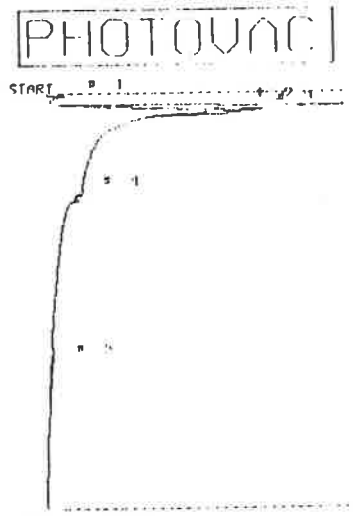
Assistant: _____

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: TW-SG-4
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, RI

Date: July 2, 1996
Analysis #: 9
Weather: Sunny
Sample Depth: 3 feet



STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	200 µl								
Gain	50								
Retention Time	81.8 Sec	191.2 Sec	444.8 Sec	482.3 Sec	580.3 Sec	N/S Sec	N/S Sec		
Response	18.7 Vs	11.7 Vs	7 Vs	29.8 Vs	10.9 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____

GC Background		Chemist:	
Syringe Background			
Total VOC's		Assistant:	
VOC's w/ Background			

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: TW-SG-3
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, RI

Date: July 2, 1996
Analysis #: 10
Weather: Sunny
Sample Depth: 3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	200 µl								
Gain	50								
Retention Time	81.8 Sec	191.2 Sec	444.8 Sec	482.3 Sec	580.3 Sec	N/S Sec	N/S Sec		
Response	18.7 Vs	11.7 Vs	7 Vs	29.8 Vs	10.9 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

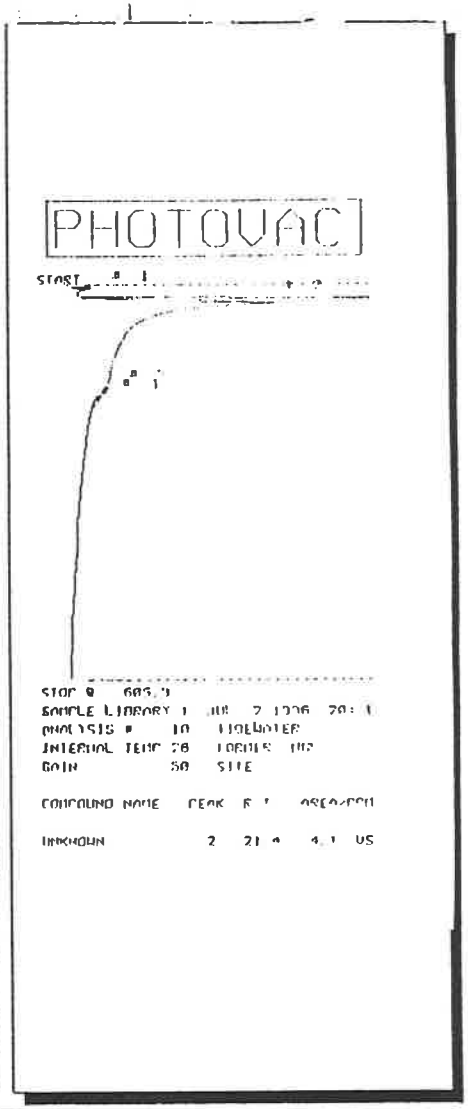
Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____



GC Background
Syringe Background

Total VOC's
VOC's w/ Background

Chemist: _____

Assistant: _____

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification:	TW-SG-2	Date:	July 2, 1996
Project Number:	2061-03-01	Analysis #:	11
Client Name:	Blackstone Valley Electric/Valley Gas	Weather:	Sunny
Location:	Tidewater Former MGP Pawtucket, RI	Sample Depth:	3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	200 µl								
Gain	50								
Retention Time	81.8 Sec	191.2 Sec	444.8 Sec	482.3 Sec	580.3 Sec	N/S Sec	N/S Sec		
Response	18.7 Vs	11.7 Vs	7 Vs	29.8 Vs	10.9 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

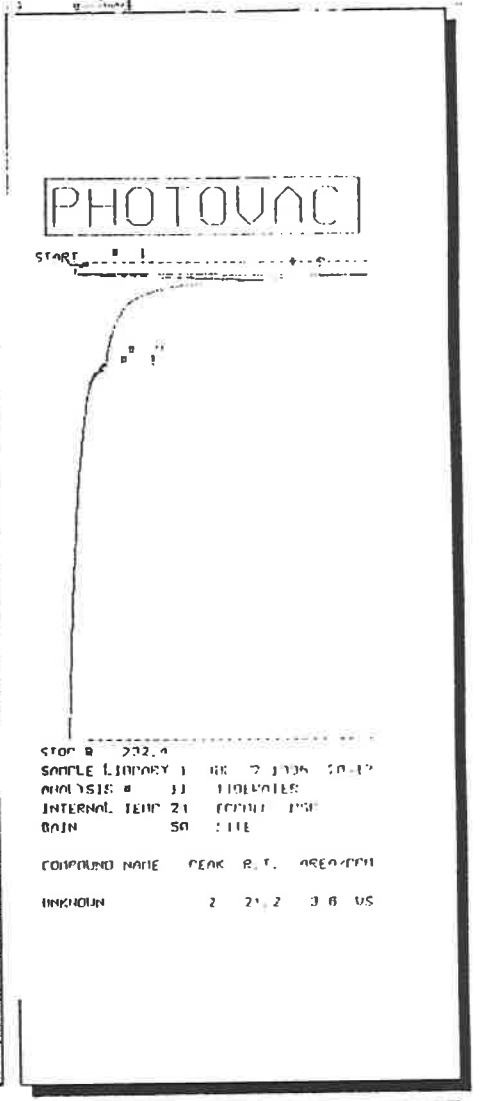
Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____



GC Background		Chemist:	
Syringe Background			
Total VOC's		Assistant:	
VOC's w/ Background			

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification:	TW-SG-1	**Date:**	July 2, 1996
Project Number:	2061-03-01	**Analysis #:**	12
Client Name:	Blackstone Valley Electric/Valley Gas	**Weather:**	Sunny
Location:	Tidewater Former MGP Pawtucket, RI	**Sample Depth:**	3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	200 µl								
Gain	50								
Retention Time	81.8 Sec	191.2 Sec	444.8 Sec	482.3 Sec	580.3 Sec	N/S Sec	N/S Sec		
Response	18.7 Vs	11.7 Vs	7 Vs	29.8 Vs	10.9 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

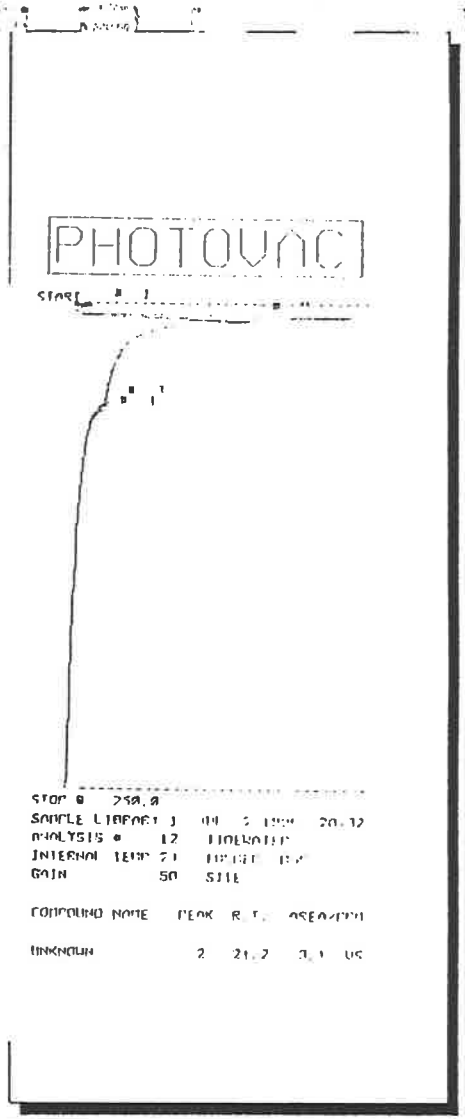
Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____



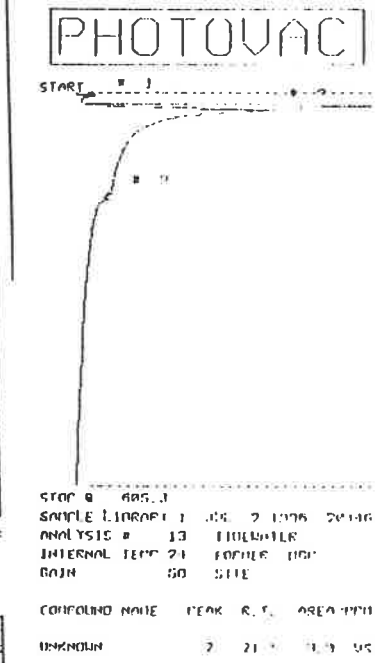
GC Background		Chemist:	
Syringe Background			
Total VOC's		Assistant:	
VOC's w/ Background			

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: TW-SG-19
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, RI

Date: July 2, 1996
Analysis #: 13
Weather: Sunny
Sample Depth: 3 feet



STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	200 µl								
Gain	50								
Retention Time	81.8 Sec	191.2 Sec	444.8 Sec	482.3 Sec	580.3 Sec	N/S Sec	N/S Sec		
Response	18.7 Vs	11.7 Vs	7 Vs	29.8 Vs	10.9 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____

GC Background		Chemist:	
Syringe Background			
Total VOC's		Assistant:	
VOC's w/ Background			

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: Continuing Calibration Std
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, RI

Date: July 2, 1996
Analysis #: 14
Weather: Sunny
Sample Depth: 3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	200 µl								
Gain	50								
Retention Time	81.8 Sec	191.2 Sec	444.8 Sec	482.3 Sec	580.3 Sec	N/S Sec	N/S Sec		
Response	18.7 Vs	11.7 Vs	7 Vs	29.8 Vs	10.9 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

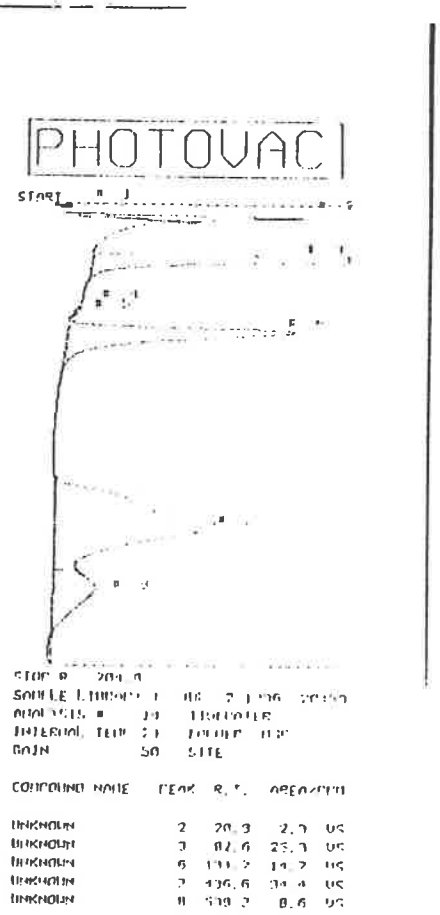
Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____



GC Background _____
Syringe Background _____

Total VOC's _____
VOC's w/ Background _____

Chemist: _____

Assistant: _____

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: Instrument Blank
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, RI

Date: July 3, 1996
Analysis #: 1
Weather: Partly Cloudy occasional rain/thunder storms
Sample Depth: 3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	200 µl								
Gain	50								
Retention Time	81.8 Sec	191.2 Sec	444.8 Sec	482.3 Sec	580.3 Sec	N/S Sec	N/S Sec		
Response	18.7 Vs	11.7 Vs	7 Vs	29.8 Vs	10.9 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____

GC Background
Syringe Background

Total VOC's
VOC's w/ Background

Chemist: _____

Assistant: _____

PHOTOVAC

START

STOP @ 342.2
SAMPLE LIBRARY : JUL 3 1996
ANALYSIS # 1
GAIN 2

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: Equipment/Syringe Blank
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, RI

Date: July 3, 1996
Analysis #: 2
Weather: Partly Cloudy occasional rain/thunder storms
Sample Depth: 3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	200 µl								
Gain	50								
Retention Time	81.8 Sec	191.2 Sec	444.8 Sec	482.3 Sec	580.3 Sec	N/S Sec	N/S Sec		
Response	18.7 Vs	11.7 Vs	7 Vs	29.8 Vs	10.9 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

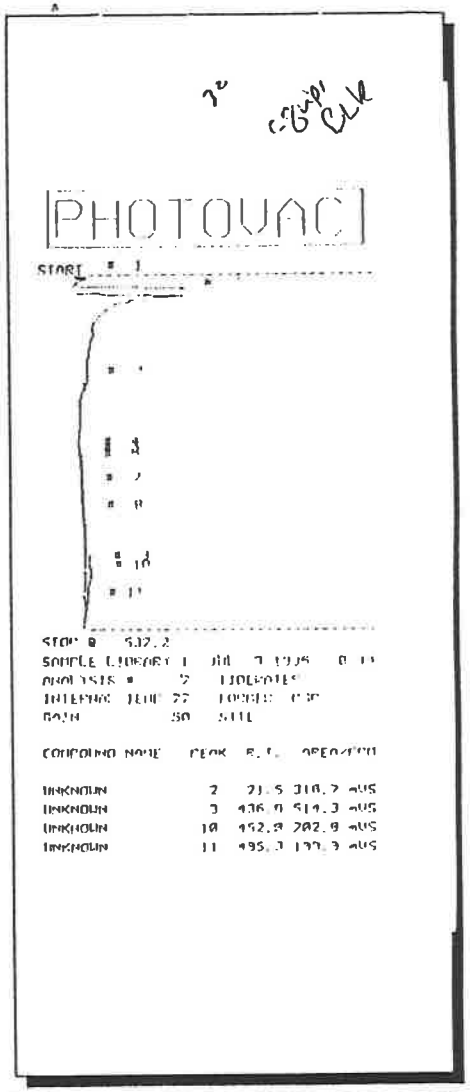
Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____



GC Background
Syringe Background

Total VOC's
VOC's w/ Background

Chemist: _____

Assistant: _____

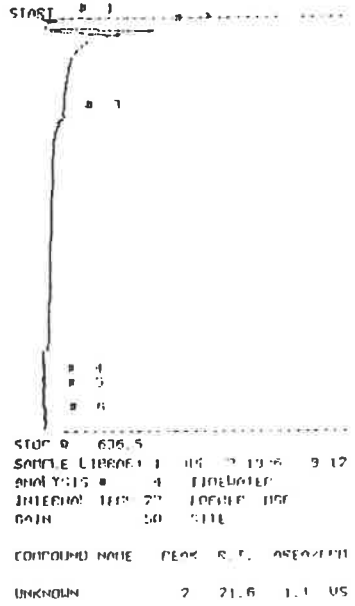
ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: Equipment Blank
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, RI

Date: July 3, 1996
Analysis #: 4
Weather: Partly Cloudy occasional rain/thunder storms
Sample Depth: 3 feet

PHOTOVAC



STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____

GC Background
Syringe Background

Total VOC's
VOC's w/ Background

Chemist: _____

Assistant: _____

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: TW-SG-5
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Ga
Location: Tidewater Former MGP Pawtucket, R

Date: July 3, 1996
Analysis #: 5
Weather: Partly Cloudy occasional rain/thunder storms
Sample Depth: 3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volum 300 µl

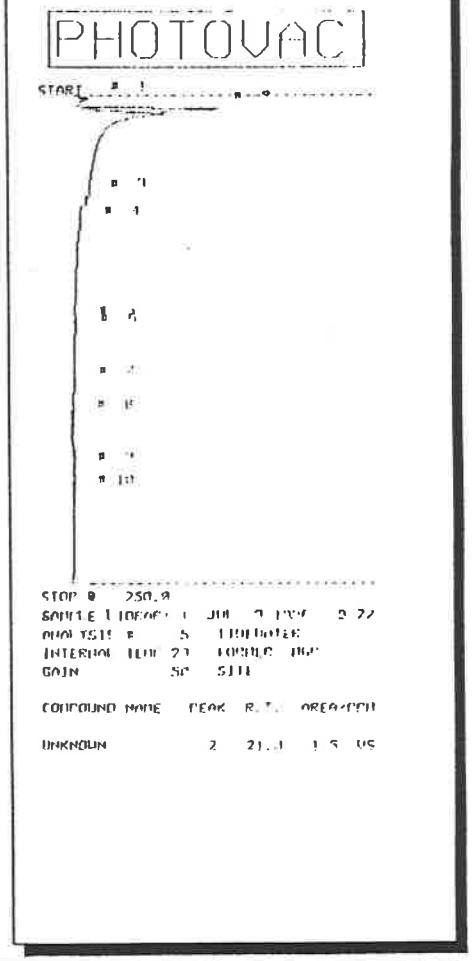
Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____



GC Background
Syringe Background

Total VOC's
VOC's w/ Background

Chemist: _____

Assistant: _____

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: TW-SG-6
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Ga
Location: Tidewater Former MGP Pawtucket, R

Date: July 3, 1996
Analysis #: 6
Weather: Partly Cloudy occasional rain/thunder storms
Sample Depth: 3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volum 300 µl

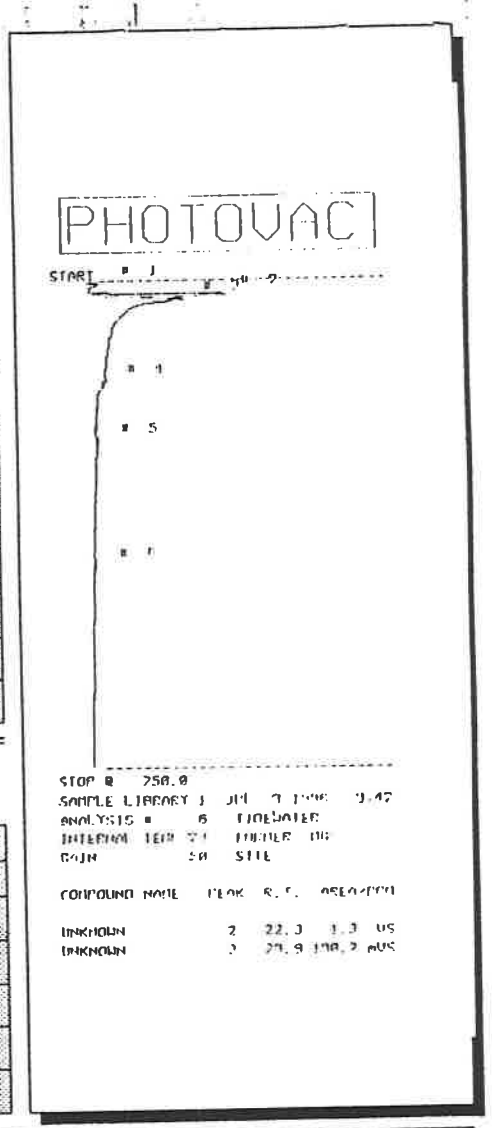
Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____



GC Background
Syringe Background

Total VOC's
VOC's w/ Background

Chemist: _____

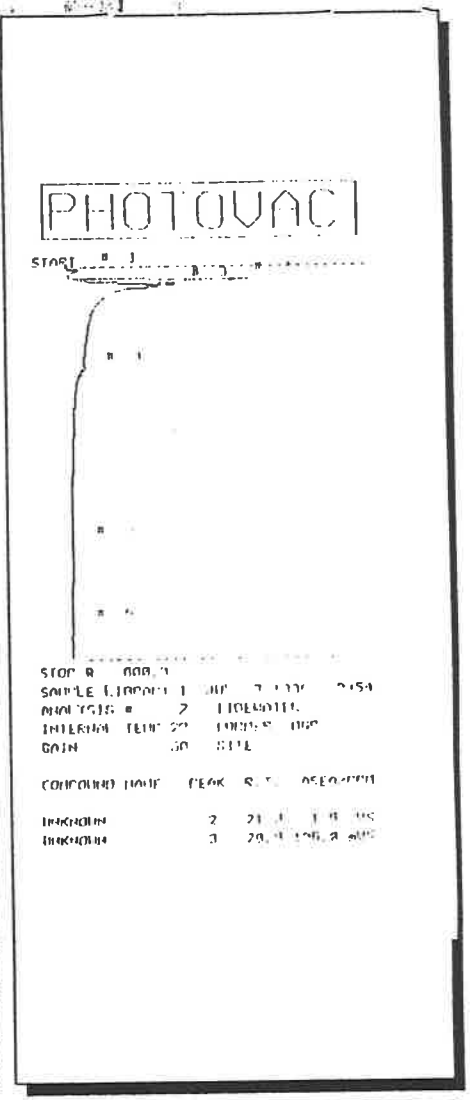
Assistant: _____

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: TW-SG-28
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, RI

Date: July 3, 1996
Analysis #: 7
Weather: Partly Cloudy occasional rain/thunder storms
Sample Depth: 3 feet



STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____

GC Background
Syringe Background

Total VOC's
VOC's w/ Background

Chemist: _____

Assistant: _____

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: TW-SG-27
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, RI

Date: July 3, 1996
Analysis #: 8
Weather: Partly Cloudy occasional rain/thunder storms
Sample Depth: 3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

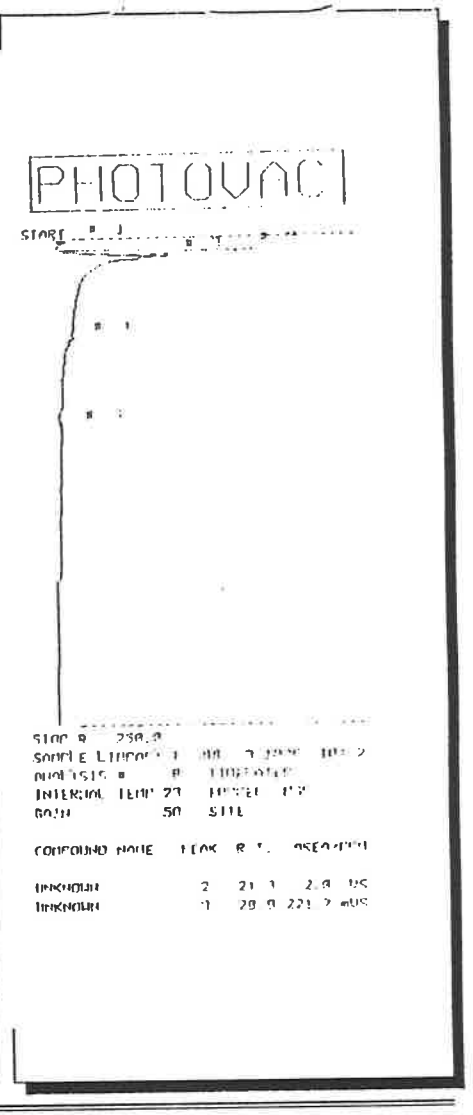
Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____



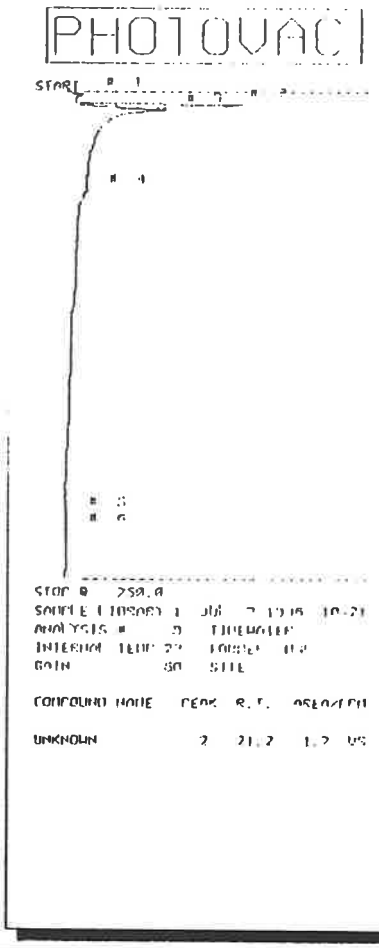
GC Background		Chemist: _____
Syringe Background		
Total VOC's		Assistant: _____
VOC's w/ Background		

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: TW-SG-8
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, RI

Date: July 3, 1996
Analysis #: 9
Weather: Partly Cloudy occasional rain/thunder storms
Sample Depth: 3 feet



STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments:

GC Background
Syringe Background

Total VOC's
VOC's w/ Background

Chemist:

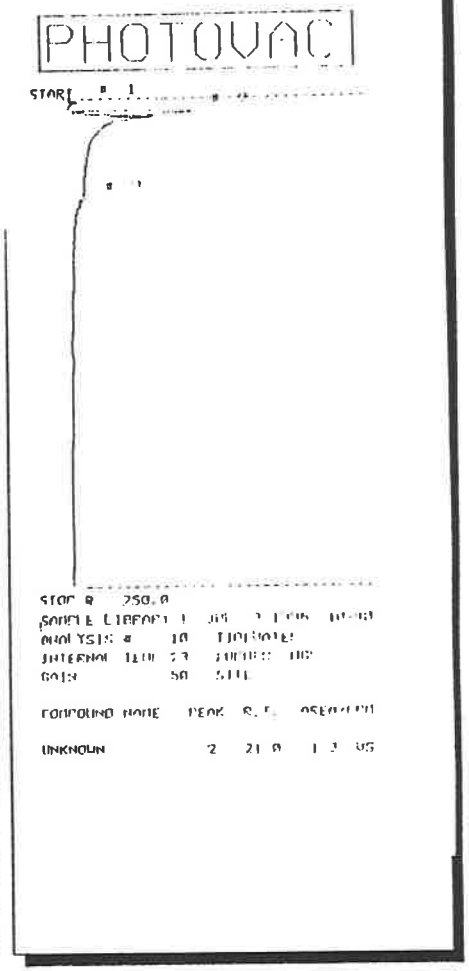
Assistant:

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: TW-SG-9
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, RI

Date: July 3, 1996
Analysis #: 10
Weather: Partly Cloudy occasional rain/thunder storms
Sample Depth: 3 feet



STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____

GC Background
Syringe Background

Total VOC's
VOC's w/ Background

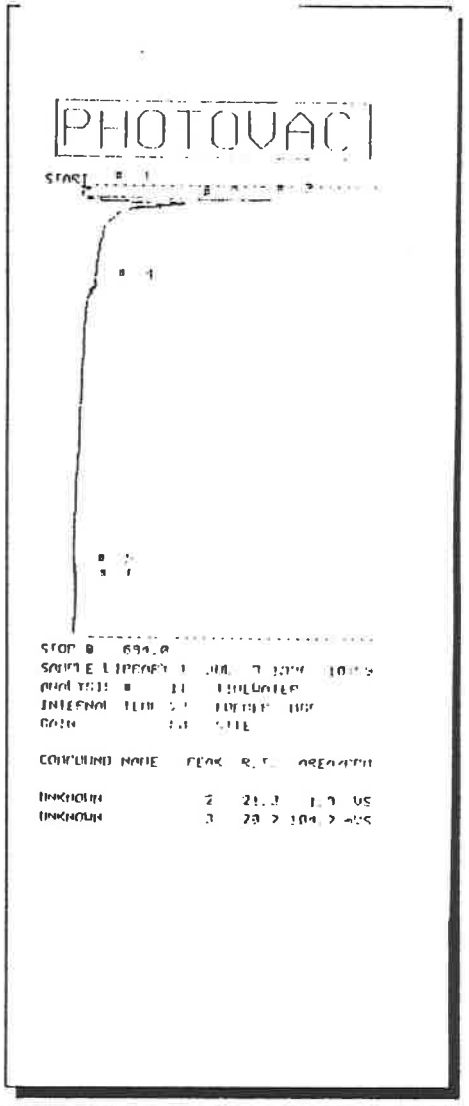
Chemist: _____

Assistant: _____

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification:	TW-SG-10	Date:	July 3, 1996
Project Number:	2061-03-01	Analysis #:	11
Client Name:	Blackstone Valley Electric/Valley Gas	Weather:	Partly Cloudy occasional rain/thunder storms
Location:	Tidewater Former MGP Pawtucket, RI	Sample Depth:	3 feet



STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 300 µl

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

GC Background		Chemist:	
Syringe Background			Steven J Wallet
Total VOC's		Assistant:	
VOC's w/ Background			

Comments: _____

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification:	TW-SG-11	Date:	July 3, 1996
Project Number:	2061-03-01	Analysis #:	12
Client Name:	Blackstone Valley Electric/Valley Gas	Weather:	Partly Cloudy occasional rain/thunder storms
Location:	Tidewater Former MGP Pawtucket, R	Sample Depth:	3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume 300 µl

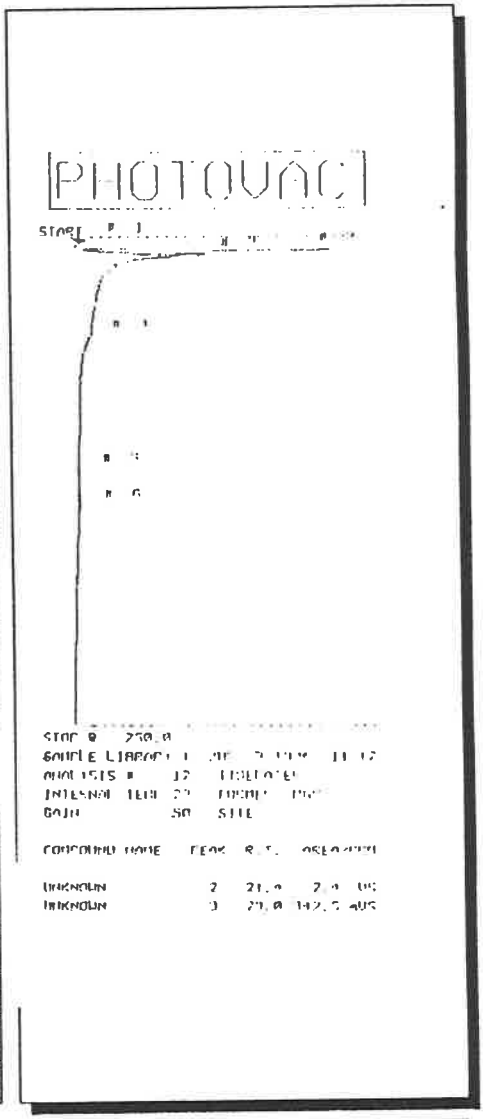
Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____



GC Background		Chemist:	Steven J Wallet
Syringe Background			
Total VOC's		Assistant:	
VOC's w/ Background			

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: TW-SG-26
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, R

Date: July 3, 1996
Analysis #: 13
Weather: Partly Cloudy occasional rain/thunder storms
Sample Depth: 3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume 300 µl

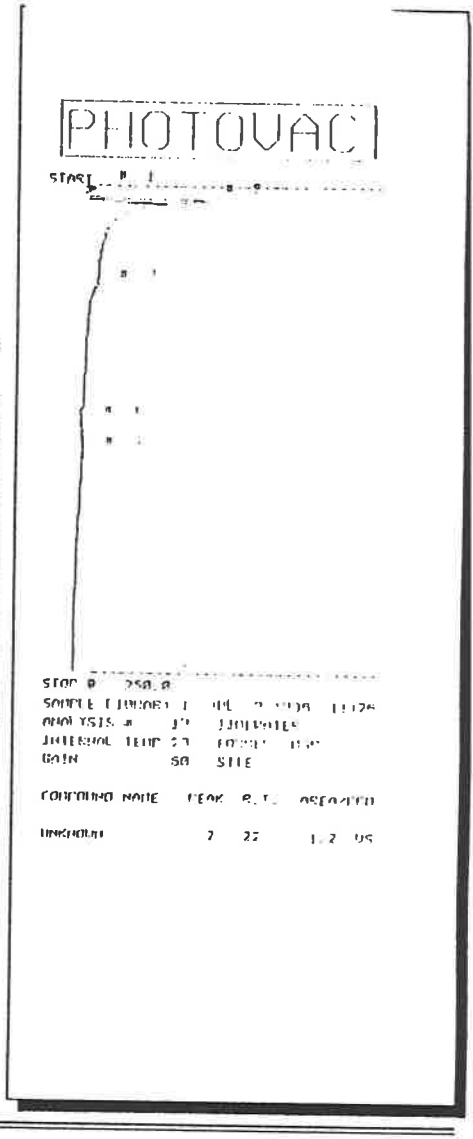
Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____



GC Background
Syringe Background

Total VOC's
VOC's w/ Background

Chemist: Steven J Wallet

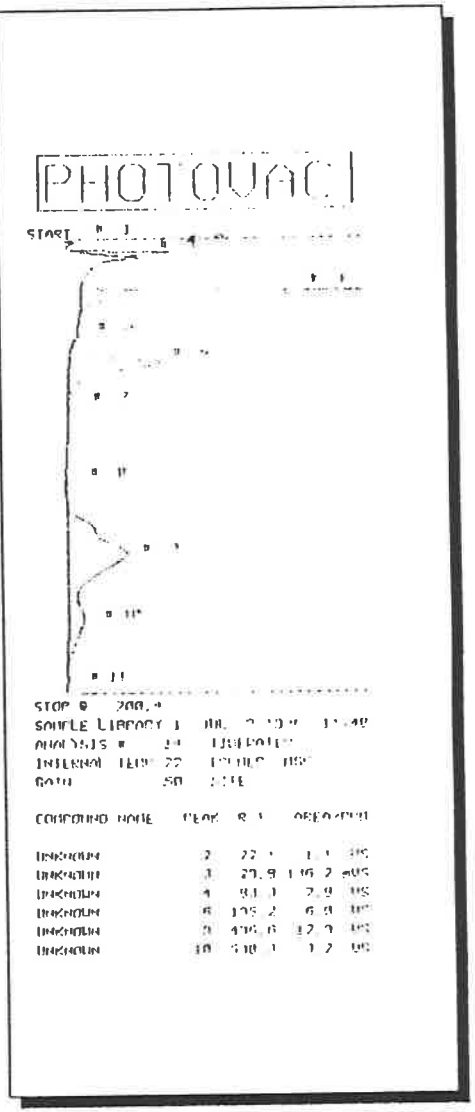
Assistant: _____

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: Tubing Standard
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, R

Date: July 3, 1996
Analysis #: 14
Weather: Partly Cloudy occasional rain/thunder storms
Sample Depth: 3 feet



STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume 300 µl

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #	4	6		9	10				
Retention Time	83.3 Sec	195.2 Sec	496.6 Sec	496.6 Sec	598.3 Sec				
Response	7.8 Vs	6.0 Vs		12.9 Vs	3.2 Vs				
	.	.		.	.				

Unidentified Peaks

Peak #						
Retention Time						
Response						

GC Background
Syringe Background

Total VOC's 29.9 Vs
VOC's w/ Background 29.9 Vs

Chemist: Steven J Wallet

Assistant:

Comments:

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification:	Tubing Blank	**Date:**	July 3, 1996
Project Number:	2061-03-01	**Analysis #:**	15
Client Name:	Blackstone Valley Electric/Valley Gas	**Weather:**	Partly Cloudy occasional rain/thunder storms
Location:	Tidewater Former MGP Pawtucket, R	**Sample Depth:**	3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

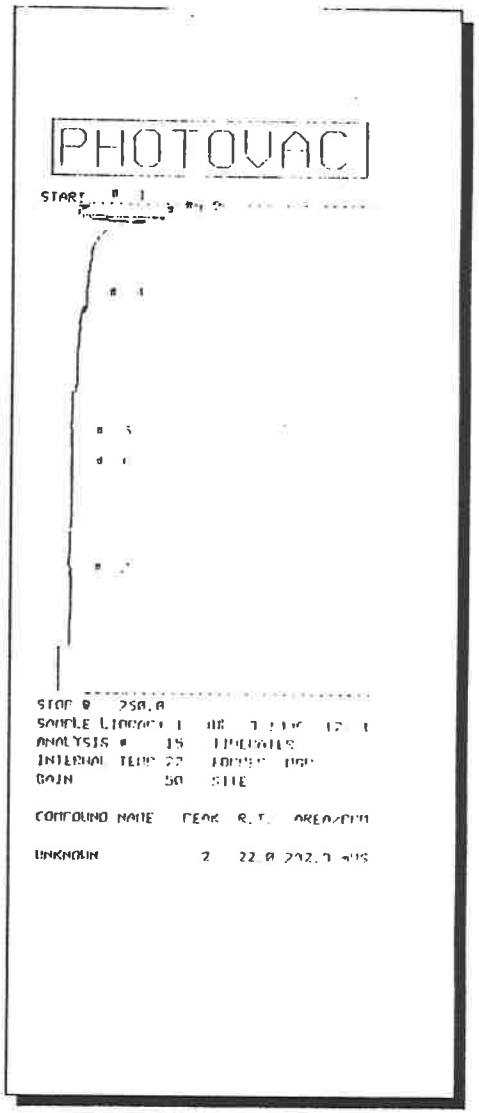
Sample Injection Volume 300 µl

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						



GC Background
Syringe Background

Total VOC's
VOC's w/ Background

Chemist: Steven J Wallet

Assistant:

Comments:

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: Syringe STD
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, R

Date: July 3, 1996
Analysis #: 16
Weather: Partly Cloudy occasional rain/thunder storms
Sample Depth: 3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

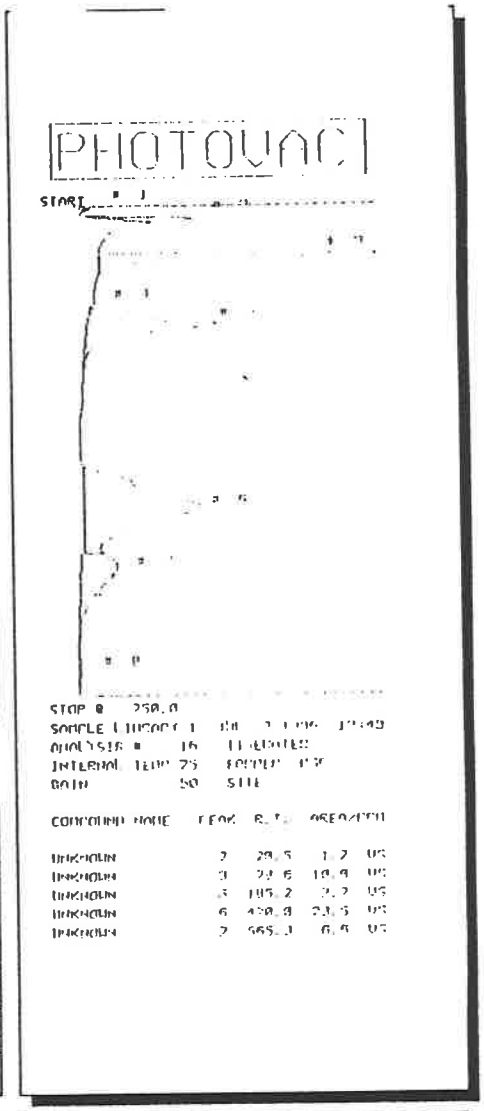
Sample Injection Volume 300 µl

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #	3	5		6	7				
Retention Time	78.6 Sec	185.2 Sec		470 Sec	565.3 Sec				
Response	10.8 Vs	7.7 Vs	23.5 Vs	23.5 Vs	6.6 Vs				
	.	.		.	.				

Unidentified Peaks

Peak #						
Retention Time						
Response						



GC Background
Syringe Background

Total VOC's 72.1 Vs
VOC's w/ Background 72.1 Vs

Chemist: Steven J Wallet

Assistant:

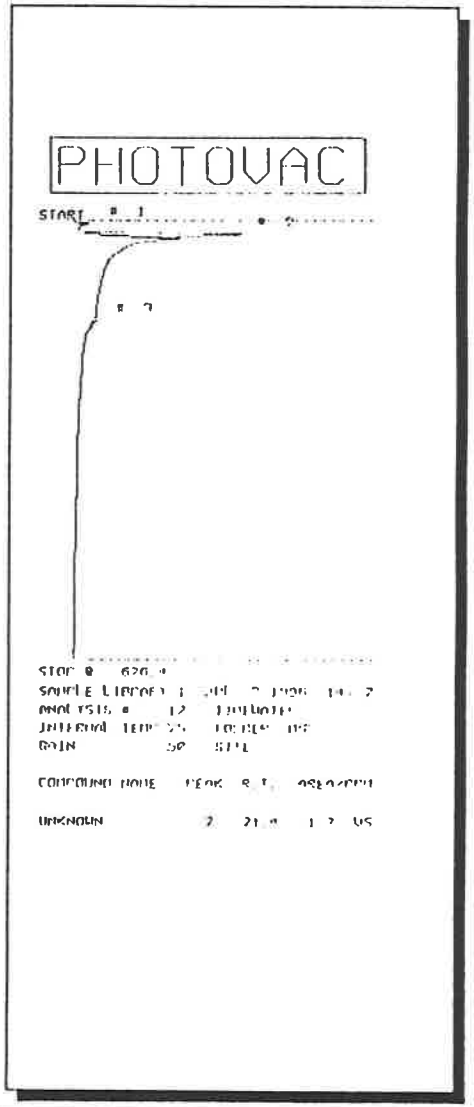
Comments:

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: Equipment Blank
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, R

Date: July 3, 1996
Analysis #: 17
Weather: Partly Cloudy occasional rain/thunder storms
Sample Depth: 3 feet



STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume 300 µl

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____

GC Background
Syringe Background

Total VOC's
VOC's w/ Background

Chemist: Steven J Wallet

Assistant: _____

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: TW-SG-22
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, R

Date: July 3, 1996
Analysis #: 18
Weather: Partly Cloudy occasional rain/thunder storms
Sample Depth: 3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume 300 µl

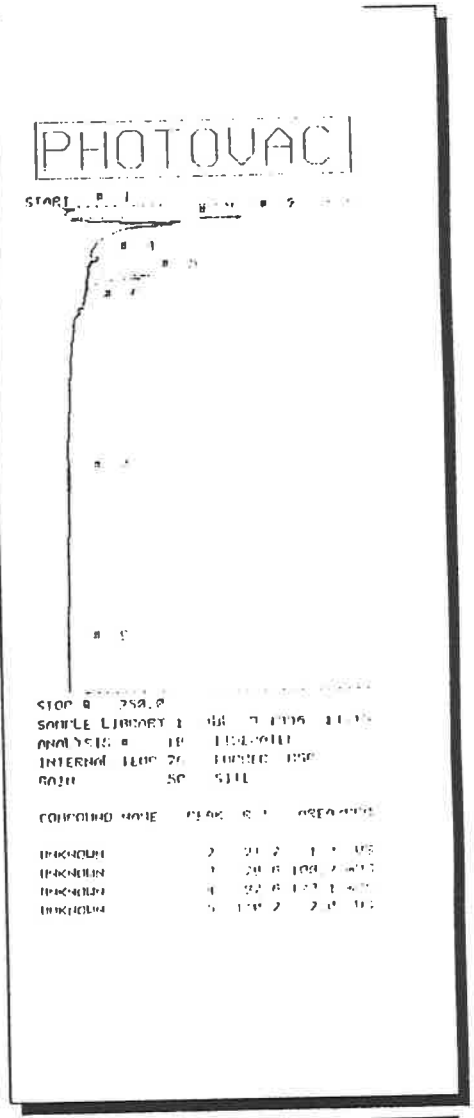
Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
		300 µl							
Peak #						5			
Retention Time						110.2			
Response						2.0 Vs			

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments:



GC Background
Syringe Background

Total VOC's
VOC's w/ Background

Chemist: Steven J Wallet

Assistant:

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: TW-SG-23
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, R

Date: July 3, 1996
Analysis #: 19
Weather: Partly Cloudy occasional rain/thunder storms
Sample Depth: 3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume 300 µl

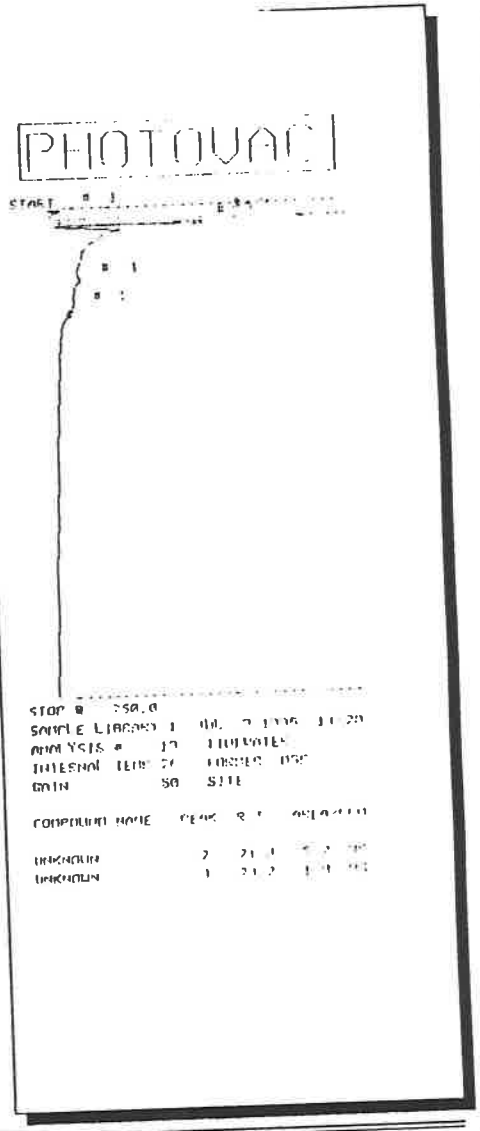
Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____



GC Background
Syringe Background

Total VOC's
VOC's w/ Background

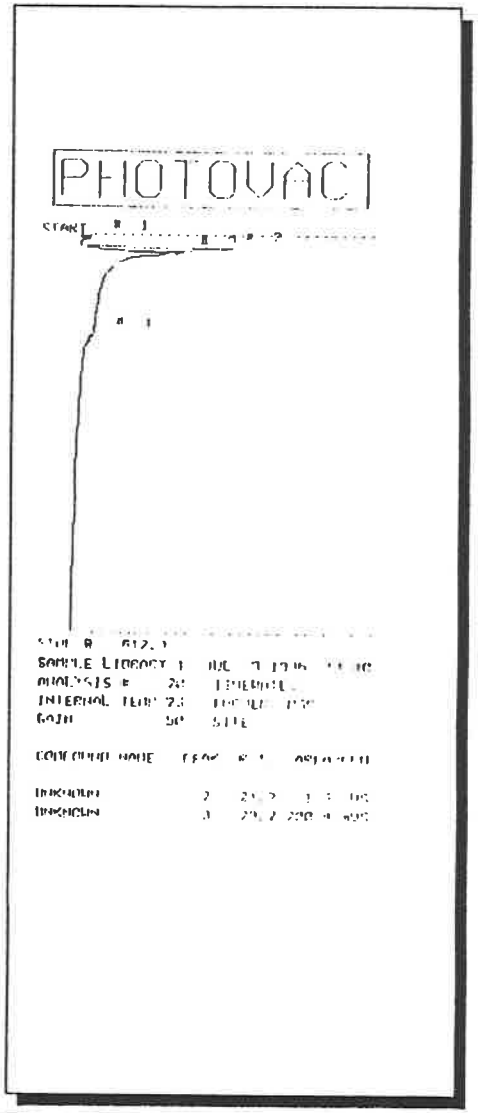
Chemist: Steven J Wallet

Assistant: _____

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification:	TW-SG-24	Date:	July 3, 1996
Project Number:	2061-03-01	Analysis #:	20
Client Name:	Blackstone Valley Electric/Valley Gas	Weather:	Partly Cloudy occasional rain/thunder storms
Location:	Tidewater Former MGP Pawtucket, R	Sample Depth:	3 feet



STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume 300 µl

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____

GC Background		Chemist:	Steven J Wallet
Syringe Background			
Total VOC's		Assistant:	
VOC's w/ Background			

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: TW-SG-25
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, R

Date: July 3, 1996
Analysis #: 21
Weather: Partly Cloudy occasional rain/thunder storms
Sample Depth: 3 feet

STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume 300 µl

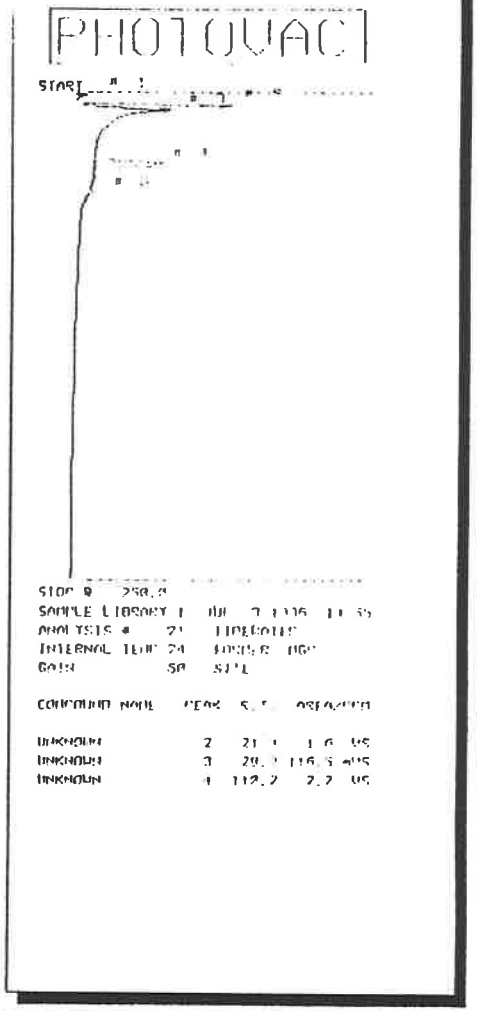
Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #						4			
Retention Time						110.2			
Response						2.2 Vs			

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____



GC Background
Syringe Background

Total VOC's
VOC's w/ Background

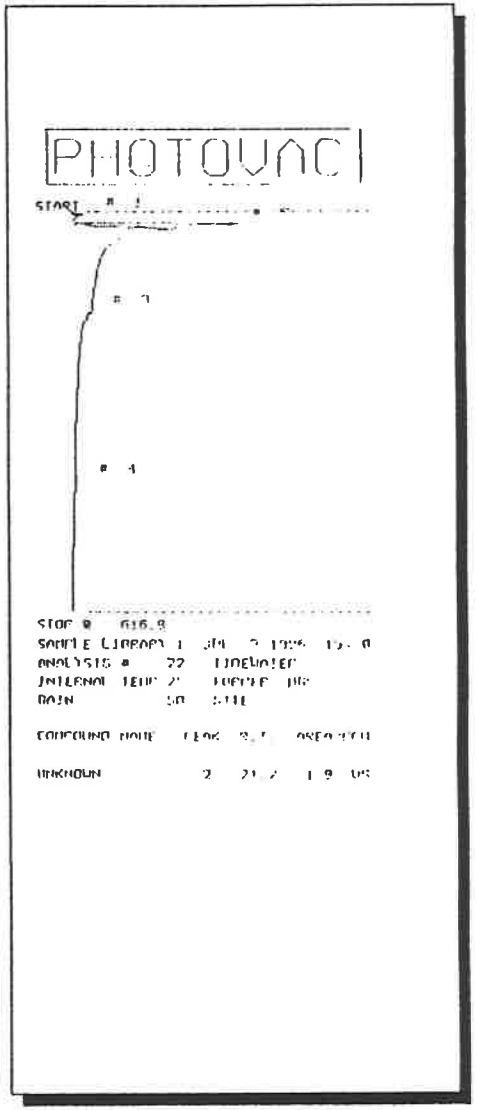
Chemist: Steven J Wallet

Assistant: _____

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification:	TW-SG-17	Date:	July 3, 1996
Project Number:	2061-03-01	Analysis #:	22
Client Name:	Blackstone Valley Electric/Valley Gas	Weather:	Partly Cloudy occasional rain/thunder storms
Location:	Tidewater Former MGP Pawtucket, R	Sample Depth:	3 feet



STANDARD INFORMATION

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume 300 µl

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #									
Retention Time									
Response									

Unidentified Peaks

Peak #						
Retention Time						
Response						

Comments: _____

GC Background		Chemist:	Steven J Wallet
Syringe Background			
Total VOC's		Assistant:	
VOC's w/ Background			

ATLANTIC Environmental Services, Inc.

SOIL GAS SURVEY

Sample Identification: TW-SG-22 (reanalysis)
Project Number: 2061-03-01
Client Name: Blackstone Valley Electric/Valley Gas
Location: Tidewater Former MGP Pawtucket, R

Date: July 3, 1996
Analysis #: 23
Weather: Partly Cloudy occasional rain/thunder storms
Sample Depth: 3 feet

STANDARD INFORMATION

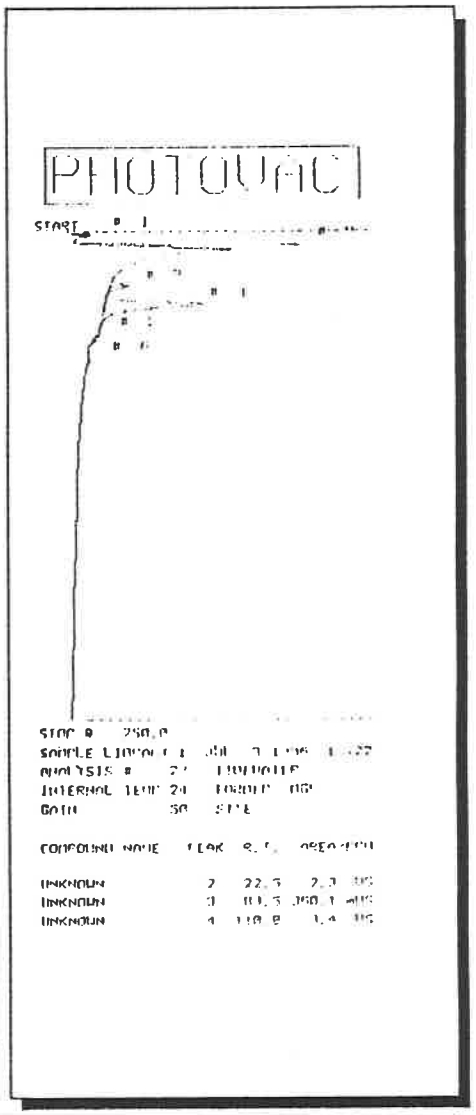
	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Injection Volume	150 µl								
Gain	50								
Retention Time	83.2 Sec	196.2 Sec	Sec	499.2 Sec	599.9 Sec	N/S Sec	N/S Sec		
Response	5.6 Vs	4.9 Vs	Vs	13.6 Vs	3.2 Vs				
Concentration	1000 ppb	1000 ppb	1000 ppb	1000 ppb	1000 ppb				

SAMPLE INFORMATION

Sample Injection Volume: 500 µl

Identified Peaks

	Benzene	Toluene	Ethyl Benzene	m-p Xylene	o Xylene	TCE	PCE		
Peak #						4			
Retention Time						110.8 Sec			
Response						3.4 VS			



Unidentified Peaks

Peak #	1	2	3			
Retention Time	27.5	—	83.5			
Response	2.3 VS		360 nVs			

Comments: Peak #4 is NOT Identifiable due to R.T. and Detection limits.

GC Background
Syringe Background

Total VOC's
VOC's w/ Background

Chemist: Steven J Wallet

Assistant: