REVISED REMEDIAL WORK PLAN
124 -136 SECOND AVENUE
BROOKLYN, NEW YORK
SITE #V00405-2

Prepared For:

Forest City Ratner Companies
One Metrotech Center
Brooklyn, New York

Prepared By:

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Arnold F. Fleming, P.E. #050411
President

Revised
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1.0 INTRODUCTION

The work described in this plan is intended to remediate contamination resulting from past use of a portion of the site as a manufactured gas plant. This work plan has been prepared by AKRF Engineering, P.C. for Forest City Ratner Companies. Specifically, the aims of the remedial actions are:

- To remove manufactured gas plant (MGP) impacted material contained within former Gasholder Nos. 1, 2, and 3 at the site.
- To remove hot spots of coal tar contamination above the meadow mat layer, which is 16 to 20 feet below the current ground surface.
- To collect mobile coal tar from the deep soil (more than 20 feet below the surface) at locations where there is a potential for coal tar to move off the site.
- To prevent infiltration of any residual volatile organic compounds in the shallow subsurface soils into any enclosed structures to be built on the site.

All remediation work will be performed in accordance with the project Health and Safety and Community Air Monitoring Plan attached as Appendix A. Technical specifications are located in Appendix B. Engineering Drawings A-1 through A-4 are attached at the back of this report.

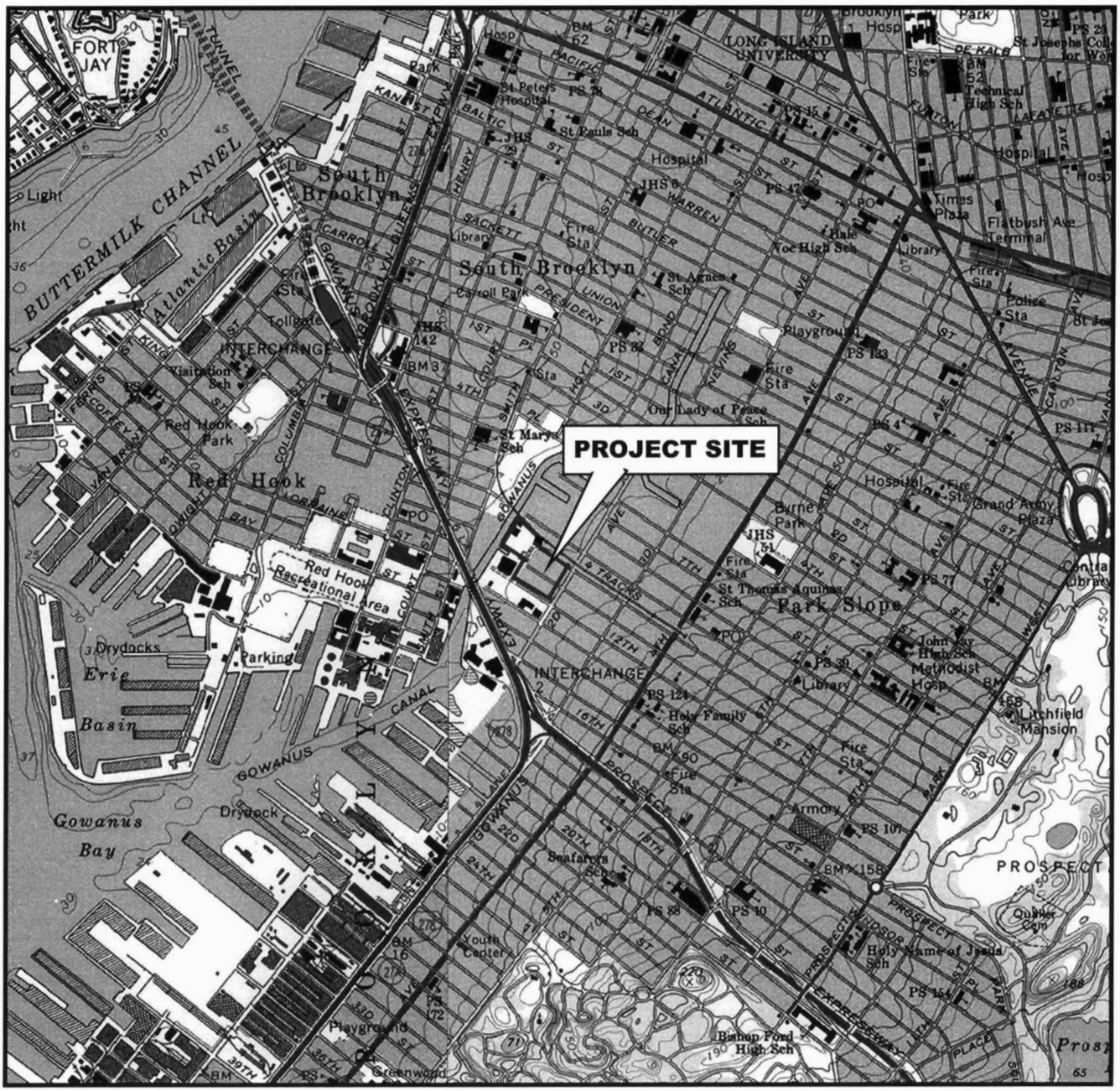
2.0 PROJECT SITE

2.1 Site Description

The site is located on the west side of Second Avenue between 10th Street and 12th Street in Brooklyn, New York (see Figure 1). The total area of the site is about 9.4 acres. The southern portion of the site, between 11th and 12th Streets, is vacant and unpaved. This area was the location of the recent remedial actions discussed below. The northeast portion of the site, between 10th and 11th Streets, is occupied by the concrete frame of a partially-demolished building formerly occupied by the US Postal Service. The northwest portion of the site, between the building frame and the Gowanus Canal, is vacant and paved, with several piles of soil and debris. The surrounding properties are primarily industrial and commercial except for the Hamilton Plaza retail development containing a supermarket, restaurant, and some other stores and offices which directly abuts the site on the northwest. The Gowanus Canal borders the site on the west. The nearest residential areas are to the east of the site between Second and Third Avenues.

2.2 Site History

The site history is described in detail in the 1997 Phase I Environmental Site Assessment and is briefly summarized here. The southeast portion of the site, along with adjacent properties to the south and west, was occupied by a manufactured gas plant from prior to 1880 until about 1938 (see Figure 2). The plant was originally operated by the Metropolitan Gas Light Company and later (c. 1900) became the Metropolitan Works Branch of the Brooklyn Union Gas Company. The Sanborn insurance maps from 1880 and 1886 show a coal shed and retorts on the area to the west of the site



SCALE IN FEET

0' 1000' 2000' 4000'

SCALE: 1"=2000'

QUADRANGLE LOCATION

SOURCE:

USGS TOPOGRAPHIC MAP - BROOKLYN, N.Y.
QUADRANGLE - DATED 1967, PHOTOREVISED 1979.

N

124-136 SECOND AVENUE

Brooklyn, New York

PROJECT SITE LOCATION

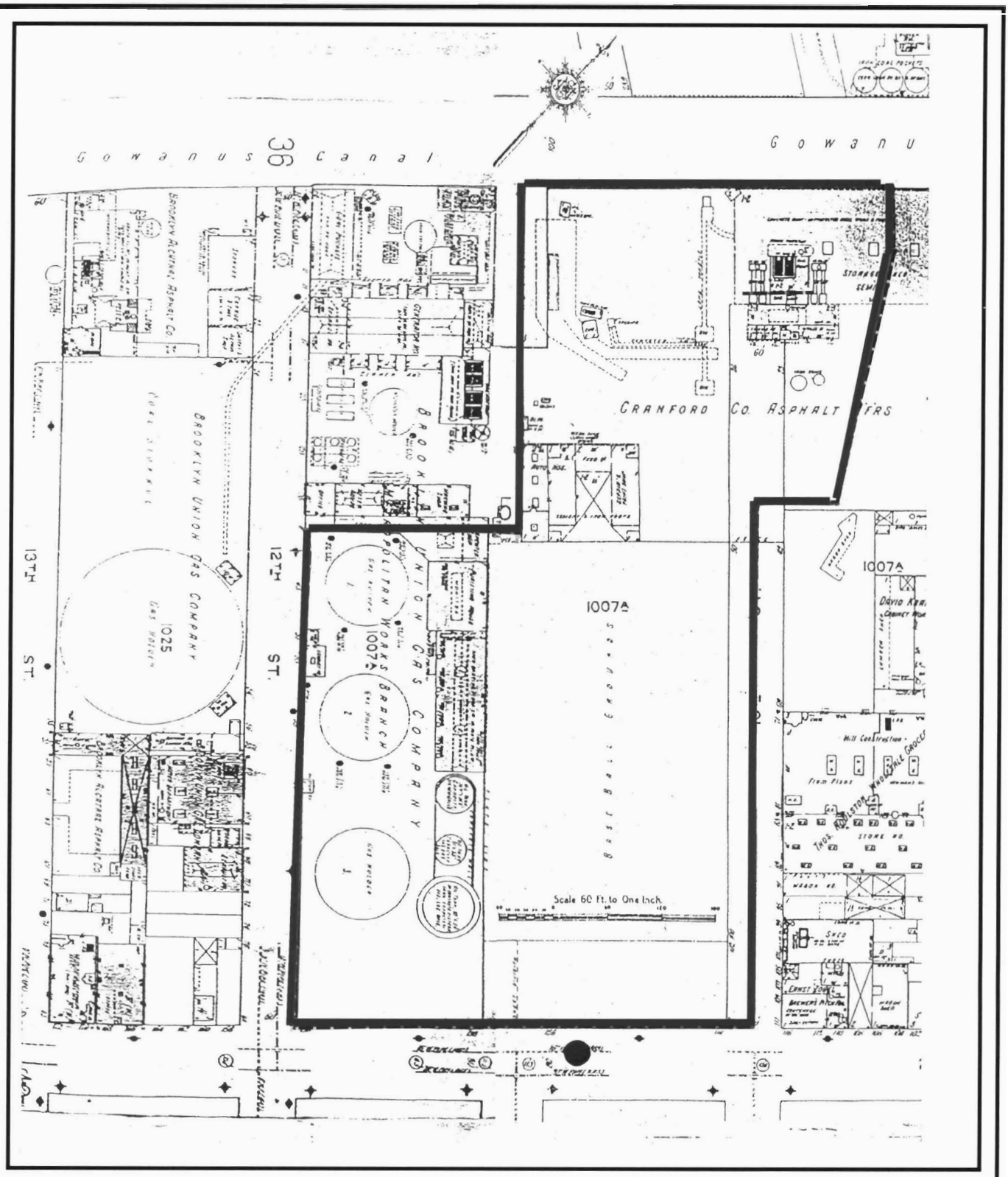
AKRF Engineering, P.C.

Environmental & Engineering Consultants
117 East 29th Street New York, N.Y. 10016

DATE 12.05.01

PROJECT No. 80030

FIGURE No. 1



124-136 SECOND AVENUE

Brooklyn, New York

1915 SANBORN MAP

AKRF Engineering, P.C.

Environmental & Engineering Consultants
117 East 29th Street New York, N.Y. 10016

DATE
12.05.01

PROJECT No.
80030

FIGURE No.
2

now occupied by Hamilton Plaza, and one gasholder on the site. By 1904, there were three gasholders on the site, as well as a hydrogen tank and a purifying house. The remainder of the gas plant was located to the west of the site, and included a coal shed, retorts, condensers, scrubbers, oxidizing rooms, and other associated facilities. By 1915, the purifying house had been extended to the east, occupying much of the area between the two western gasholders and 11th Street. To the east of the purifying house, between the easternmost gasholder and 11th Street, were three large oil tanks. The 1939 Sanborn map shows most of the gas plant structures, including the gasholders, removed.

Other past uses on the site include an asphalt plant, which occupied the northwest portion of the site, and a paint factory, which was located at the northeast corner of the site.

Around 1952, the US Postal Service took over the site and constructed two large buildings along Second Avenue, a vehicle maintenance facility on the southeast portion of the site and a parcel post facility known as the detached mail unit on the northeast portion of the site. The northwest portion of the site was used for storage and parking. The Postal Service vacated the site in 1992. In 1999, the vehicle maintenance facility was demolished and the detached mail unit building was partially demolished.

2.3 Geology and Hydrogeology

Information on site geology was obtained from the borings performed for this and previous environmental assessments, from prior borings prepared for geotechnical studies, and from geotechnical studies performed for the New York City Department of Transportation for reconstruction of the Ninth Street Bridge over the Gowanus Canal. (Their information was not presented in the prior Nelson & Pope reports.)

The eastern part of the site is flat and at an elevation of about 10 feet (Brooklyn Borough Datum, which is approximately equal to mean high water). To the west, between the former detached mail unit building and the Gowanus Canal, the ground slopes downward to an elevation of 3 to 4 feet at the bulkhead. The surface soil on the site is miscellaneous fill material that overlies a meadow mat layer of peat, clay, and silt. The top of the meadow mat layer is 16 to 18 feet below the ground surface. It is two to four feet thick on the eastern part of the site, the thickness increasing to ten to twelve feet close to the Gowanus Canal. This meadow mat layer is continuous with the layer that forms the bottom of the Canal. Below that are layers of sand, of silt, and of clay. However, the stratigraphy is very variable from one boring location to the next, and apart from the meadow mat layer, none of the low permeability layers appears to be continuous across the site. Bedrock is at about 180 feet below grade.

Wells screened in the shallow aquifer, above the meadow mat layer, indicate that the water table surface is at an elevation of about 6 feet (about 4 feet below grade) on the eastern part of the site and slopes downward to an elevation of about -1 foot near the Gowanus Canal. Wells screened in the deeper aquifer, below the meadow mat layer, indicate a potentiometric groundwater surface at about elevation 2 feet near Second Avenue, sloping gradually downwards to an elevation of less than 1 foot near the Gowanus Canal. The flow in the shallow aquifer is almost directly towards the Canal, while the slope of the deeper aquifer indicates a slightly different flow direction more towards the northwest. Thus the groundwater studies indicate that the deeper aquifer is confined, with a strong downward gradient between the shallow and deeper aquifer, except near the Canal at the western

edge of the site. Groundwater elevations in both the shallow and deeper aquifer near the Canal are tidally influenced.

2.4 Subsurface Structures

As shown in the 1915 Sanborn map of the site (Figure 2), there were three gasholders on the southern portion of the site. Below-grade portions of the gasholders remain on the site. Engineering Drawing A-1 shows the findings of the exploratory excavations performed in November 2001, which are described below.

Gasholder 1 - Gasholder 1 is the westernmost gasholder, located 13 feet from Pathmark at its closest location. The gasholder is 99 feet in diameter. The perimeter of the gasholder was entirely exposed during the exploratory work, and consists of a 2-foot thick brick wall. The top of wall varies from 2 feet to 6 feet below current ground elevation. The bottom of the gasholder is approximately 20 feet below current grade. Gasholder 1 has a reinforced concrete wall running from north to south through the gasholder approximately 50 feet from Pathmark, splitting the gasholder into two separate portions. According to Impact Environmental, the contractor who performed the earlier remediation work described in Section 3.1 below, the larger section of the gasholder, to the east of the dividing wall, had been emptied out and was utilized by the Post Office as a boiler room and tank vault. Impact removed the fuel tanks and other equipment from this section of the gasholder and backfilled it with clean fill.

Gasholder 2 - Gasholder 2 is the middle gasholder and is 106 feet in diameter. Parts of the perimeter of the gasholder were exposed during exploratory work. The walls of this gasholder are 2-foot thick brick with the top of the walls located approximately 5 feet below current grade. The bottom of the gasholder is approximately 20 feet below current grade.

Gasholder 3 - Gasholder 3 is located closest to Second Avenue and is 106 feet in diameter. The gasholder is made of 4 steel walls, with the outer wall being thicker than the three inner steel walls. The top of the outer wall is located one foot below current grade and the tops of the three inner walls are 3 feet below current grade. It appears that the outer wall is supported by metal supporting beams. A concrete pad that is at least 2 feet thick at its outer edge extends 4 feet out from the outside of the gasholder and is located 6 feet below current grade. It appears that the bottom of the gasholder is located at 6 feet below current grade.

Several concrete columns in and around the gasholders appear to be the remains of footings for the former Post Office building. There is no indication that any of these footings were supported on piles.

The subsurface remains of other structures also seem to be present on the north side of the gasholders, near 11th Street. The old Sanborn maps show a number of aboveground tanks, a purifier house, and other structures in this area. To the north of Gasholder 3 there is a buried layer of pea gravel several feet thick overlying a concrete slab at about 11 feet below grade. In the area north of Gasholder 2, wood was encountered between 12 and 25 feet below grade. The wood is probably from the piles that supported the aboveground tanks or other structures formerly in this area. Piles were similarly encountered in borings close to the gasholders. There are also some heavy foundation structures on the northwest area of the site, near the Gowanus Canal.

3.0 PRIOR INVESTIGATIONS AND REMEDIATION

3.1 Work Performed by Nelson, Pope & Voorhis

A Phase I Environmental Site Assessment report (Nelson, Pope & Voorhis, May 15, 1997) for the site was prepared for a potential developer of the site in 1997. The Phase I identified a number of environmental concerns, including the presence of underground petroleum storage tanks, documented fuel spills on the site, and the past use of the site by a manufactured gas plant. A Phase II Environmental Site Assessment (Nelson, Pope & Voorhis, June 2, 1997) was performed to investigate these concerns. Volatile and semivolatile organic compounds were detected in soil and groundwater at a number of locations. These were attributed to gasoline and oil releases from the underground fuel storage tanks on the site. A remediation plan (September 30, 1997) and a Corrective Action Plan (December 1, 1997) were prepared and approved by NYSDEC. A Stipulation Agreement was entered into with NYSDEC on December 19, 1997.

In accordance with the terms of the Agreement, all remaining petroleum storage tanks were removed from the site. The vehicle maintenance facility was demolished and all contaminated soil under the building site was excavated down to the groundwater level (about four feet below grade) and removed off-site for proper disposal. Post-excavation testing reported in a Closure Report (Nelson, Pope & Voorhis, June 7, 1999) found elevated levels of volatile and semivolatile organic compounds remaining at the groundwater interface. The excavation on the former site of the vehicle maintenance facility was backfilled with demolition debris and clean fill. (In this and other reports from 1999 and 2000, the site is referred to as Brooklyn Commons, which was the name of the proposed site development at that time.)

Additional testing was also performed on the site of the detached mail unit building, on the northeast portion of the site. The results of that testing, reported in a Supplemental Phase II Environmental Site Assessment (Nelson, Pope & Voorhis, July 2, 1999), showed much lower levels of volatile and semivolatile organic compounds than were detected in the vehicle maintenance facility area. No other parameters were analyzed for in this area.

3.2 Work Performed by AKRF

AKRF implemented a testing program on the site which followed the scope of Voluntary Cleanup Program Sampling and Analysis Plan (SAP) prepared by Nelson, Pope, and Voorhis dated March 31, 2000, as modified based on discussions with NYSDEC and NYSDOH at a December 1, 2000 meeting at Region 2 and subsequent communications. The results are reported in the Voluntary Cleanup Program Site Assessment Report and Conceptual Remedial Work Plan dated January 2001.

Soil samples were collected within Gasholders 1 and 2. Drilling at Gasholder 3 was not successful because borings were blocked by the steel roof. However, test excavations at Gasholder 3 showed material similar to that observed in Gasholders 1 and 2. The gasholders were filled with soil and some wood fragments (in Gasholder 2). All the soil was heavily contaminated with coal tar. Coal tar appeared as free product in the soil in the bottom 8 to 10 feet of Gasholders 1 and 2. In Gasholder 1, the sample from the 16 to 18 foot depth exceeded the TCLP benzene standard (500 parts per billion) for hazardous waste classification while the sample from the 12 to 14 foot depth was just below the standard. In Gasholder 2, both the 8 to 10 foot sample and the 16 to 18 foot sample exceeded the TCLP benzene standard. Levels of total volatile organic compounds in the soil samples from the gasholders were very high. Benzene levels ranged from 48 to 340 parts per million, and ethylbenzene levels ranged from 110 to 600 parts per million. Levels of semivolatile organic

compounds were also very high, with levels of total target compound list polycyclic aromatic hydrocarbons (PAH's) in the 10,000 to 15,000 parts per million range, and naphthalene levels ranging from 860 to 4600 parts per million. No significant cyanide or sulfide levels were detected.

The borings outside the gasholders showed the presence of coal tar in soils at the west end of the gasholder area, near Hamilton Plaza, and much lower levels of contamination in the borings to the east, near Second Avenue. At boring locations just north of Gasholders 2 and 1, free product was observed in the soils below the meadow mat layer. Samples from each of these locations exceeded the TCLP benzene standard. At the location north of Gasholder 2, the boring was extended downwards to locate the bottom of the coal tar contamination. At this location, a dense till was encountered at a depth of about 35 feet, and there was no evidence of coal tar contamination below 40 feet.

Significant coal tar contamination above the meadow mat layer was only observed at one boring location just west of Gasholder 1. Although there were no exceedances of the TCLP benzene standard, high levels of volatile and semivolatile organic compounds were detected in both the sample from 6 to 8 feet and the sample from 24 to 28 feet.

No evidence of coal tar contamination was observed in the borings performed on the northwest portion of the site, near the Gowanus Canal except at one location near the 11th Street basin) at a depth of 31 feet below grade. The sample from this level contained elevated levels of benzene and ethylbenzene. Levels of volatile and semivolatile organic compounds in the other samples from this portion of the site were significantly lower. Trace levels (less than 1000 parts per billion) of chlorinated solvents were detected in the DP-12 (4-6) sample.

The monitoring wells constructed for this study were installed with screens extending through the meadow mat layer, but it is likely that the samples are primarily representative of the shallow groundwater above the meadow mat. Elevated benzene levels were only detected in groundwater in two areas: on the south side of Gasholder 1 and to the east of Gasholder 3. The area near Gasholder 1 is a known "hot spot" where coal tar is present in the shallow soils. Another such "hot spot" may exist on the east end of the site.

Additional site investigations were performed in February 2001. The scope for these investigations was based on the Supplemental Remedial Investigation Work Plan as modified by DEC comments. The results were reported in a Remedial Investigation Report dated July 2001.

Six well clusters were installed on the site (Figure 3). These each comprise a well screened in the shallow aquifer (above 20 feet) and a well screened in the deeper aquifer (35 to 45 feet). Two additional deep wells were also installed. The wells are all 2-inch PVC with 0.02' slotted screens and 2-foot sumps. In order to speed the process while collecting the required information on subsurface conditions, the wells were drilled using a truck-mounted hollow-stem auger rig without collecting soil samples. Then a 2-inch diameter Geoprobe was used to collect continuous soil samples for logging the subsurface conditions.

Soil sampling was performed at 35 locations arrayed in a 40-foot grid pattern in the area surrounding the gasholder structures (see Figure 4). Continuous soil sampling was performed between 4 feet below grade and the meadow mat layer, which is at 16 to 20 feet below grade, using a Geoprobe. Soil was screened in the field using a PID, and the sample from the two-foot interval with the highest organic vapor reading was submitted for laboratory analysis for volatile and semivolatile

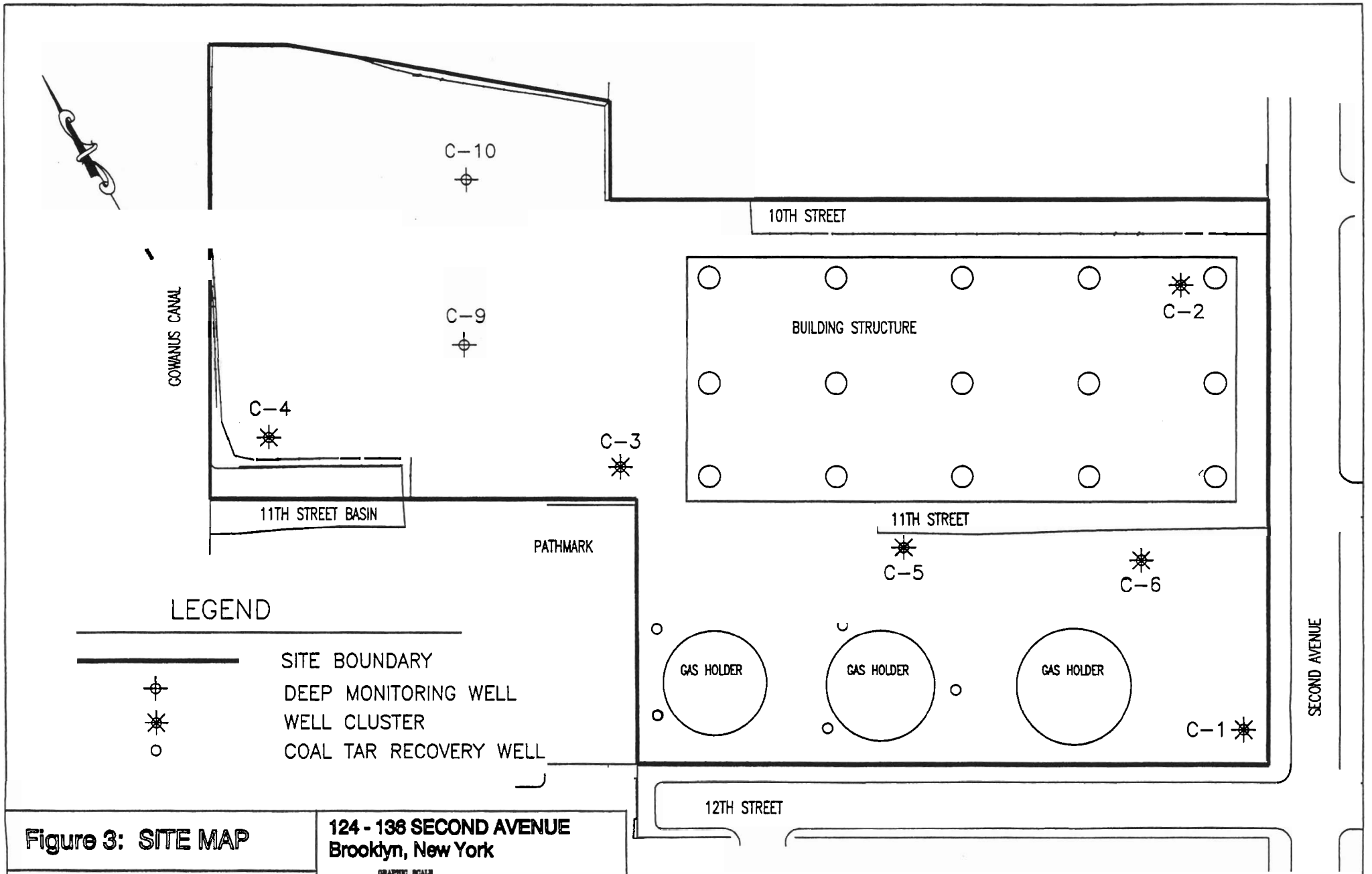


Figure 3: SITE MAP

124 - 136 SECOND AVENUE
Brooklyn, New York

GRAPHIC SCALE
0 25 50 100
(IN FEET)

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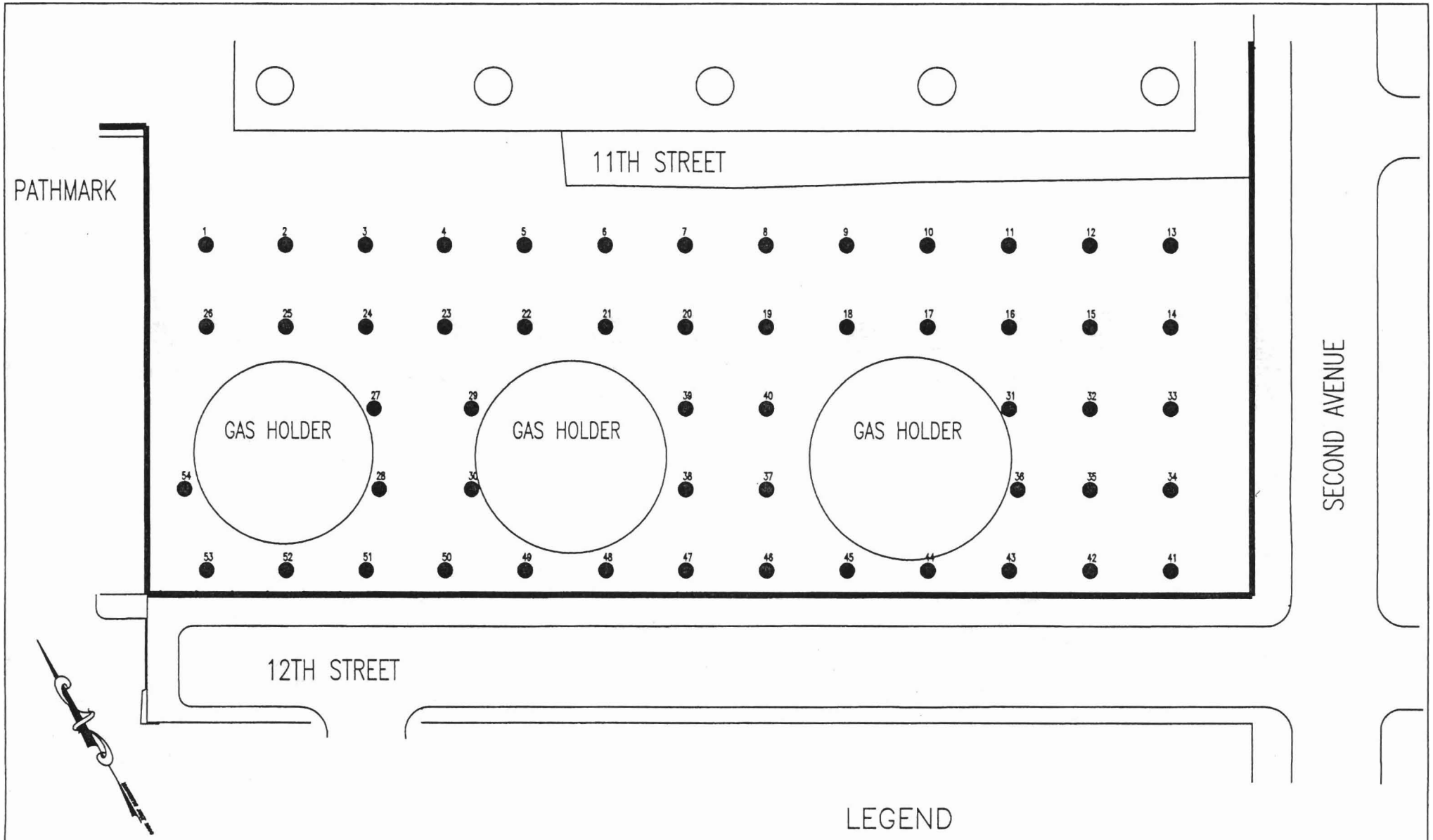
BY:
DATE:

FIGURE
NUMBER:



LEGEND

SITE BOUNDARY

GEOPROBE SOIL SAMPLE LOCATION

Figure 4: Geoprobe Locations

124 - 136 SECOND AVENUE
Brooklyn, New York

GRAPHIC SCALE
25 15 5 0 25 50 100
(IN FEET)

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organic compounds. For each sample analyzed, the sum of the concentrations of semivolatile organic compound including naphthalene was calculated in order to determine the amount of total target compound polynuclear aromatic hydrocarbons (PAH's). At six sampling locations, total PAH levels exceeded 1000 parts per million.

To test the feasibility of free product collection, five collection wells were installed: two on the west side of Gasholder 1, next to the adjacent building, and three around Gasholder 2. These are 4-inch PVC wells, screened from 20 to 45 feet with 0.02' slotted screens and 2-foot sumps. In September 2001 the collection wells were inspected for the presence of free product. About six inches of free product were present in the well located to the southwest of gasholder 2. This corresponds to about 1.2 liters of product. No free product was observed in the other collection wells. However, it should be noted that the well to the southwest of gasholder 1 is not functional and will be replaced. There were problems installing this well because the boring encountered the piles that apparently supported the gasholder.

4.0 OVERVIEW OF REMEDIATION PLAN

Gasholders - MGP-impacted material will be removed from within the three gasholders for off-site treatment and disposal.

Shallow coal tar-contaminated soil (above the meadow mat layer) - Hot spots of shallow contaminated soil will be excavated for off-site treatment and disposal.

Mobile coal tar below the meadow mat layer (more than 20 feet below grade) - Collection wells will be installed in areas of where there is a potential mobile coal tar. Coal tar removed from the wells will be disposed of off-site.

Vapors in shallow soil - Any enclosed structure constructed above the former gasholder area will be designed with a vapor barrier and sub-slab vapor collection system.

5.0 GASHOLDER REMEDIATION

The proposed work plan for the remediation of former Gasholder Nos. 1, 2, and 3 involves excavation, containerization, and off-site disposal of impacted materials within the former gasholders. Groundwater encountered during excavation will be pumped from the excavation and managed as detailed below. A temporary enclosure, including a vapor management system, will cover the excavation to contain odors and emissions anticipated to be generated by the excavation/disturbance of the impacted material. Following removal of impacted material from the holder excavation, the excavated area will be backfilled with clean fill.

5.1 Mobilization/Site Access

Prior to mobilization to the site, the contractor will prepare and submit all required documents for review and approval by AKRF Engineering, P.C., the Owner, and NYSDEC. Other Contractor tasks include obtaining all necessary Federal, State and local permits associated with the scope of work. In addition, the all utilities on the site will be located and marked prior to mobilization. The contractor will mobilize all necessary labor, equipment, supplies and materials to complete the gasholder remediation upon approval by the Owner. Lay down areas for storage tanks, equipment,

supplies and materials, the appropriate exclusion zone(s) and support zone(s) will be identified to conduct the planned activities safely and effectively as shown on Engineering Drawing A-1.

Access/egress to the work area is from Second Avenue and 11th Street through a gate. The site perimeter is fenced and will provide security, in addition to keeping the public and on-site workers/employees at a safe distance from the work plan activities. Truck staging areas are shown on Engineering Drawing A-2.

5.2 Site Preparation

Site preparation activities include the establishment of work zones, support facilities, decontamination facilities, erosion control measures, and installation of temporary fabric on portions of the existing fence. Soil erosion and sediment control measures will be implemented prior to any site disturbance, as presented on Engineering Drawing A-4.

Engineering Drawing A-2 shows the areas designated for use by the Contractor for staging of construction materials and supplies, establishment of construction offices and a parking area. The construction trailer on the site will contain a heated office space with a desk, telephone, and power supply for a desktop computer and a fax machine, and adequate space for confidential phone conversations.

The existing six-foot high chain link fence with access gates will remain intact along the perimeter of the site to enclose and control the work as shown in the Engineering Drawing A-2. All gates will be properly secured based upon the activities performed at that time.

Following preparation of the site, a decontamination pad will be constructed. The pad will be constructed as shown on Engineering Drawing A-2. The pad will be of sufficient size to contain the equipment to be utilized for the project and will be sloped to a sump for collection of accumulated water. This decontamination water will be removed continuously during decontamination operations and conveyed to a storage tank located adjacent to the pad. This decontamination water will be sampled, analyzed and disposed of at an Owner-approved facility in accordance with NYSDEC and USEPA regulations.

5.3 Temporary Enclosure

Due to the anticipated odors generated by the excavation of the MGP-impacted material, all excavation activities will be performed within a temporary enclosure fitted with a vapor management system. The proposed temporary enclosure (provided by the contractor) will consist of a metal frame structure with a peaked roof and covered with a durable fabric suitable for the proposed environment. The temporary enclosure will be sized to allow a large excavator and anticipated truck traffic as shown on Engineering Drawings A-2 and A-3.

The structure(s) will have two entrances. The main entrance will be located to facilitate the movement of large equipment and roll-off trucks into and out of the enclosure. A smaller entrance will be located as required to allow entrance of personnel, small vehicles and support equipment during these activities.

5.4 Excavation Activities

Excavation of the former gasholders will proceed in a manner that will prevent the mixing of uncontaminated overburden soil with the impacted material. The overburden material will be removed first and stockpiled at a location to be agreed to by the Owner, the Engineer, and the contractor for later use as backfill. Based on explorations and previous sampling, approximately the top 3 feet below the current ground surface is uncontaminated overburden soil. Excavation of the impacted material will then proceed. All excavation activities within the gasholder area will be performed as identified on the drawings and described in the specification. The contractor will utilize the appropriate sloping/benching or shoring/bracing techniques to maintain stability of the excavation sidewalls.

All material within the gasholders will be removed completely exposing the walls and floor of each gasholder. In Gasholder 3, which does not extend down to the meadow mat layer, four borings through the floor will be performed to sample the soil between the bottom of the gasholder and the meadow mat layer (i.e. from about 8 to 14 feet below current grade). Soil samples from each two-foot depth interval between the bottom of the tank and the top of the meadow mat layer at each boring location will be sampled and analyzed for volatile and semivolatile organic compounds (Methods 8260 and 8270). The analysis results will be transmitted to NYSDEC along with a plan to remediate any remaining significant contamination under the gasholder (i.e contamination exceeding the hot spot criteria)..

Gasholder 1 is divided by a reinforced concrete wall running from north to south approximately 50 feet from Pathmark. The section of the gasholder to the east of this wall was reportedly excavated and used as a boiler room by the Post Office. Later, the equipment was removed and the space backfilled with clean fill. To confirm that this section of gasholder 1 is completely filled with clean soil, three borings will be advanced to the expected bottom of the gasholder at about 20 feet below grade. At each sampling location, a Geoprobe rig will be used to drive a sampling probe into the soil. Soil samples will be collected by driving the soil sampling probe with a four-foot Teflon liner into the soil at four-foot depth intervals to a total depth of 20 feet. The first four-foot liner will be discarded (since the top four feet is clean fill placed on the site after the original top four feet of soil were excavated). Soil gas will be screened in the other four 4-foot teflon liners at one-foot intervals using a photoionization detector (PID). A field geologist will record soil conditions in the four-foot liners. If a one-foot interval shows evidence that it contains higher levels of contamination than any other interval (free phase product, increased visual staining, chemical odor and/or elevated PID readings), a soil sample will be collected from this interval. If no evidence of contamination is identified in any single interval, a composite soil sample will be collected from the liner from the 16-20 foot depth. The soil samples will be containerized in accordance with EPA analytical protocols. Each sample will be labeled, sealed, and placed in a chilled cooler for shipment to the laboratory. Soil samples will be analyzed for target compound list volatile and semivolatile organic compounds (EPA Method 8260 and 8270). If refusal is consistently encountered at a depth less than the expected depth of the gasholder bottom, then test pits will be excavated to expose the gasholder bottom so sampling can be performed of soil below the bottom as described for gasholder 3, above.

5.5 Material Handling

The proposed excavation may require staging of excavated material in roll-offs. Empty roll-off trucks will enter through the access gate at Second Avenue and 11th Street. Engineering Drawing A-3 details the truck flow through the site. All loading of impacted material will be performed

within the temporary enclosure. Once a roll-off truck is filled with excavated material, the roll-off will be covered and properly labeled. The roll-off truck will then exit the temporary enclosure and proceed immediately to the decontamination pad. Following decontamination, the truck will proceed either directly off-site to the appropriate Owner-approved facility or to the on-site roll-off staging area. If filled roll offs are staged at any location outside the vapor control structure, they will first be securely covered to prevent vapor release. Roll-offs staged in this on-site area will be inspected, as required. When trucks arrive to pickup the full roll-offs from the roll-off staging area, trucks will enter from the Second Avenue and 11th Street access gate and will directly proceed to the roll-off staging area. Trucks will pickup the roll-off and then leave the site without entering the excavation area.

5.6 Odor Control

Excavation of material from the gasholders will be performed within a temporary enclosure. The temporary enclosure will be fitted with a negative pressure vapor management system (provided by the Contractor) to process air from the excavation area through catalytic oxidation or other approved system to remove odors. The temporary enclosure will be negatively pressured and adequately lighted. Entryways will be designed to allow closure for odor control purposes. The vapor management system will be located outside of the temporary enclosure. The Contractor will monitor the system to ensure removal efficiency from the vapors.

The Contractor will also provide a backup odor suppressant system consisting of chemical foam, "Biosolve" solution or other approved method. The Contractor will keep sufficient backup odor suppressant on-site in the event of a structure failure, a material spill outside the structure, or to suppress heavy odors within the structure. The material will be stored near the excavation and will be easily mobile in case of need.

5.7 Dewatering

Two 20,000-gallon mobile storage tanks (frac tanks) will be used to contain stormwater run-on, and groundwater pumped from the excavation. If more storage is required then additional tanks will be installed on the site. The frac tanks will be staged as shown on Engineering Drawing A-2 to allow easy access for the contractor to stage and remove the frac tanks for off-site disposal. An additional tank (smaller in size, approximately 5,000 gallons) will be located adjacent to the decontamination pad for collection of decontamination water. All tanks will be properly labeled. The liquid will be sampled and analyzed prior to disposal. Water will either be transported to an off-site facility for disposal in accordance with NYSDEC and USEPA regulations, or treated on-site and discharged to the sewer in accordance with New York City Department of Environmental Protection (NYCDEP) requirements. The water treatment and/or the transportation and disposal system will be adequately sized to treat or remove from the site all water generated on a daily basis, with a 50 percent contingency factor.

Groundwater and any free product will be pumped from the gasholders prior to excavation. If the excavated material is still too wet for the proposed disposal, a backup area for gravity drainage of the excavated soil will be provided either within the enclosure or within the partially demolished building east of 11th Street. If the building is to be used for dewatering or storage of contaminated soil, the area would be enclosed and connected to the air treatment system.

5.8 Backfilling

Upon removal of the impacted material from the gasholders, each gasholder will be backfilled to the pre-construction grade. Any off-site material used as backfill will be either from an NYSDOT approved source, or shall qualify as "exempt fill" under NYCRR Part 360. Any off-site backfill materials from non-approved sources will be tested for volatile organic compounds (VOCs), PCBs, and metals as a rate of one sample per 200 cubic yards. In addition, the clean overburden material previously removed from the holder or on-site clean fill from other areas of the site will be re-used as backfill as directed by the Engineer.

5.9 Waste Classification Sampling

During the implementation of the gasholder remediation, soil and groundwater will be sampled and analyzed from various sources. Soil samples will be collected from off-site fill source(s) that shall be approved by the Engineer and the Owner, and analyzed for full Target Compound List (TCL) and Target Analyte List (TAL) constituents.

All material being disposed of off-site will be analyzed in accordance with the requirements of the disposal facility and with all applicable regulations. All samples will be collected in accordance with the AKRF Generic Field Sampling Plan. A New York State certified laboratory will analyze the samples.

5.10 Equipment Decontamination

All equipment that will be used during implementation of the work plan will be decontaminated on the pad prior to leaving the site. This will include, but is not limited to, excavation equipment, roll-off trucks and containers, hand tools, etc. Additionally, excavation equipment will be decontaminated prior to being used for backfill activities. During these field activities, personal protective equipment (PPE) will be utilized. This PPE will be containerized for off-site disposal by the Contractor.

5.11 Transportation and Disposal

During the implementation of the gasholder remediation and hot spot removal (as detailed in Section 6.0), impacted material (soil, groundwater, decontamination fluids, and PPE) will be generated by the contractor. Following sampling and analysis of this material, the material will be properly disposed of by the contractor in accordance with applicable laws and regulations at an Owner-approved facility. DEC will be notified of the selected disposal facility prior to the start of any excavation. Transport bills of lading and/or manifests and certificates of destruction will be generated as applicable and will be appended to the Gasholder and Hot Spot Remediation Report. All manifests and bills-of-lading will be reviewed by the Engineer and signed by the Owner.

5.12 Site Restoration and Demobilization

Following the completion of gasholder remediation activities, the Contractor will remove all equipment, structures, temporary facilities and utilities, and materials from the site. All wastes generated will be disposed of in accordance with all applicable Federal, State, and local regulations at facilities previously approved by the Owner.

6.0 HOT SPOT REMOVAL

At locations where "hot spots" of coal tar contamination are identified in shallow soils above the meadow mat, contaminated soil will be excavated and transported off-site for proper disposal. The hot spot locations will be identified based on observations of mobile coal tar in the shallow soil borings performed as part of the Remedial Investigation. "Hot spots" are defined as areas of contaminated soil above the meadow mat layer (approximately 15 feet below grade) which either exceeds the TCLP standard for benzene, contains total concentrations of target compound list polycyclic aromatic hydrocarbons (PAH's) exceeding over 1000 parts per million, or contains free mobile coal tar. All soil has already been removed from the site to the depth of groundwater (approximately four feet below grade) and has been replaced with fill material.

In addition to the identified hot spots, areas where piping associated with the gasholders is present will be investigated. Any piping found during the gasholder excavation will be "chased" and excavated to the property boundaries. The areas adjacent to holders 2 and 3 at Geoprobe borehole locations 38 and 44, and the area near borehole 26, will be investigated.

The soil in the hotspots will be removed from the ground and disposed of at an appropriate off-site facility. However, because the targeted soil is located below the groundwater table, sheeting will be driven around the hotspots prior to removal. The presence of this sheeting would inhibit endpoint collection after soil removal. Therefore samples will be collected to define the horizontal and vertical limits of the hotspots prior to soil removal through the three-phase sampling program. This sampling program, laboratory analysis, reporting, and hotspot removal methodology has been outlined in the "Voluntary Cleanup Program Remedial Work Plan Supplement for Hot Spot Removal," dated December 5, 2001 prepared by AKRF Engineering, P.C, which is attached in Appendix C of this report. All work will be performed in accordance with the existing project Health and Safety and Community Air Monitoring Plan, which is located in Appendix A. To the extent feasible, enclosures will be provided to control emissions of volatile organic compounds.

It will be necessary to excavate uncontaminated or less-contaminated soil to access the hot spot soils. The surface soil at all the locations is clean, recently-placed fill. That soil, and any other soil that does not exhibit the staining and odor characteristic of coal tar contamination, will be reused on the site. Other excavated soil which does not meet hot spot criteria will either be disposed of off-site in accordance with applicable regulations or temporarily stockpiled on the site and tested. Soil containing less than 500 parts per million of total PAHs and not exceeding the TCLP benzene standard will be reused on site at locations where it will be three or more feet below final grades. Any staged soil piles will be covered with 10-mil plastic.

7.0 FREE PRODUCT COLLECTION WELLS

Prior to the start of excavation, free product collection wells will be installed along the downgradient edge of the area where mobile coal tar may be present (see Engineering Drawing A-2). Wells will be located at about 25-foot spacings. However, if drill cuttings indicate the presence of free product at some location, well spacings in that area will be reduced to 10 to 15 feet. At locations where no contamination is observed, spacings may be increased. The recovery wells will be 4-inch PVC wells, screened from 20 to 45 feet (beneath the meadow mat layer) with 0.02' slotted screens and 4-foot sumps. At the southwest corner of the site, near Pathmark, shallow collection wells, screened

above the meadow mat layer, will also be installed in any area not designated as a "hot spot" for shallow soil removal. The downgradient wells are intended to prevent off-site movement of deep mobile coal tar.

The collection wells will initially be monitored weekly through at least the completion of the remediation process. Free product will be collected manually with bailers and the volume recorded. The monitoring schedule will be adjusted based on the observed collection rate. The monitoring and/or collection schedule will ensure that the volume of free product collected does not exceed the sump capacity. Free product collected will be placed in DOT-approved 55-gallon drums, properly labeled, and disposed of. Progress reports submitted to DEC will include the volume of tar collected at each well at each sampling event.

When detectable free product is no longer entering the collection wells, then those wells will be abandoned. However, the downgradient wells will be retained (or replaced) after development of the site for long-term monitoring. The wells would be designed so they could be used for the addition of oxygen releasing compounds, or for other procedures to reduce dissolved levels of dissolved contaminants following their use for free product collection.

8.0 VAPOR CONTROL SYSTEM

The design for any enclosed structure to be built above the former gasholder area will include both a vapor barrier and a sub-slab vapor collection system. The systems will be designed to prevent any potential infiltration of residual vapors into the buildings.

9.0 LONG-TERM MONITORING

Following the conclusion of the remediation and the development of the site, quarterly monitoring will continue. The following parameters will be monitored and reported to DEC:

1. Levels of dissolved volatile organic compounds in both deep and shallow upgradient and downgradient wells.

2. Volume of free product collected in downgradient collection wells.

3. Levels of volatile organic compounds in air samples collected from the sub-slab vapor collection system.

10.0 EXPECTED USE

The current projected use of the property is for a retail facility with associated parking and no basements or other occupied sub-grade spaces. The building would be supported on piles, some of which would likely penetrate the former gasholders. Future use of the property will be limited to commercial uses by a deed restriction. A deed restriction will also proscribe the use of groundwater under the site, and excavation below sea level without DEC notification and approval, and maintenance of a two-foot clean soil cover in any landscaped area.

11.0 DELIVERABLES

A site management plan will be submitted to the DEC for their review and approval at least two weeks prior to construction. The site management plan will include the following items:

Shoring and Bracing Plan - This submittal will state the location and depth of any proposed sheeting, and techniques for installation and removal. Interior bracing, if any, will be specified as well. Any interior bracing will be designed so as to not preclude full removal of the holder contents. Any sheeting to be removed and reused will be decontaminated prior to reuse and prior to leaving the site. The plan will be stamped by a P.E. licensed to practice in the State of New York.

Design of the Sprung Structures - This submittal will specify the size and construction details, along with the plans for moving the structure from one location to the next.

Dewatering Facility Design - It is anticipated that additional dewatering will be accomplished by a combination of gravity drainage and the addition of cement kiln dust or similar material. This submittal will specify the location and design of any facility for dewatering of excavated material

Air Handling and Treatment System - This submittal will specify the design of the air handling system and demonstrate compliance with relevant emissions standards in accordance with the DEC publication "Air Guide 1". The design will be stamped by a New York State P.E.

Material Handling and Disposal - The facility or facilities contracted to receive the MGP wastes will be specified for DEC approval before the beginning of excavation on the site.

Wastewater Treatment Plant - Water will either be transported to an off-site facility for disposal in accordance with NYSDEC and USEPA regulations, or treated on-site and discharged to the sewer in accordance with New York City Department of Environmental Protection (NYCDEP) requirements. If the water is treated on-site, the design will be stamped by a New York State P.E. and submitted to the DEC for approval.

In addition, an Erosion Control Plan, a Site Security Plan, a Truck Traffic Routing Plan, and specifications for the decontamination area will be provided to the DEC for their review and approval prior to construction.

Regular monthly progress reports will be submitted to the NYSDEC detailing the progress of the work at the site. In addition, following the completion of the field activities associated with the remediation of the gasholders and hot spot removal, AKRF will prepare an Gasholder and Hot Spot Remediation Complete Report. The Report will be submitted to NYSDEC. The Report will contain chronological records of work performed by the Contractor, a list and quantity of materials and equipment utilized for the project, any deviations from this Work Plan, a copy of all permits issued, analytical data generated, photo-documentation of the field activities, and a copy of all transport bills of lading and/or manifests generated.

Plans and specifications for the sub-slab vapor collection system will be submitted to the NYSDEC once a proposed building plan is finalized.

12.0 LABORATORY ANALYSES

All laboratory analyses being performed to monitor remediation, or to determine initial and end-point conditions will be performed by a NYSDOH ELAP-certified laboratory. The laboratory reports

will contain NYSDEC ASP Category B deliverables. A Data Usability Summary Report will be prepared in accordance with NYSDEC's "Guidance for the Development of Data Usability Summary Reports."

13.0 ENGINEERING EVALUATION OF REMEDY SELECTION

1. Overall protectiveness of public health and the environment. By removing coal tar in soil above the meadow mat layer and within the gasholders, the remedy will remove all pathways for human exposure, including direct contact with soil and inhalation of vapors both during and following construction on the site. As an added protection, the remedy also specifies that enclosed structures to be built above the former gasholder area will include both a vapor barrier and a sub-slab vapor collection system designed to prevent any potential infiltration of residual vapors into the buildings.

The remedy will also minimize any potential impacts on surface waters, including the Gowanus Canal and Gowanus Bay, since groundwater from the shallow aquifer above the meadow mat layer presumably discharges to those waters.

2. Standards, criteria, and guidance (SCG). Applicable standards are the Toxic Characteristic standard for benzene, which is currently exceeded for soils both within and outside the gasholders, and the Class GA groundwater standard for benzene, which is exceeded in most groundwater at the site. The remedy is aimed at removing or treating all soil above the meadow mat layer which exceeds the Toxic Characteristic standard. By removing the source, this will also reduce benzene levels in the shallow groundwater on the site. Deeper soil and groundwater, below the meadow mat layer, are isolated from both any potential human contact and from nearby surface waters.

3. Short-term Effectiveness and Impacts. The remedy will include activities which involve the disturbance of soil contaminated with coal tar. This may result in short-term releases of benzene, naphthalene, and other volatile hydrocarbons into the atmosphere. All such work would be performed within a temporary enclosure equipped with a negative pressure vapor management system. All remedial actions will be performed in accordance with a health and safety plan, which includes a community air monitoring plan. Implementation of the plan will protect site workers and limit potential short-term community exposures to the levels specified in the community air monitoring plan.

All remedial action objectives are expected to be completed within two years, except for the collection of mobile coal tar from the deep soil at the periphery of the site. That activity will continue as long as there is any significant level of product collected.

4. Long-term Effectiveness and Permanence. The remedy is permanent in that it removes the MGP-impacted materials from the gasholders and in shallow coal tar-contaminated soil outside the gasholders, with off-site treatment and disposal. The ability of the remedy to achieve remedial objectives will not lessen over time. After completion of the remediation, there will be no significant threats, exposure pathways, or risks to the community or environment from on-site remaining wastes or treated residuals unless some future development on the site requires deep excavation. A deed restriction would require prior notification to DEC before any such excavation.

5. Reduction of Toxicity, Mobility, or Volume. All contaminated material within the gasholders and all shallow soil outside the gasholders above the meadow mat layer which contains mobile coal

tar, levels of total target compound list polycyclic aromatic hydrocarbons (PAH's) over 1000 parts per million, or leachable levels of benzene exceeding the toxic characteristic standard will be removed. Groundwater contamination in the shallow aquifer above the meadow mat layer will be addressed by source removal. Thus all shallow contamination will be treated or removed except for areas of soil containing relatively low levels of immobile coal tar.

The mobility of the coal tar remaining in the deep soil below the meadow mat layer will be reduced by the use of collection wells to collect mobile free product at the periphery of the site. Other deep contamination which is contained below the meadow mat layer and not moving off-site will not be treated.

6. Implementability. Potential construction difficulties may arise because of the condition of the gasholders, which is only partially known. The work plan outlines how both damaged wall sections and potential penetrations in the gasholder bottoms will be dealt with. All supplies, services, and equipment required for the remediation and for long term operation and maintenance are readily available