SUPPLEMENTAL
REMEDIAL INVESTIGATION REPORT

For the:

CLIFTON OU-2
OFF-SITE AREA (89 WILLOW AVE)
Former Manufactured Gas Plant Site
Staten Island, Richmond County, New York
Site No. 2-43-023

Prepared for:

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1.0 EXECUTIVE SUMMARY

Paulus, Sokolowski and Sartor Engineering, PC (PS&S) has been retained by KeySpan Corporation (KeySpan) to prepare this Report to document the findings of a Supplemental Remedial Investigation of a now offsite property at 89 Willow Avenue associated with the Clifton OU-2 former Manufactured Gas Plant. This Supplemental Remedial Investigation Report (SRIR) documents the completed soil and groundwater investigation activities within the 89 Willow Avenue parcel, which is referred to throughout this report as the "Off-Site Area". This parcel is owned by a third party, and is presently vacant while being prepared for development by its owner. The investigation program was conducted by PS&S from September to October 2007 in accordance with the approved New York State Department of Environmental Conservation (NYSDEC) Supplemental Remedial Investigation Work Plan dated August 2007.

Materials believed to be associated with the former MGP operations had previously been found on the parcel. The purpose of the Supplemental Remedial Investigation was to characterize the existing soil and groundwater conditions within the Off-Site Area, update the qualitative human health exposure assessment prior to its future development and guide the determination as to whether remedial actions, beyond an approved work plan for the excavation of the contaminated surface soils, would be required.

As part of this program, a total of 14 soil borings and 10 ground water points were installed for the purpose of retrieving test samples and visual observations. Visual observations of the existing subsurface soil indicate the presence of purifier waste at 1 location and suspected MGP related impacts in the soil at 3 of the 14 boring locations. Soil sample analytical results revealed the presence of metals, semivolatile organic compounds (SVOC) and volatile organic compounds (VOC) at levels which exceed the NYSDEC SubPart 375 Protection of Human Health Restricted Commercial Soil Cleanup Objective (Part 375 SCO) at 10 of the 14 boring locations. Exceedances in the Part 375 SCO concentration for total cyanide (27 mg/kg) were detected at 7 of the 14 boring locations ranging from 33.6 to 299 mg/kg. Both the visual observations and analytical data indicate that impacted soils were encountered within the surface (i.e., the top six feet) and then at depths between 12 and 25 feet below grade surface. Two soil samples were collected and delivered to Alpha Woods Hole Labs for an environmental forensic analysis. This analysis confirmed that the parcel exhibited MGP related impacts.

Groundwater sample analytical results revealed the presence of metals, semivolatile organics compounds (SVOC) and volatile organic compounds (VOCs) at levels which exceed the NYSDEC Ambient Water Quality Standards (AWQS) at 6 of the 10 locations. Exceedances in the AWQS concentration for total cyanide (200µg/L) were detected at 5 of the 10 sample locations ranging from 300 to 5010 µg/L. The analytical data indicates that groundwater impacts extend to a depth of approximately 20 feet below ground surface (bgs).

The SRIR identified concentrations of constituents that pose potentially complete exposure pathways to the users of 89 Willow Ave if there were to be unrestricted land use activities. However, the site's zoning, current, and future use are consistent with industrial/commercial land use which dramatically reduce the potential for exposure. Therefore, when considering the intended commercial use and when comparing to the Restricted Commercial Use SCOs, the only

potential exposure pathways are to soils at or greater than 12 feet deep and to groundwater beneath the site. These potential pathways are mitigated by the commercial land use, the lack of groundwater use at the site, and by the use of soil and groundwater management plans minimizing the potential for contact and exposure.

The soil and groundwater impacts encountered during this Supplemental Remedial Investigation program were located in the general area of the proposed remedial excavation of contaminated surface soils. However, based on the findings presented below, PS&S will prepare for submission to the NYSDEC a Revised-Interim Remedial Measures Work Plan for the proposed remedial excavation of the Off-Site Area. This submission will provide further details on the proposed remedial excavation intended to address the impacts observed at these areas. The planned IRM, redevelopment and institutional controls at the site will eliminate or reduce the identified exposure pathways at the site.

2.0 INTRODUCTION

Paulus, Sokolowski & Sartor Engineering, PC (PS&S) has been retained by KeySpan Corporation (KeySpan) to perform a Supplemental Remedial Investigation (SRI) of an Off-Site Area located immediately adjacent to and west of the Former Clifton Manufactured Gas Plant (MGP) Site Operable Unit No. 2 (OU-2). The Off-Site Area is located at 89 Willow Avenue and is shown on Figure No. 1.

This Supplemental Remedial Investigation Report (SRIR) describes the methodologies undertaken to complete the SRI and presents the results of the soils and groundwater investigations. The SRI was completed in accordance with the New York State Department of Conservation (NYSDEC) approved Supplemental Remedial Investigation Work Plan (SRIWP) dated September 2007.

The SRI objectives are as follows:

1. To sufficiently characterize the existing site soil and groundwater conditions in order to understand the nature and extent of environmental impacts and update the qualitative human health exposure assessment (QHHEA) prior to the future commercial development of the site by others.
2. To provide sufficient information to support the implementation of the planned Interim Remedial Measure (IRM) Excavation.

2.1 Background Information

Current Site Conditions

The Off-Site Area is currently an undeveloped, unpaved lot that is privately owned. The Off-Site area is designated as Block 2841 Lot 138 and is currently zoned for manufacturing (M3-1). The property is bounded to the north by the Staten Island Railroad (SIRR); to the south by Willow Avenue and residential condominiums, to the east by the Clifton former MGP site OU-2 and a commercial/manufacturing facility to the west.

In 2007, the current private property owner began removing fill associated with the former railroad spur to the SIRR as part of the property development. The property is anticipated to be developed in 2008 with a warehouse or other manufacturing facility based upon preliminary discussions with the property owner.

Site History

The property was previously an elevated railroad spur for the SIRR. The abandoned railroad spur was excavated and leveled by the current property owner, as part of the site development activities. The property is located in a mixed commercial and manufacturing zone that is zoned M3-1 with commercial/manufacturing uses. North and west of the property is the SIRR right-of-way and active tracks. A parking lot and

machine shop currently exist to the southwest of the property. South of the property is Willow Avenue and then residential condominiums. The former MGP site is located to the east and north of the property. A storm sewer is located on the north and east side of the 89 Willow Avenue Property along the property line with the former MGP.

3.0 SUPPLEMENTAL REMEDIAL INVESTIGATION PROGRAM

3.1 Overview of Field Program Activities

The field procedures and analytical methodologies presented in the September 2007 Supplemental Remedial Investigation Work Plan (SRIWP) were used to complete this SRI program. The initial scope of work, outlined in the SRIWP, identified a total of 10 soil borings and 5 groundwater probes. As a result of identified visual impacts encountered in some of the borings, the actual scope of work conducted consisted of the installation and advancement of 14 soil borings, 2 GeoProbe groundwater probes and 10 temporary wells. As a safety precaution, the first 5 bgs of each boring and temporary well were hand cleared using a shovel, a post-hole digger and/or vacuum "Guzzler" type equipment. GeoProbe® direct push technology was utilized to advance each boring and temporary well from 5 feet bgs to its end point.

3.1.1 Surface Soil Sampling

A total of 14 surface soil samples were collected from depths ranging between 0 and 2 feet below any encountered ground surface cover utilizing a dedicated polyethylene scoop and placed into laboratory-supplied sample containers. All samples were field-screened utilizing a photoionization detector (PID) for the presence of volatile organic vapors. Surface soil samples collected for laboratory analysis were targeted towards visual, olfactory and PID indications of impacts.

Samples were placed in a cooler and maintained at a temperature of 4º Celsius until delivery to H2M Labs, Inc. under chain of custody documentation. All surface soil samples selected for laboratory analysis were analyzed for Target Compound List (TCL) Volatile Organic Compounds (VOC), TCL Semi-Volatile Organic Compounds (SVOC), polychlorinated biphenyls (PCB), total cyanide and Resource Conservation Recovery Act Metals (RCRA-8 Metals). The analytical results of the surface soil samples collected from the Off-Site Area are presented and discussed in **Section 3.1.2**. The surface soil sample locations are shown on **Figure 2**.

3.1.2 Subsurface Soil Sampling

A total of 42 subsurface soil samples were collected using direct push GeoProbe sampling techniques with a decontaminated probe sampler and dedicated acetate liners. All samples were field-screened for volatile organic vapors utilizing a PID; inspected for the presence of staining, discoloration, Non-Aqueous Phase Liquid (NAPL), ash, tar and other MGP-residuals; checked for odors; and logged by a geologist using the Unified Soil Classification System (USCS).

A total of 14 soil borings were advanced as part of this SRI Program. Soil borings were advanced to depths ranging from 15 to 35 feet bgs. A minimum of two

subsurface soil samples were selected for analysis from each boring based on the following criteria:

- The apparent groundwater table;
- The interval exhibiting the greatest indications of impacts based on visual observations and field screening; and,
- The "visibly clean" zone located 10 feet beneath the deepest interval of observed impacts.

If no impacts were observed throughout the boring, a sample was obtained at the termination depth of the boring.

Samples were placed in a cooler and maintained at a temperature of 4º Celsius until delivery to H2M Labs, Inc. under chain of custody documentation. All subsurface soil samples selected for laboratory analysis were analyzed for TCL VOC, TCL SVOC, PCBs, total cyanide and RCRA-8 Metals. The analytical results of the subsurface soil samples collected from the soil borings are discussed in **Section 3.1.2**. The locations of the soil borings are shown on **Figure 2**.

Upon completion of the soil borings, recovered sample material that did not exhibit field evidence of MGP related impacts (i.e., elevated PID readings, staining or odors) were returned to the boring. Soils that exhibited field evidence of MGP related impacts were placed in 55-gallon steel drums and later disposed of in accordance with applicable federal and state regulations. The remainder of each borehole was backfilled with grout and restored at grade with like material.

3.1.3 Temporary Groundwater Wells

A total of 10 temporary groundwater wells and two GeoProbe groundwater probes were installed at the Off-Site Area during the SRI activities. The two hydropunch samples were collected using a two foot long stainless steel hollow sampling point with 0.010-inch slotted screen. Grab samples SB-8W-GW3 (11.0 to 15.0 feet bgs) and SB-8W-3 (12.0 to 17.0 feet bgs) were collected from the groundwater probe locations.

Temporary wells were constructed of 5 feet of 1-inch diameter, schedule 40 poly-vinyl chloride (PVC) 0.010-inch slotted well screen. The remainder of each well was constructed of 1-inch diameter, schedule 40 PVC solid riser. GeoProbe® technology was used to install each well. Temporary wells were screened at the following depths:

- GPESB-1WS (shallow): 4.0 to 9.0 ft bgs
- GPESB-1WI (intermediate): 15.0 to 20.0 ft bgs
- GPESB-3WS (shallow): 4.0 to 9.0 ft bgs
- GPESB-3WD (deep): 25.0 to 30.0 ft bgs
- GPESB-5WS (shallow): 4.0 to 9.0 ft bgs

- GPESB-5WI (intermediate): 10.0 to 15.0 ft bgs
- GPESB-6WS (shallow): 3.0 to 8.0 ft bgs
- GPESB-6WI (intermediate): 9.0 to 14.0 ft bgs
- GPESB-8WS (shallow): 3.0 to 8.0 ft bgs
- GPESB-8WD (deep): 20.0 to 25.0 ft bgs

Prior to the collection of groundwater samples from the temporary wells, PS&S attempted to develop each well until field parameters stabilized. Water quality parameters, including pH, conductivity, turbidity, dissolved oxygen, temperature and redox potential, were monitored during development and sampling activities utilizing a calibrated Horiba U-22 multiple parameter instrument. Additionally, any evidence of odors, sheens or the presence of NAPL was noted. All field parameters and observations were logged in project field forms. All evacuated groundwater was stored in 55-gallon drums until its disposal in accordance with applicable federal and state regulations. Visual observations and water quality parameters noted during groundwater sampling activities are summarized in **Section 3.2.1**.

Groundwater samples were collected from each temporary well using a peristaltic pump and low-flow sampling techniques where adequate groundwater recovery occurred. Static groundwater samples were collected from the temporary wells where adequate groundwater recovery did not occur (GPEGW-1WS, GPEGW-3WS, GPEGW-3WD, GPEGW-6WS and GPEGW-8WD).

All groundwater samples were transferred into laboratory-supplied sample containers. Samples were placed in a cooler and maintained at a temperature of 4º Celsius until delivery to H2M Labs, Inc. under chain of custody documentation. All groundwater samples selected for laboratory analysis were analyzed for TCL VOC, TCL SVOC, PCBs, total cyanide and RCRA-8 Metals with the exception of samples collected from GPESB-1WS, GPESB-3WS and GPESB-6WS which did not yield enough groundwater for a full analytical scan. The groundwater sample collected from GPESB-1WS was analyzed for TCL VOC only and the groundwater samples collected from GPESB-3WS and GPESB-6WS were analyzed for TCL VOC and TCL SVOC only. The analytical results of the groundwater samples collected from the temporary wells are discussed in **Section 3.2.2**. The locations of the temporary wells are shown on **Figure 2**.

The initial scope of work, outlined in the SRIWP, the proposed groundwater sampling parameters were to consist of TCL VOC, TCL SVOC and cyanide. To provide for a more accurate comparison of potential impacts, a decision was made to analyze the groundwater samples for the same parameters as the collected soil samples. Therefore, the groundwater samples were additionally analyzed for PCBs and RCRA Metals.

Upon completion of sampling activities, the PVC riser and screen were removed from each borehole and the borehole was allowed to naturally collapse into itself.

The remainder of each borehole was grouted and finished to grade with like material.

3.1.4 Community Air Monitoring Program

In accordance with NYSDEC and NYSDOH, a Community Air Monitoring Program (CAMP) was implemented at the site during the installation of the soil borings at the Off-Site Area. The requirements for the CAMP, VOC monitoring, response levels and actions were presented in the Health and Safety Plan previously approved for Clifton OU-1. Air monitoring stations were utilized at locations up and down-wind of the investigation activities. VOCs and respirable particulates (PM-10) were monitored at the stations on a continuous basis. Each monitoring station contained a data logging PID and a data logging dust meter. In addition, a PID was used to monitor the breathing zone and to quantify any VOCs emanating from the open bore hole and from soil removed.

All air monitoring instruments were calibrated on a daily basis prior to the start of field work. All data from the stationary air monitoring stations were electronically downloaded to the on-site computer at the conclusion of each work day. No exceedances of the prescribed 15-minute averages for VOC and particulate emissions were noted during the SRI.

3.1.5 Data Validation/Data Usability

The analytical data reported herein is based on unconfirmed data from H2M Labs Inc. All analytical data packages submitted by H2M Labs were validated in accordance with the NYSDEC 10/95 Analytical Services Protocol (ASP) Quality Assurance/Quality Control (QA/QC) requirements. Data validation was performed by an independent QA/QC officer, meeting the qualifications required by NYSDEC to perform data validation. The data packages were reviewed for transcription errors, as well as compliance with analytical methods and QA/QC requirements. A Data Usability Summary Report (DUSR) was prepared for each sample delivery group (SDG) or data package. The DUSRs are located in **Appendix I**.

4.0 FINDINGS

The assessment of the presence of chemical constituents in the existing site soil was conducted using physical descriptions of the recovered sample media and analytical results. The soil laboratory analytical data packages are presented in **Appendix A** and physical observations are included on the soil boring longs presented in **Appendix B** of this Report. The findings are further summarized in the subsections below.

4.1 Soil

4.1.1 Visual Observations

During the soil boring installations, the recovered soils were field screened using a PID, and inspected for visual and olfactory evidence to determine the apparent presence/absence of MGP-related impacts. The recovered soils were classified utilizing the USCS for soil descriptions and related MGP-impacts were described utilizing criteria established by KeySpan.

The shallow stratigraphy beneath the area of investigation consisted of heterogeneous fill and alluvial/marsh deposits based on soil samples examined during the soil boring and temporary monitoring well installations by PS&S as part of this SRI. Surficial soils are composed of heterogeneous fill across most of the site and ranges in thickness from approximately 3 feet to 22 feet in the off-site area just west of the site boundary. The fill composition is primarily poorly sorted and high permeability sand and gravel with varying percentages of gravel, silt, clay, and ash, brick, coal, concrete, metal, slag and wood fragments. The alluvial/marsh deposits encountered in the area of investigation consist mainly of interbedded layers of silt, peat and clay as shown on the cross-section (Figure 5). The top of these deposits were encountered from approximately 3 feet bgs on to approximately 22 feet bgs.

In general, only four soil borings exhibited evidence of visual impacts, including the presence of wood chips (purifier waste) and a sheen on the soils. The observed impacts occurred at approximately 1.5 ft bgs in GPESB-8W, at approximately 16.0 feet bgs in GPESB-7A, at approximately 13.5 feet bgs in GPESB-6W and at approximately 21.0 feet bgs in GPESB-1W. Soil boring logs, which include descriptions of the observed impacts, are included in **Appendix B**.

4.1.2 Discussion of Laboratory Analytical Results

As noted in **Section 2**, all soil samples submitted for laboratory analyses were analyzed for TCL VOC, TCL SVOC, PCB, total cyanide and RCRA-8 Metals.

The analytical results were compared to the NYSDEC SubPart 375 Protection of Human Health Restricted Commercial Soil Cleanup Objectives (Part 375 SCO) and are presented in Data Summary **Tables 1** through **4** of **Appendix C**. The data

summary tables also present the sum of all detected VOC and benzene, toluene, ethylbenzene and xylenes (BTEX) compounds, SVOC, and tentatively identified compounds (TICs). Concentrations of chemical constituents that exceed the Part 375 SCO are presented in bold type on the data summary tables.

4.1.2.1 Volatile Organic Compounds

TCL VOC analysis was performed on 56 soil samples collected from 14 soil boring locations. Analytical results of soil sampling indicated that no individual VOC were detected at concentrations exceeding their respective Part 375 SCO. Total BTEX concentrations were negligible ranging from not detected (ND) to 0.205 milligrams per kilogram (mg/kg).

The non-MGP related VOC compounds, methylene chloride, acetone, 2-butanone and carbon disulfide were detected in several of the soil samples at concentrations below their respective Part 375 SCO. Data summary tables comparing the VOC concentrations to Part 375 SCO are included as **Table 1**.

4.1.2.2 Semi-Volatile Organic Compounds

Total SVOC analysis was performed at the 56 soil samples collected from the 14 soil boring locations. Total SVOC concentrations range from ND to 3,584 mg/kg (GPESB-6W-4). Total PAH concentrations range from ND to 3,270 mg/kg (GPESB-6W-4). The distribution of total PAH concentrations show 86% of the total concentrations at or below 10 mg/kg, 9% greater than 10 mg/kg and below 100 mg/kg, and 5% at 100 mg/kg or greater.

Soil samples collected from four of the borings (GPESB-1W, GPESB-6W, GPESB-8WA and GPESB-10) contained SVOC (more specifically, polyaromatic hydrocarbons [PAH]) at concentrations greater than their respective Part 375 SCO. The individual SVOC which exceeded their Part 375 SCO in one or more of the aforementioned samples are as follows:

- Indeno(1,2,3-cd)pyrene;
- Benzo(a)pyrene;
- Benzo(k)fluoranthene;
- Benzo(b)fluoranthene'
- Chrysene;
- Benzo(a)anthracene;
- Fluoranthene;
- Phenanthrene; and
- Dibenzo(a,h)anthracene.

Summary tables comparing the SVOC concentrations to Part 375 SCO are included as **Table 2**.

4.1.2.3 RCRA Metals and Cyanide

Analytical results of soil sampling indicated that cyanide was detected at concentrations greater than its respective Part 375 SCO of 27 mg/kg, in 11 of the 56 total soil samples analyzed. These exceedances ranged from 33.6 mg/kg to 299 mg/kg. Cyanide was detected above Part 375 SCO at depths ranging from 0.5 to 16.0 feet bgs. In addition, barium (GPESB-6W-3) and mercury (GPESB-4-1) were detected at concentrations greater than their respective Part 375 SCO. These samples are located in the area of the previously approved IRM.

Summary tables comparing the RCRA Metals concentrations to Part 375 SCO are included as **Table 3**.

4.1.2.4 Polychlorinated Biphenyls

Analytical results of soil sampling indicated that PCBs were reported as not detected at concentrations exceeding their respective method detection limit. Summary tables comparing the PCB concentrations to Part 375 SCO are included as **Table 4**.

4.1.3 Discussion of Environmental Forensic Analysis and Results

Two soil samples were collected by PS&S field representative for the purpose of conducting a high resolution hydrocarbon fingerprint (forensic) analysis to determine the nature of the impacts (i.e., odor and/or sheen). The samples were retrieved on October 3, 2007 from boring locations GPESB-6WA and GPESB-7A at a sample interval of 13.5 to 14.5 feet bgs and 15 to 16 feet bgs, respectively. The samples were delivered, under chain of custody documentation, to NewFields Environmental Forensics Practice, LLC (NewFields) and immediately transferred, under chain of custody documentation, to Alpha Woods Hole Labs in Mansfield, MA for laboratory testing and analysis.

The analytical data results and a detailed report prepared by NewFields containing their findings and conclusions are presented in **Appendix G.**

4.2 Groundwater

The assessment of the presence of chemical constituents in groundwater at the Off-Site Area was conducted using physical descriptions of the recovered sample media and analytical results. The groundwater laboratory analytical data package is presented in **Appendix D** while physical observations are included on the groundwater sampling logs presented in **Appendix E** of this Report.

4.2.1 Visual Observations

All groundwater evacuated from temporary wells during development and sampling activities was initially turbid. In some instances, groundwater cleared up prior to sampling but was typically turbid during sampling activities. A sheen was noted during the development and sampling of temporary well GPESB-1WI. All observations noted during development and sampling of the temporary wells is included on the groundwater sampling logs in **Appendix E**.

4.2.2 Discussion of Laboratory Analytical Results

The analytical results were compared to the Ambient Water Quality Standards (AWQS) Source of Drinking Water (groundwater) Classification GA, established in 6NYCRR Part 703 and TOGS 1.1.1 and are presented in Data Summary **Tables 5** through **8**, contained in **Appendix C**. Concentrations of chemical constituents that exceed the AWQS are presented in bold type on the data summary tables.

4.2.2.1 Volatile Organic Compounds

Analytical results of groundwater sampling indicated that benzene was detected in temporary wells GPEGW-1WI and GPEGW-6WI at a concentration greater than its respective AWQS. In addition, toluene and total xylenes were detected at concentrations greater than their respective AWQS in GPEGW-6WI and 2-butanone was detected at a concentration greater than its respective AWQS in SB-8W3. It should be noted that these samples are located in the area of the previously approved IRM.

Summary tables comparing the VOC concentrations to AWQS are included as **Table 5**.

4.2.2.2 Semi-Volatile Organic Compounds

Analytical results of groundwater sampling indicated that naphthalene was detected in temporary wells GPEGW-1WI and GPEGW-6WI at a concentration greater than its respective AWQS. In addition, acenaphthene was detected at a concentration greater than its respective AWQS in GPEGW-1WI.

Summary tables comparing the SVOC concentrations to AWQS are included as **Table 6**.

4.2.2.3 RCRA Metals and Cyanide

Concentrations of several individual metals exceeded their respective AWQS in 10 of the 13 groundwater samples. The individual metals which exceeded their AWQS in one or more of the temporary wells are as follows:

- Barium;
- Chromium;
- Lead;
- Mercury; and
- Cyanide.

Summary tables comparing the RCRA Metals and cyanide concentrations to AWQS are included as **Table 7**.

As discussed on **Section 3.2.1**, the majority of the groundwater samples collected were observed to be turbid. Elevated concentrations of metals in groundwater are often a result of metal molecules attaching themselves to sediment as opposed to a representation of dissolved metals in groundwater.

4.2.2.4 Polychlorinated Biphenyls

Analytical results of groundwater sampling indicated that no PCBs were detected at concentrations exceeding their respective AWQS. Summary tables comparing the PCB concentrations to AWQS are included as **Table 8**.

5.0 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT EXECUTIVE SUMMARY

At the request of KeySpan Corporation (KeySpan) [now a part of National Grid], GEI Consultants, Inc. (GEI) prepared Qualitative Human Health Exposure Assessment (QHHEA) for the third-party-owned 89 Willow Avenue property. This Assessment was undertaken in support of the Supplemental Remedial Investigation (SRI) conducted by Paulus, Sokolowski and Sartor Engineering, PC (PS&S). The QHHEA evaluated whether potentially complete exposure pathways exist for human users of the 89 Willow Avenue property to compounds of potential concern related to the former Manufactured Gas Plant (MGP) site, for which KeySpan has responsibility. The former MGP is located adjacent to the east of 89 Willow Avenue parcel. The 89 Willow Avenue property is also referred to as the Off-Site Area of the Former Clifton Manufactured Gas Plant (MGP) Site Operable Unit No. 2 (OU-2). KeySpan previously performed a Remedial Investigation (RI) of the former MGP under an Administrative Order on Consent (Index No. D2-0001-98-11) with the New York State Department of Environmental Conservation.

The 89 Willow Avenue parcel is currently a gravel parking lot and the property owner has indicated that the property will be developed with a slab-on-grade commercial warehouse and paved parking areas. The parcel is zoned M3-1 for commercial / manufacturing uses.

During site clearing activities conducted by the property owner in the Spring 2007, isolated pockets of purifier material were encountered at the 89 Willow Avenue property. Purifier material was used to purify the gas stream during the production of MGP gas and commonly contains iron-complexed cyanide and sulfur compounds that were scrubbed out of the gas stream. In response to encountering purifier material, KeySpan proactively completed a test pit investigation to evaluate the extent of the purifier material under a NYSDEC-approved work plan. Based upon the findings of the test pit investigation, KeySpan proposed an Interim Remedial Measure (IRM) to remove the purifier material. Prior to implementing the removal IRM, a Supplemental Remedial Investigation (SRI) was completed to further evaluate the environmental conditions at the 89 Willow Ave. property in accordance with the NYSDEC-approved Supplemental Remedial Investigation Work Plan (SRIWP).

The data obtained during the SRI were combined with data obtained from the 89 Willow Avenue parcel as part of the Remedial Investigation for OU-2 (documented in the *Final Remedial Investigation Report Clifton Former MGP Site Operable Unit 2 (OU-2)* dated February of 2005). These data were then used to evaluate the potential qualitative human health exposure for the 89 Willow Avenue parcel; the findings of this analysis are summarized below and detailed in the remainder of this appendix.

The QHHEA findings indicate that if left unmitigated, there are complete exposure pathways for users of the 89 Willow Ave parcel that could be exposed to soil and groundwater containing chemical constituents at adverse concentrations associated with the adjacent former MGP. However, the property is zoned for Commercial Use, it is being developed for and its foreseeable future use is as a commercial property. This use combined with the intended soil removal IRM

greatly reduces the potential for any future users of the property to be exposed to materials associated with the former MGP. The key findings of the QHHEA are as follows:

Soils:

- Under current conditions, a potentially complete exposure pathway exists for current and future construction/utility workers and trespassers to compounds of concern (COCs) in shallow subsurface soils to a depth of 2 feet during site activities. The planned IRM to remove the shallow subsurface soils will eliminate this potential exposure pathway.

- Under current conditions, a potentially complete exposure pathway exists for the current and future construction workers to come into contact with COCs in isolated pockets in deep subsurface soils at approximately 12 to 14 feet below the ground surface. However, these isolated pockets are below the groundwater table, are below typical depths required for construction of footers for a slab-on-grade building, and are at a depth approaching the limits of typical construction excavation equipment (commonly considered to be 15 feet for risk assessment purposes). The relative inaccessibility of these materials and the potential use of institutional controls such as a soils management plan will mitigate any future potential exposure pathway to these deep soils.

Groundwater:

- Several chemicals in groundwater are present at concentrations that exceed NYSDEC Standards, Criteria, and Guidance (SCG) values; however the groundwater is not used as a potable water source and the property will be connected to the New York City water supply system so a complete exposure pathway for ingestion does not exist.

- A potentially complete exposure pathway to shallow groundwater is expected to be limited to those individuals engaged in excavation work (e.g., construction worker and utility worker). Depth to groundwater ranges from two to eight feet below ground surface. The only chemical in shallow groundwater that exceeds the SCGs and these workers have the potential to come into contact with, is cyanide; however dermal absorption is not a route of exposure for cyanide, therefore a complete exposure pathway is not present.

- Direct contact exposures to deep groundwater are expected to be limited to those individuals engaged in excavation work (e.g., construction worker and utility worker). However, implementation of institutional controls such as a soil and groundwater management plan will minimize this potential pathway.

The SRI identified concentrations of constituents that pose potentially complete exposure pathways to the users of 89 Willow Ave when compared to unrestricted land use activities. However, the site's zoning, current, and future use are consistent with industrial/commercial land use which dramatically reduce the potential for exposure. Therefore, when considering the intended commercial use and when comparing to the Restricted Commercial Use SCOs, the only potential exposure pathways are to soils at or greater than 12 feet deep and to groundwater

beneath the site. These potential pathways are mitigated by the commercial land use, the lack of groundwater use at the site, and by the use of soil and groundwater management plans minimizing the potential for contact and exposure.

6.0 CONCLUSIONS

The following section summarizes the findings of the supplemental remedial investigation program with regard to the chemical results and visual observations of the soils and groundwater within the Off-Site Area:

- Based on the soil analytical results, SVOC and barium, mercury and cyanide are present in soil at concentrations greater than their respective Part 375 SCO and are generally associated with the identified visual impacts.

- Based on the groundwater analytical results, VOC, SVOC, RCRA Metals and cyanide are present in groundwater at concentrations greater than their respective AWQS.

- Additional evidence of purifier waste as observed within the first two-feet of soil at boring location GPESB-8W.

- Suspected MGP-related visual impacts were encountered at depths between 12 and 21 feet bgs at boring locations GPESB-1W and GPESB-7A.

- Forensic soil testing of soils which exhibited visual impacts (13.5' to 16') confirmed these impacts to be MGP-related.

- The locations of visual impacts and analytical data exceedances of SCGs have been designated as three discrete locations and have been identified as "cells" which will require remediation.

- The SRIR identified concentrations of constituents that pose potentially complete exposure pathways to the users of 89 Willow Ave when compared to unrestricted land use activities. However, the site's zoning, current, and future use are consistent with industrial/commercial land use which dramatically reduce the potential for exposure. Therefore, when considering the intended commercial use and when comparing to the Restricted Commercial Use SCOs, the only potential exposure pathways are to soils at or greater than 12 feet deep and to groundwater beneath the site. These potential pathways are mitigated by the commercial land use, the lack of groundwater use at the site, and by the use of soil and groundwater management plans minimizing the potential for contact and exposure.

7.0 RECOMMENDATIONS

- The planned IRM will consist of the excavation, handling and disposal of soils containing exceedances of individual SVOC, RCRA-8 Metals or visual impacts within the first six feet of soil ("cells"). The material will be disposed of at a KeySpan approved disposal facility.

- The planned IRM will also consider the redevelopment of the property and the use of institutional controls to eliminate or reduce the potential for future exposure to the identified pathways.

APPENDIX A

Soil Laboratory Analytical Package

APPENDIX B

Soil Boring Logs

APPENDIX C

Data Summary Tables

APPENDIX D

Groundwater Laboratory Analytical Package

APPENDIX E

Groundwater Sampling Logs

APPENDIX F

Qualitative Human Health Exposure Assessment

APPENDIX G

Environmental Forensic Analytical Package and Report on Findings

APPENDIX H

Test Pit Investigation Letter

APPENDIX I

Data Usability Summary Report