APPENDIX C

Qualitative Human Exposure Assessment/Fish and Wildlife Resources Impact Analysis

GEI Consultants

Geotechnical
Environmental and
Water Resources
Engineering

Qualitative Human Exposure Assessment
Fish and Wildlife Resources Impact Analysis

Hempstead/Intersection Street

Former Manufactured Gas Plant Site
Nassau County, New York
NYSDEC Consent Index No. D1-0002-98-11

Submitted to:
KeySpan Corporation
One MetroTech Center
15th Floor
Brooklyn, NY 11201-3850

Submitted by:
GEI Consultants, Inc.
455 Winding Brook Drive
Glastonbury, CT 06033
860-368-5300

November 2006

Project 982482-25-3502

Table of Contents

Tables

Attachments

1. Introduction

This qualitative exposure assessment is part of a Remedial Investigation conducted under an Order on Consent (Index No. D1-0002-98-11) between KeySpan Corporation (KeySpan) and the New York State Department of Environmental Conservation (NYSDEC) concerning the former manufactured gas plant (MGP) site located on the Garden City/Hempstead town line in Nassau County, New York. An evaluation of potential human exposure pathways and risk of impact to the environment is part of the scope-of-work presented in the Investigation Work Plan for Hempstead (Intersection Street) Former MGP Site, dated June 2000 (Dvirka and Bartilucci Consulting Engineers [D&B] 2000).

This assessment identifies potential human exposures associated with chemical constituents detected in soil, groundwater, indoor air, and ambient air at or near the site. A screening-level ecological assessment in the form of a fish and wildlife resources impact analysis (FWRIA) also is included.

This assessment considers potential exposure of humans and biota to site chemicals. The objectives of the assessment are:

- To identify chemicals of potential concern (COPCs) that are related to the former gas manufacturing activities conducted at the site

- To identify potential pathways of exposure to people, plants, and animals

- To estimate and characterize the potential ecological risks of impacts associated with these exposures

- To indicate the need for mitigative measures to reduce potential exposures

This assessment used data collected as a part of D&B's Draft Remedial Investigation Report (March 2003), and from the Paulus, Sokolowski, and Sartor Engineering, P.C. (PS&SPC) Final Remedial Investigation (RI) Report (March 2006 amended November 2006). In addition, recent groundwater monitoring results were evaluated. The ecological portion of the assessment is consistent with the NYSDEC's FWRIA guidance found in Draft DER-10 Technical Guidance for Site Investigation and Remediation (December 2002).

1.1 Site Background and Setting

1.1.1 Site Location and Description

The Hempstead/Intersection Street former MGP site is located in Nassau County, New York. Immediately adjacent to the site are residences (both single-family and multi-unit dwellings) to the north; and an oil company, a medical office building, and an automobile storage lot to the south. Automobile dealerships border the site to the east and a Garden City public park, two public water supply wells, and commercial and residential properties border the site to the west (Attachment 1-1A). The primary access to the site is from Intersection Street. The nearby public water supply wells are side-gradient of the site and are screened within the Magothy aquifer at depths between 540 and 570 feet below grade. A well capture zone analysis conducted by H2M Group concluded that it is unlikely that benzene, toluene, ethylbenzene, xylene/polycyclic aromatic hydrocarbons (BTEX/PAHs) associated with the site could impact the water quality of these wells based on groundwater flow direction (away from the wells) and current and historic pumping rates (H2M Group October 2006).

The site is primarily vacant; however, KeySpan uses portions of the property in support of their natural gas distribution system and for storage of equipment. Additionally, high-pressure underground water and gas lines traverse the site.

For the purposes of the qualitative human exposure assessment, the site and surrounding property are considered separately with respect to potential exposure to human populations. Current and potential future exposures occurring within the confines of the land currently and previously owned by KeySpan, which includes the leased property to the east of the active utility property and the southern property outside the current fence line that was sold by KeySpan, will be referred to hereafter as “on-site” exposures. Current and potential future exposures that could potentially occur outside the confines of this area will be referred to as “off-site” exposures.

1.1.2 Site History

An MGP facility reportedly operated at the site from 1890 to 1951. Originally, the MGP produced coal gas but the plant was converted to produce carbureted water gas after 1910. By the mid-1950s most of the MGP-related structures were demolished. A detailed history of the former MGP site is provided in the Final RI Report (PS&SPC March 2006 amended November 2006).

1.1.3 Land Use and Demographics

Land use and demographic information is provided in subsection 1.5.1 of the PS&SPC Final RI Report (March 2006 amended November 2006).

1.1.4 Climate

A description of regional climatic conditions is provided in subsection 1.5.2 of the PS&SPC Final RI Report (March 2006 amended November 2006).

1.1.5 Topography

A description of site topography is provided in subsection 1.5.3 of the PS&SPC Final RI Report (March 2006 amended November 2006).

1.1.6 Site Hydrogeological Characteristics

A description of the site hydrogeological characteristics is provided in Section 3.0 of the PS&SPC Final RI Report (March 2006 amended November 2006).

2. Qualitative Human Exposure Assessment

2.1 Nature and Extent of Chemical Constituents

BTEX (benzene, toluene, ethylbenzene, and xylenes) were the principal volatile organic compounds (VOCs) detected in samples at the site and are the common VOCs associated with coal tar. Semivolatile organic compounds (SVOCs) were also detected at the site. PAHs are the common subset of SVOCs found in coal tar. Additionally, Section 4.0 of the PS&SPC Final RI Report (March 2006 amended November 2006) provides a detailed description of the nature and extent of chemical constituents detected on-site and in relevant off-site locations.

2.2 Chemical Fate and Transport

The fate and transport of chemicals in the environment are influenced by a variety of site- and chemical-specific factors. Environmental fate and transport processes for the primary COPCs at the site are summarized briefly in this section and discussed in detail in Section 5.0 of the PS&SPC Final RI Report (March 2006 amended November 2006).

The fate and transport of chemicals in the environment depend on the properties of both the chemicals and the environmental media in which they occur. For organic constituents, physical and chemical properties such as water solubility, Henry's law constant, octanol-water partition coefficient, and organic-carbon partition coefficient, affect the fate and transport in the environment.

Coal tar is a by-product of the manufactured gas process and is typically comprised of a broad spectrum of hydrocarbon compounds including BTEX compounds, PAHs, and phenols. However, it should be noted that elevated concentrations of phenols have generally not been encountered by KeySpan at their former MGP sites. Coal tar can be encountered in a solid, semi-solid or liquid state. Similar to petroleum, coal tar does not readily dissolve in water and will exist as a separate non-aqueous phase liquid (NAPL) when released in a soil/water environment.

BTEX compounds have high vapor pressures and, therefore, would be expected to volatilize readily from environmental media to the atmosphere. Once released to the atmosphere, these compounds are rapidly photodegraded (broken-down by light). These compounds have low octanol/water coefficients (log K_{ow}) and, therefore, do not adsorb well to soil.

PAHs contain only carbon and hydrogen and consist of two or more fused benzene rings in linear, angular, or cluster arrangements. In general, most PAHs can be characterized as having low vapor pressure, low to very low water solubility, low Henry's law constant, high log K_{ow}, and high organic carbon partition coefficient (K_{oc}), which means PAHs remain bound to soil particles.

Although PAHs are regarded as persistent in the environment, they are degradable by microorganisms. Environmental factors, microbial flora and physicochemical properties of the PAHs themselves influence degradation rates and degree of degradation. Important environmental factors influencing degradation include temperature, pH, redox potential (the tendency of a chemical to accept or donate electrons, or to become reduced or oxidized), and microbial species present. Physicochemical properties that influence degradation include chemical structure, concentration, and lipophilicity ("fat-loving" tendency).

In general, PAHs show little tendency to biomagnify in food chains, despite their high lipid solubility, probably because most PAHs are rapidly metabolized by the organisms that are exposed to them (Eisler 1987).

Metals are most mobile under acid conditions. Increased pH usually reduces their bioavailability (McIntosh 1992).

2.3 Selection of Chemicals of Potential Concern

Several classes of chemicals were detected in the environmental media at the site. COPCs for the Hempstead/Intersection Street site were selected following the practice established by the United States Environmental Protection Agency (EPA) in the Risk Assessment Guidance for Superfund, Volume I, Part A (EPA 1989). Selection criteria were as follows:

- Site-wide frequency of detection was considered. Chemicals with a frequency of detection of less than 5 percent in a data set of 20 or more samples were excluded from the assessment. Also, consideration was given as to whether the detected chemical is related to historic and current uses of the site.

- Chemicals not detected at least once above the limit of detection were automatically excluded from the assessment, regardless of the size of the data set.

- Chemicals detected infrequently in one or two environmental media and detected at low concentrations were eliminated from further consideration.

In selecting COPCs, consideration was given as to whether the chemical would be expected to be present given historical and current operations at the site. A summary list of COPCs by medium is presented in Table 2-1.

Defining the objectives of the qualitative human exposure assessment includes establishing the assessment endpoints based on the fate and transport of relevant chemical constituents and identification of potential exposure populations and pathways occurring at the site. This process results in the production of a Conceptual Site Model (CSM). The CSM graphically represents a site and its environment and presents information regarding potential exposure pathways for humans, plants, or animals. Exposure pathways represent the course that a chemical may take from a source to an individual receptor. The exposure route is defined by a source, which is described by the measurement of concentrations of chemicals in a given medium (e.g., chemical concentrations in soil), a release mechanism (e.g., leaching from soil to groundwater), and a point of exposure (e.g., human skin). The CSM for the site is provided in Attachments 1-1A through 1-1D.

As described above, COPCs have been detected in soil and ambient air at the site. Additionally, an indoor air sample was collected at 230 Hilton Avenue. The depth to groundwater in the vicinity of the site is approximately 30 feet below ground surface (bgs). Direct contact with groundwater is unlikely and concentrations of volatile chemicals in groundwater are unlikely to contribute to potential vapor concentrations in indoor air; therefore, COPCs for groundwater were not selected. This human health exposure assessment provides qualitative descriptions of potential exposure to site-related COPCs for human populations who may reasonably be expected to contact site media under present or future conditions. This qualitative human exposure assessment is comprised of two primary components:

- Description of exposure setting and identification of potentially exposed populations
- Identification of exposure pathways

These components are discussed in greater detail in the following paragraphs.

2.4 Exposure Setting and Identification of Potentially Exposed Populations

Under current and future site and off-site use conditions, the potentially exposed populations (i.e., potential receptors) are those that might come into contact (including incidental exposure) with the COPCs. Table 2-2 presents an exposure pathway matrix that depicts the various potential exposure pathways for current and future on site and off site human populations.

2.4.1 Current Scenarios

Current human populations considered in this exposure assessment include on-site trespassers, adult on-site KeySpan workers, adult commercial workers, and adult and child visitors to the leased property located to the east of the active utility property and for the property to the south previously owned by KeySpan. The population of the leased and previously owned properties consists of salespeople and customers of an automobile dealership as this property is used for storage of vehicles. While trespassing at these sites is unlikely given current security measures, the potential for trespasser exposure was considered because the properties could be accessed, with difficulty, over the fence. Additionally, gates to these properties may occasionally be left unlocked, thereby allowing potential trespasser access. Potential on-site exposure for trespassers is limited to chemicals in surface soil and ambient air. Current on-site KeySpan workers are those individuals currently engaged in activities associated with utility operations. Potential exposure to surface soil, subsurface soil, and ambient air is possible for these individuals. Potential exposure media for adult commercial workers and adult and children visitors to the leased and previously owned parcels include surface soil and ambient air.

Current off-site human populations considered in the exposure assessment include adult commercial workers, adult and child visitors to commercial establishments, adult and child residents, and adults and children using the park adjacent to the site. Potential indoor air exposure to chemicals volatilizing from subsurface soil underneath commercial structures may be possible for the off-site commercial workers and visitors. Additionally, potential exposure to surface soil, and particulates and vapors in ambient air exists for the individuals visiting the car lots adjacent to the site. There are areas of these lots that are devoid of gravel and vegetation; these conditions potentially permit direct contact with surface soil. For adult and child residents, potential exposure media include surface and subsurface soil and indoor and ambient air. For the adults and children using the park, potential exposure media include surface soil and ambient air. Potential exposure to surface soil is expected to be limited given that the vast majority of the park is vegetated.

2.4.2 Future Scenarios

Future uses of the site and immediate off-site areas are not expected to change substantially from the current commercial/residential uses. As a consequence, the current exposure scenarios also hold for future use of the site and surrounding areas.

Future human populations considered in this exposure assessment include on-site and off-site construction workers, on-site commercial workers, and on-site adult and child visitors to commercial establishments; on-site adult and child residents, and nearby off-site adult utility workers. The construction worker is considered because any site or off-site redevelopment likely would involve construction activity. Potential exposure media for the construction worker include surface and subsurface soil, and ambient air.

The possibility exists that the site may be used in the future for commercial purposes. Thus, exposures for adult on-site commercial workers and adult and child visitors to future on-site commercial establishments may occur. These individuals have the potential for exposure to chemicals in indoor air that have volatilized from the subsurface soil underneath a future commercial structure.

There is a potential for chemical exposure for nearby off-site utility workers because of the presence of subsurface utility lines in areas adjacent to the site. Potential exposure media for nearby off-site utility workers includes surface and subsurface soil, and soil vapor.

Potential exposure media for future on-site adult and child residents includes surface and subsurface soil and indoor and ambient air.

2.4.3 Water Supply Wells

Two public water supply wells are located just west of the site and serve the residents of the Village of Garden City. Although considered side gradient of site-related contamination, H2M Group was consulted by KeySpan to provide an in-depth capture zone analysis to help provide a better understanding of the groundwater flow in this area. This report, completed in November 2005 and revised in October 2006, used current and historic pumping data, groundwater flow direction, and computer modeling to simulate groundwater flow in the aquifer system and to determine if under current or worst-case scenarios, these wells could potentially draw from site-related impacted groundwater. Based on this analysis, H2M concluded that under normal pumping rates, the site is outside of the capture zone of the two water supply wells. H2M also noted that the capture zones may move closer to the site under theoretical maximum pumping conditions, but there isn’t a precedent for this type of well operation for these wells or other local wells. In addition, standard engineering practice and applicable industry guidance standards generally prevent such maximum pumping conditions for a length of time that would be significant enough to draw site related groundwater into the wells (estimated at 16 years of constant pumping at the maximum capacity by H2M). Based on these findings, the two Village of Garden City public water supply wells are unlikely to draw from the groundwater impacted by the site.

A similar analysis was conducted by H2M for the Village of Hempstead water supply wells which are located on Clinton Street approximately 4,000 feet east of the former MGP site. Similar findings were reached by H2M. Based on H2M’s modeling results, these Village of Hempstead public water supply wells are also unlikely to draw water from the groundwater impacted by the site.

The completed private well survey (see Section 2.0 of the PS&S Final RI Report) identified six possible private wells located downgradient of the former MGP site. In addition, based on NYSDEC records, private well permit applications were identified for 11 other wells associated with commercial/industrial properties (total of 17 possible wells). Most of these properties are located along Fulton Street near the downgradient end of the groundwater plume. It is noted that none of the 17 wells are used for drinking water based on DEC records, property inspections, and property owner information.

Two wells were identified as being actively used for irrigation purposes (one private residence, one golf course). Sample results were obtained from the owner of one of these wells, and samples were collected from the sprinkler head of the other well after letting it run for approximately 10 minutes. A third well was identified as being active and used for air conditioning, but the owner would not allow access for sampling. This property is located near the downgradient end of the plume (approximately 3,800 feet south of the site), and approximately 400 to 500 feet away from the side edge of the groundwater plume. None of the remaining wells that were identified were found to be active, and they were either abandoned, or unable to be located upon inspection.

Well water samples collected by KeySpan were analyzed for VOCs, SVOCs, total cyanide and free cyanide. Table 2-10 of the PS&SPC Final RI Report summarizes the private groundwater well sampling activities. The analytical results are presented and discussed in Section 2.4.6 of the PS&SPC Final RI Report.

2.5 Identification of Exposure Pathways

Table 2-2 provides qualitative descriptions of the potentially complete exposure pathways for potential current and future on-site and off-site human populations. No potential complete exposure pathways have been identified that pose a significant and imminent threat (as defined by 6NYCRR Part 375) to human health such that an interim remedial measure is required to protect human health. Under current site use conditions, the on-site trespasser has the potential for exposure to surface soil via the ingestion (oral), dermal, and inhalation (of particulates) exposure pathways. Inhalation exposure to volatile chemical constituents in ambient air also is possible for these individuals.

On-site KeySpan workers have the potential for exposure to chemicals in surface soil and subsurface soil via the ingestion, dermal, and inhalation exposure pathways. Additionally, exposure to volatile chemical constituents in ambient air is possible for this population. Adult commercial workers and adult and child visitors to the leased and previously owned properties located to the south and east of the active utility property have the potential for exposure to surface soil via ingestion and dermal contact, and ambient air through both inhalation of soil particulates and vapors.

Under future site use conditions, on-site construction workers have the potential for exposure to surface and subsurface soil through ingestion and dermal contact, and to ambient air via inhalation. Exposure to ambient air includes both the inhalation of volatiles resulting from construction activities (i.e., trenching, excavation, installing deep piles, etc.) and soil particulate inhalation.

Given the potential for commercial redevelopment at the site, on-site commercial workers and adult and child site visitors to these commercial establishments also are considered. Relevant potential exposure for commercial workers and visitors includes inhalation of vapors in indoor air. Future on-site adult and child residents have the potential for exposure to surface and subsurface soil through ingestion and dermal contact, to particulates and vapors in ambient air, and to vapors in indoor air.

Current off-site human populations, including commercial workers and adult and child visitors to commercial establishments have the potential for exposure to site-related COPCs via ingestion of and dermal contact with surface soil, inhalation of particulates and inhalation of vapors in ambient air. Potential exposure to volatile chemical constituents in indoor air also is possible for these populations. Additionally, off-site adult and child residents have the potential for exposure to surface and subsurface soil via ingestion and dermal contact, to vapors in indoor air; and to vapors and particulates in ambient air. Because the residences obtain there water from either the Village of Hempstead or Village of Garden City public water supply system, and the site is not considered to be within the capture zone of the two nearest public water supply well fields, this pathway is not considered complete for current or future off-site residents. Adults and children using the park adjacent to the site have the potential for exposure to site-related COPCs in surface soil via ingestion and dermal contact and in ambient air (both through potential inhalation of vapors and inhalation of particulates).

Under future off-site conditions, construction workers and utility workers have the potential for exposure to surface and subsurface soil through ingestion and dermal contact, and to ambient air via inhalation. Exposure to ambient air considers both the inhalation of volatiles resulting from construction activities (i.e., trenching, excavation, installing deep piles, etc.) and soil particulate inhalation.

2.6 Conclusions

There are several distinct human populations, both on site and in the vicinity of the site, who have the potential for exposures to site-related COPCs. These on-site populations include: trespassers, KeySpan workers, commercial workers, and visitors under current site use conditions. Under future site use conditions, potential receptors include construction workers, commercial workers, and adult and child visitors to the commercial establishments; and adult and child residents. Relevant current off-site receptor populations include commercial workers and adult and child visitors to commercial establishments, adult and child residents; and adults and children using the park adjacent to the site. Under future off-site use conditions, relevant human populations include construction workers and nearby off-site utility workers. A summary of the potential exposure pathways, by population and medium, is presented in Table 2-2.

The Final RI Report and qualitative human exposure assessment have indicated that there are pathways through which people on site and in the vicinity of the site could be exposed to potentially hazardous materials related to former MGP activities. However, there are no significant or imminent threats to human health that warrant an interim remedial action. Based upon the findings of the RI, remedial actions, where warranted, will be addressed during the next phase of this program, the development of a Remedial Action Plan.

3. Fish and Wildlife Resources Impact Analysis

Following the Appendix 1C Decision Key in the NYSDEC's FWRIA guidance, a FWRIA was required (Table 3-1). Therefore, the following analysis identifies actual or potential risks of impact to wildlife residing on and near the Hempstead Intersection site from chemicals potentially migrating from the former MGP. The analysis focuses on risks associated with site-related chemicals detected in soil and groundwater. This analysis contains:

- Site descriptions and a characterization of plant and animal resources and their value to humans
- The identification of regulatory standards and criteria for wildlife
- Evaluations of potential exposure pathways to wildlife from site-related chemicals of potential ecological concern to regulatory criteria or derived toxicological benchmarks for the protection of wildlife
- Conclusions regarding the potential of exposure and possible risks to wildlife on or near the site

3.1 Fish and Wildlife Resources

3.1.1 Terrestrial Resources

The U.S. Fish and Wildlife Service (USFWS) and the NYSDEC Natural Heritage Program were contacted regarding species of concern, significant habitats, and fishery resources within 0.5 miles of the site. In addition, the New York State Freshwater Wetland Maps were used to identify state wetlands within two miles of the site. The USFWS National Wetland Inventory (NWI) Maps also were obtained.

In addition, a field reconnaissance survey of the site and surrounding 0.5-mile radius was conducted on July 24, 2000. The objectives of the survey were to:

- Map and describe plant communities and aquatic resources on and adjacent to the site
- Observe wildlife species

- Identify significant ecological resources
- Observe evidence of stress to plants and animals, if any, from site-related chemicals

Three distinct terrestrial plant cover types were identified during the field reconnaissance within a 0.5-mile radius of the site. The boundaries between these cover types are depicted in Attachment 1-1D. Plant species identified by cover type within the site are presented in Table 3-2. Field surveys were not conducted outside the 0.5-mile study area. Ecological resources within the 0.5-mile radius were identified from agency contacts, the U.S. Geological Survey topographic maps, and state and federal wetland maps. Each plant cover type is described below as to plant species composition, vegetation structure and land use. These areas were classified according to the New York State Natural Heritage Program's *Ecological Communities of New York State* (Reschke, 1990).

3.1.1.1 Cover Type 1: Industrial/Commercial Areas

Several areas near the Hempstead Intersection site are classified as industrial/commercial. Most of these areas are covered with gravel, concrete, asphalt, a gravel and dirt mixture, or geotextile fabric and fill and gravel. These areas are essentially devoid of vegetation, with the exception of a few small patches of grass and weeds due to constant disturbances from on-site equipment and paving. Therefore, there is little area for free growth of vegetation or development of wildlife habitats.

3.1.1.2 Cover Type 2: Successional Northern Hardwood Forest

This cover type is a small wooded area located west of the site in the park. It is associated with a recharge basin. It is dominated by black walnut (*Juglans nigra*), red oak (*Quercus rubra)*, buckthorn (*Rhamnus cathartica*), and goldenrods (*Solidago* sp). Runoff from the site and park area enters this basin. A wash out was observed on the bank. Also, an outfall overflow pipe from the water treatment facility's metals treatment building was observed in this basin. Tires, cans, bottles, and other litter were strewn about this cover type.

3.1.1.3 Cover Type 3: Park Land

Adjacent to the western boundary of the site is a community park. This park is a mowed playground with planted ornamental trees (Chinese elm [*Solanum nigrum*], white pine [*Pinus strobes*], and sugar maple [*Acer saccharum*]). Along the fence line, it is not mowed and a scrub/shrub community was identified there. The fence line was dominated by honey locust (*Gleditsia triacanthos*), choke cherry (*Prunus virginiana*), red mulberry (*Morus rubra*), sugar maple, green briar (*Smilax rotundifolia)*, and mugwort (*Artemisia vulgaris*). Clinker material was observed in the park under trees and in the playground area.

3.1.2 Aquatic Resources

There are no aquatic resources within 0.5 miles of the site. Drainage occurs primarily through sheet flow runoff, which is conveyed to sewers and eventually discharges into local tidal water bodies. Precipitation that does not enter the storm sewer system generally collects in large puddles in local low areas and eventually infiltrates or evaporates.

3.1.3 Freshwater Wetlands

Wetlands have been identified on the U.S. Fish and Wildlife NWI Maps (Lynbrook and Freeport, NY quadrangle) and NYSDEC Tidal and Freshwater Wetland Maps (Attachment 1-1C). Some of the wetlands are downgradient from the site. However, there are no known direct migration pathways from the site into the wetlands. Also, due to distance involved and fate and transport mechanisms, no significant effects on wetlands are expected.

3.1.4 Fish and Wildlife Resources

Federally listed endangered, threatened or species of concern are not known to occur within 2 miles of the site (Clough 2001). Several state-listed endangered, threatened, or special concern species were identified as occurring within 2 miles of the site (Ketcham 2002; Attachment 1-1C) and are summarized in Table 3-3. In addition, the NYSDEC has identified one significant habitat, as presented in Table 3-3.

Wildlife uses in the area were evaluated using literature sources and field observations. Wildlife sightings included direct observations and identifications based on vocalizations, tracks, browse and scat, and general wildlife values (e.g., food and cover availability) noted.

The surrounding 0.5-mile radius consists of residential homes and industrial/commercial properties. These areas typically consist of mowed lawns interspersed with trees and shrubs, which often times are introduced exotics used for ornamental purposes. These areas do not support an abundance of wildlife because of the lack of vegetation, which could provide food and cover, and constant human activity. The parkland and successional woodlot, identified during the field reconnaissance do provide habitat for wildlife. However, the small size limits the size of the population these areas can support. Tables 3-4 through 3-6 list the herptile (amphibian and reptile), bird, and mammal species that may potentially occur within and adjacent to the site based on the land uses identified during the field reconnaissance. The species observed during the field reconnaissance (which are representative for the point in time of the field reconnaissance) also are identified in the tables.

3.1.5 Observation of Stress

No signs of stress to vegetation and wildlife at or around the site were noted during the field reconnaissance.

3.1.6 Value of Habitat to Associated Fauna

The residential, commercial, and industrial properties are of little value to wildlife. The area is developed and only isolated pockets of vegetation exist, and in most cases, these areas are maintained by frequent mowing. The wildlife expected to occur in the vicinity of the site includes more urbanized bird and mammalian species such as mockingbird (*Mimus polyglottos*), gray squirrel (*Sciurus carolinensis*), and Norway rat (*Rattus norvegicus*).

The successional northern hardwood woodlot is dominated by red oak and black walnut. Because acorns are a preferred food item and are abundantly available, oak trees are of major importance to wildlife (Martin et al. 1951). They are a staple in the diets of blue jays (*Cyanocitta cristata*), raccoon (*Procyon lotor*), and gray squirrel (*Sciurus carolinensis*). Due to the limited size of these fields, larger mammalian and bird of prey species are not likely to occur.

3.1.7 Value of Resources to Humans

The site and surrounding area are of little value to humans for recreational use of wildlife. Bird feeders may be in residential yards. The developed nature of the area precludes small game and deer hunting.

3.2 Exposure Pathways Analysis

3.2.1 Chemicals of Potential Ecological Concern

A number of substances were detected in surface soil, shallow subsurface soil and groundwater. To focus the FWRIA on those chemicals that may pose risks to the environment, chemicals of potential ecological concern (COPECs) were selected.

For this assessment, the chemicals detected in groundwater are not considered COPECs for ecological receptors except indirectly as a potential source of chemicals to surface water or sediment downgradient of the site. The depth to groundwater is greater than 4 feet below ground surface (bgs), which is below the root zone of most plants. Therefore, no complete exposure pathways exist, and the chemicals detected in groundwater are not discussed.

3.2.1.1 On-Site Soil

Surface and subsurface soil (borings and test pits) samples were collected from the Hempstead Intersection site and analyzed for BTEX, PAHs, Resource Conservation and Recovery Act (RCRA) metals, and total cyanide. Only shallow subsurface soils (up to 4 feet bgs) were considered in this FWRIA. A total of 20 samples (11 surface soil and nine subsurface soil) were analyzed in this depth interval. Data for deeper subsurface soils were not evaluated due to the lack of exposure pathways to wildlife. Most burrowing animals create dens in the upper 4 feet of soil. In addition, the deeper subsurface soil samples (i.e., greater than 4 feet) are below the root zone of most plants. Essential nutrients (calcium, iron, potassium, sodium and magnesium) are not considered COPECs.

3.2.1.2 Off-Site Soil

Surface and subsurface soil samples were collected off site in the park and analyzed for BTEX, PAHs, RCRA metals and total cyanide. Only shallow subsurface soil data (up to 4 feet bgs) were considered in this FWRIA. A total of 15 samples (five surface soil and 10 subsurface soil) were analyzed in this depth interval. Data for deeper subsurface soils were not evaluated due to lack of exposure pathways to wildlife. Most burrowing animals create dens in the upper 4 feet of soil. In addition, the deeper subsurface soil samples (i.e., greater than 4 feet) are below the root zone of most plants. Essential nutrients (calcium, iron, potassium, sodium and magnesium) are not considered COPECs.

3.2.2 Exposure Pathways

Wildlife resources in the industrial/commercial/residential area surrounding the site are limited due to the general lack of quality food and appropriate cover. In addition, constant human disturbance limits the population to wildlife species more tolerant of human activity. No federally or state-listed species were identified as occurring on the site (Clough, 2001; Ketcham, 2002). Several wetlands were identified in the two-mile radius study area. These wetlands are currently too distant and/or upgradient of the site for any likely exposure to site-related chemicals. Also, some of the COPECs are metals and PAHs. The fate and transport mechanisms of these chemicals reduce the likelihood of future migration into these wetland areas. Thus, exposure is likely to be limited to wildlife on, near, or immediately downgradient from the site.

Plant roots are not discriminating in the uptake of small organic molecules (molecular weight less than 500) except on the basis of polarity. The more water-soluble molecules pass through the root epidermis and translocate throughout the plant and are eventually volatilized from the leaves (Efroymson et al. 1997a). Plants selectively uptake metals in soil by absorption from soil solution by the root. Metals may be bound to exterior exchange sites on the root and not actually taken up. They may enter the root passively in organic or inorganic complexes or actively by way of metabolically controlled membrane transport (Kabata-Pendias and Pendias 1992). Once in the plant, a metal can be stored in the root or translocated to other plant parts. Potential exposure to wildlife could occur through direct contact with or accidental ingestion of contaminated soil or through the terrestrial food chain.

3.3 Criteria-Specific Toxicity Assessment

3.3.1 Soil

The NYSDEC does not have soil cleanup criteria relating to the protection of wildlife and the availability of applicable soil screening values in scientific literature is limited. The screening of soil COPECs was conducted by comparing the chemical concentrations to available screening benchmark values derived by the Oak Ridge National Laboratory (Efroymson et al. 1997a, 1997b and Sample et al. 1996) for the U.S. Department of Energy (USDOE). The benchmark values are the 10^{th} percentile of the distribution of various toxic effects threshold for the chemicals in soil for the group of organisms.

Transformation or loss due to environmental degradation is not considered in this assessment. It is assumed that following uptake, concentration in soil will equal concentrations in organisms. This assumption overestimates potential risk in that wildlife has limited contact with these chemicals in soil and plants.

Benchmark values for three groups of organisms, where available or derived, are presented in Table 3-7. Terrestrial plants were selected since they are critical in nutrient cycling and are a source of food in the diets of higher animals. Also, plants readily take up the COPECs. Earthworms were selected because of their importance in maintaining soil fertility through burrowing and feeding activities. Also, earthworms are at the base of the food chain and are an important food for higher organisms. Meadow voles were selected to represent an herbivorous small mammal. The benchmark values for meadow vole is presented as dietary concentrations in mg of chemical per kg of diet that would result in no observed adverse effect levels (NOAELs). For screening purposes, it was assumed that the chemical concentration in soil would be found in the food items of each species. As stated previously, this is a conservative approach that should result in the overestimation of potential exposure and risk.

As indicated in Table 3-7, screening values are available for a few of the chemicals of ecological concern. Therefore, the methodology of the Oak Ridge National Laboratory (Sample et al. 1996) was used to derive toxicological benchmarks for the meadow vole from published toxicological data for laboratory animals. Literature sources included IRIS (EPA 2005), HEAST (EPA 1997), and the National Toxicology Program. It should be emphasized that the resulting benchmarks obtained from this methodology and toxicological data are based on a conservative approach whose resulting relationship to potential population effects is uncertain.

NOAELs and lowest observed adverse effect levels (LOAELs) are daily dose levels normalized to the weight of the test animal [e.g., milligrams of chemical per kilogram body weight per day (mg/kg/day)]. The presentation of toxicity data on a mg/kg/day basis allows for comparison across species with appropriate consideration for differences in body sizes. If a NOAEL (or LOAEL) for a mammalian test species ($NOAEL_t$) is available, then the equivalent NOAEL (or LOAEL) for a mammalian wildlife species ($NOAEL_w$) can be calculated by using an adjustment factor for the difference in body size:

$$NOAEL_w = NOAEL_t \times \left({bw_t}/{bw_w} \right)^{1/4}$$

where:

$NOAEL_w$ = No observed adverse effect level for wildlife species (mg/kg/day)
$NOAEL_t$ = No observed adverse effect level for test species (mg/kg/day)
bw_w = Body weight for wildlife species (kg)
bw_t = Body weight for test species (kg)

In some cases, a NOAEL for a specific chemical was not available, but a LOAEL or lethal dose (LD_{50}) had been determined experimentally. The NOAEL can be estimated by applying an uncertainty factor (UF) to the LOAEL or LD_{50}. In the USEPA methodology (USEPA, 1989), the LOAEL or LD_{50} can be reduced by a factor of 10 or 50, respectively, to derive the NOAEL.

The dietary level or concentration in food (C_f) of a chemical in milligrams of chemical per kilogram of food that would result in a dose equivalent to the NOAEL can be calculated from the food factor (*f*):

$$C_f = \frac{NOAEL_w}{f}$$

The food factor, (*f*) is the amount of food consumed per day per unit of body weight. Table 3-8 provides the body weight, food intake and food factors used in the derivation of chemical-specific NOAELS for the meadow vole. Table 3-9 provides the derived toxicological benchmarks for the meadow vole. When literature values were not available for a chemical, a structurally similar surrogate was used. These surrogates are identified in Table 3-9.

3.3.1.1 On-Site Soil Comparison

Screening the maximum concentrations of the on-site soil COPECs against the literature and derived benchmark values indicated the following:

Several chemicals exceeded their respective benchmark values and may pose a risk of impact to environmental receptors. They include toluene, xylene, 2-methylnaphthalene, benzo(a)anthracene, benzo(a)pyrene, chrysene, dibenzofuran, naphthalene, phenanthrene, pyrene, arsenic, lead, mercury, and selenium.

Several chemicals did not exceed their respective benchmark values and do not pose a risk of impact to environmental receptors. These include benzene, ethylbenzene, acenaphthene, acenaphthylene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, barium, cadmium, chromium, total cyanide, and silver.

3.3.1.2 Off-Site Soil Comparison

Screening the maximum concentrations of the Park land soil COPECs against the literature and derived benchmark values indicated the following:

- Several chemicals exceeded their respective benchmark values and may pose a risk of impact to environmental receptors. They include benzo(a)anthracene, benzo(a)pyrene, chrysene, arsenic, lead, mercury, and selenium.

- Several chemicals did not exceed their respective benchmark values and do not pose a risk of impact to environmental receptors. These include benzene, ethylbenzene, toluene, xylene, 2-methylnaphthalene, acenaphthene, acenaphthylene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, dibenzofuran, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene, fluoranthene, fluorene, barium, cadmium, chromium, total cyanide, and silver.

3.4 Conclusions

3.4.1 Habitat Characterization

The site and surrounding area are poor quality environmental resources, due to the limited presence of vegetation. The site is mostly covered with buildings and asphalt. Wildlife species typically present are adapted to an urban setting. Due to the size of the vegetated areas, only a few individuals will be present. The New York Harbor and several wetland areas are located within 2 miles of the site. Potential migration of COPECs into these resources should be prevented.

3.4.2 Soil

Several COPECs were detected at concentrations greater than the toxicological benchmark values. This suggests that these chemicals may pose a risk of impact to wildlife. However, these potential effects have minimal ecological significance. In addition, toxicological benchmarks were not derived for several COPECs.

The potential risk from COPECs is minimal, for several reasons. Exposure frequency, chemical concentration (especially within the upper 6 inches), mechanism of exposure, and duration of exposure determines risk. The industrial/commercial areas (i.e., paved areas, buildings, etc.) provide minimal habitat in the form of "weedy" patches that would not support a wildlife population. These areas experience constant physical disturbance that prevents populations of wildlife from developing. Because only transient species and a few individual animals would use this area, the frequency and duration of exposure is limited. Thus, the observed chemicals detected on-site do not pose a current risk, nor is any expected in the future.

In addition, contaminant availability for biological uptake and migration from soil is an essential factor in controlling the risk of impact that these chemicals pose to ecological receptors. Many PAHs become less available as they age within soil. Furthermore, the presence and nature of the organic material in the soil has a profound influence on the availability of PAHs. This reduced availability, which results from chemical complexation or entrapment in very fine pores, results in an overestimation of risk of impact (Stroo et al. 2000).

References

Burt, W.H. and R.P. Grossenheider. 1976. *Field Guide to the Mammals*. Houghton Mifflin Company. Boston, MA.

Clough, M.W., 2002, Personal Communication. United States Department of the Interior, Fish and Wildlife Service, Cortland, NY.

Conat, R. and J.T. Collins. 1975. *A Field Guide to Reptiles and Amphibians of Eastern and Central North America.* . Houghton Mifflin Company. Boston, MA.

Dvirka & Bartilucci (D&B), 2000, *Site-Specific Investigation Work Plan for Hempstead (Intersection Street) Former MGP Site*, June 2000.

DeGraaf, R.M. and D.D. Rudis, 1983, New England Wildlife: *Habitat, Natural History, and Distribution.* General Technical Report NE-108. Northeast Forest Experiment Station. Amherst, MA.

Efroymson, R.A., M.E. Will, and G.W. Suter III, 1997a, *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision.* ES/ER/TM-126/R2. Oak Ridge National Laboratory, Oak Ridge, TN.

Efroymson, R.A., M.E. Will, G.W. Suter III and A.C. Wooten, 1997b, Toxicological *Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision.* ES/ER/TM-126/R2. Oak Ridge National Laboratory, Oak Ridge, TN.

Eisler, R., 1987, *Polycyclic Aromatic Hydrocarbon Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review.* Biological Report 85(1.11) U.S. Fish and Wildlife Service, Laurel, MD.

H2M Group, 2006, *Village of Hempstead Water Supply Wells Capture Zone Analysis Report.* Report: KEYS 04-05. October 2006.

H2M Group, 2006, *Village of Garden City Water Supply Wells Capture Zone Analysis Report.* Report: KEYS 04-05. October 2006

Howard, P.H., 1990, *Handbook of Environmental Fate and Exposure Data for Organic Chemicals.* Lewis Publishers, Chelsea, MI.

Kabata-Pendias, A. and H. Pendias, 1992, *Trace Elements in Soils and Plants.* P.T. Kostecki, E.J. Calabrese, eds. Lewis Publishers, Inc. Chelsea, MI.

Ketcham, B., 2002, Personal Communication. New York State Department of Environmental Conservation, Division of Fish, Wildlife & Marine Resources. NYS Natural Heritage Program. Albany, NY.

McIntosh, A., 1992, Trace Metals in Freshwater Sediments: A Review of the Literature and an Assessment of Research Needs. In: Metal Ecotoxicology Concepts & Applications. Edited by M.C. Newman and A.W. McIntosh, Lewis Publishers, Inc. Chelsea, MI.

National Toxicology Program's Chemical Health and Safety Data WebSite: http://ntp-server.niehs.nih.gov/Main_Pages/Chem-HS.html.

New York State Department of Environmental Conservation (NYSDEC), 2000, New York Breeding Bird Atlas 2000 Project.

NYSDEC, 2001, New York State Code of Rules and Regulations, 6NYCRR Title 6, Chapter 100, Part 700-705 and Part 925.6.

NYSDEC, 2002, The New York State 2002 Draft Section 303(d) List of Impaired Waters Requiring a TMDL and Consolidated Assessment and Listing Methodology. http://www.dec.state.ny.us/website/dow/303dcalm.pdf.

NYSDEC, 2002. Draft DER-10 Technical Guidance for Site Investigation and Remediation.

Oak Ridge National Laboratory (ORNL), 1999, on-line toxicological profiles, http://risk.lsd.ornl.gov/tox/rap_toxp.htm.

Paulus, Sokolowski, and Sartor Engineering, PC (PS&SPC), Final Remedial Investigation Report. March 2006 amended November 2006.

Peterson, R.T., 1980, *A Field Guide to the Birds East of the Rockies.* Houghton Mifflin Company, Boston, MA.

Reschke, C., 1990, Ecological Communities of New York State, New York Natural Heritage Program, Latham, NY.

Sample, B.E., D.M. Opresko and G.W. Suter, 1996, Toxicological Benchmarks for Wildlife: 1996 Revision. ES/ER/TM-86/R3. Prepared for the U.S. Department of Energy, Office of Environmental Management, Oak Ridge National Laboratory, Oak Ridge, TN.

Stroo, H.F., R. Jensen, R.C. Loehr, D.V. Nakles, A. Fairbrother, and C.B. Liban, 2000, *Environmentally Acceptable Endpoints for PAHs at a Manufactured Gas Plant Site.* Environmental Science & Technology 34: 3831-3836.

United States Environmental Protection Agency (EPA), 1989, Risk Assessment Guidance for Superfund, Human Health Evaluation Manual (Part A), Interim Final, Office of Emergency and Remedial Response, EPA/540/1-89/002.

United States Environmental Protection Agency (EPA), 1997, Health Assessment Effects Summary Tables. FY 1997 update. Washington, D.C.

United States Environmental Protection Agency (EPA), 2005, Integrated Risk Information System (IRIS) on-line database, http://www.epa.gov/iris/.

Tables

Table 2-1
Human Health Chemicals of Potential Concern

Medium	Chemicals of Potential Concern		
	Volatile Organic Chemicals	PAHs, Pesticides, and PCBs	Metals and Cyanide (total)
Surface Soil			
On-site (KeySpan property)[1]	nd	2-methylnapthalene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene	arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, cyanide (total) [2]
On-site (leased property)	na	2-methylnapthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene	arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, cyanide (total) [2]
On-site (sold property)	na	2-methylnapthalene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene	arsenic, barium, cadmium, chromium, lead, mercury, cyanide (total) [2]
Off-site (park)	benzene, toluene	2-methylnapthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene	arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, cyanide (total) [2]

Table 2-1
Human Health Chemicals of Potential Concern

Medium	Chemicals of Potential Concern		
	Volatile Organic Chemicals	SVOCs, Pesticides, and PCBs	Metals and Cyanide (total)
Surface Soil			
Off-site (east)	nd	2-methylnapthalene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)- fluoranthene, chrysene, dibenzo(a,h)-anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene	arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, cyanide (total) [2]
Off-site (south)	na	na	na
Subsurface Soil			
On-site (KeySpan property)	benzene, ethylbenzene, methylene chloride, toluene, xylenes (total)	2-methylnapthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene, endosulfan II, endrin ketone, aroclor 1260	aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, zinc, cyanide (total) [2]
On-site (leased property)	benzene, ethylbenzene, toluene, xylenes (total)	2-methylnapthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)- fluoranthene, chrysene, dibenzo(a,h)-anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene	arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, cyanide (total) [2]
On-site (sold property)	acetone, benzene, ethylbenzene, methyl ethyl ketone, toluene, xylenes (total)	2-methylnapthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, carbazole, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene, beta-BHC, 4,4'-DDD, 4.4'-DDT, dieldrin, endosulfan II, endrin ketone, gamma BHC,	aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, zinc, cyanide (total) [2]
Off-site (park)	benzene, ethylbenzene, toluene, xylenes (total)	2-methylnapthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)- fluoranthene, chrysene, dibenzo (a,h)-anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene	arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, cyanide (total) [2]

Table 2-1
Human Health Chemicals of Potential Concern

Subsurface Soil			
Off-site (east)	ethylbenzene, toluene, xylenes (total)	2-methylnapthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene	arsenic, barium, cadmium, chromium, lead, selenium, silver, cyanide (total) [2]
Off-site (south)	ethylbenzene, toluene, xylenes (total)	2-methylnapthalene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene	arsenic, barium, cadmium, chromium, lead, selenium, silver, cyanide (total) [2]

Table 2-1
Human Health Chemicals of Potential Concern

Medium	Chemicals of Potential Concern		
	Volatile Organic Chemicals	PAHs, Pesticides, and PCBs	Metals and Cyanide (total)
Ambient Air[3]			
On-site (KeySpan property)	benzene, ethylbenzene, toluene, xylenes (total)	--	--
On-site (leased property)	na	--	--
On-site (sold property)	benzene, ethylbenzene, toluene, xylenes (total)	--	--
Off-site (park)	benzene, ethylbenzene, toluene, xylenes (total)	--	--
Off-site (east)	benzene, ethylbenzene, toluene, xylenes (total)	--	--
Off-site (south)	1,4-dioxane, acetone, benzene, 1,2,4-trimethylbenzene, cyclohexane, ethanol, ethylbenzene, m/p-xylene, methyl chloride, methyl ethyl ketone, methylene chloride, methyl tert-butyl ether, o-xylene, propylene, styrene, tetrachloroethene, toluene	--	--
Indoor Air			
Off-site (230 Hilton Avenue)[3]	1,1,1-trichloroethane, acetone, benzene, cryofluorane, cyclohexane, dichlorodifluoromethane, EDB, ethanol, isopropanol, m/p-xylene, methyl chloride, methyl ethyl ketone, methylene chloride, methyl tert-butyl ether, o-xylene, toluene	--	--

Note: Depth to groundwater at the site is approximately 30 feet below ground surface, consequently, direct contact with groundwater is highly unlikely and COPCs for groundwater were not selected. Additionally, groundwater is not expected to contribute to potential vapor concentrations in indoor air.

[1] For purposes of this assessment, the KeySpan property refers to the property currently owned by and used for KeySpan operations, the leased property to the east of the KeySpan, and the previously owned parcel to the south of the KeySpan property.

[2] Analysis for RCRA metals and total cyanide. Analysis did not include Target Analyte List (TAL) metals.

[3] COPCs selected based on parameters detected in soil vapor and/or ambient air samples.

na = laboratory analysis did not include these parameters; nd = not detected; -- = not applicable

Table 2-2
Exposure Matrix for the Hempstead/Intersection Street Former Manufactured Gas Plant Site

	Media	Outdoor Air		Indoor Air	Surface Soil		Subsurface Soil		Groundwater	
	Potential Exposure	Vapor Inhalation	Particulate Inhalation	Accumulated Vapor Inhalation	Dermal Contact	Ingestion	Dermal Contact	Ingestion	Dermal Contact	Ingestion
Scenario	**Population**									
On-Site	Adult commercial worker	√	√	∅	√	√	∅	∅	∅	∅
	Adult and child visitors	√	√	∅	√	√	∅	∅	∅	∅
	Adult construction worker[1]	√	√	∅	√	√	√	√	∅	∅
	Adult KeySpan worker [2]	√	√	∅	√	√	√	√	∅	∅
	Adolescent trespasser	√	√	∅	√	√	∅	∅	∅	∅
	Adult commercial worker [1]	∅	∅	√	∅	∅	∅	∅	∅	∅
	Adult and child visitors[1]	∅	∅	√	∅	∅	∅	∅	∅	∅
	Adult and child residents[1]	√	√	√	√	√	√	√	∅	∅
Off-Site	Adult and child visitors [3]	√	√	√	√	√	∅	∅	∅	∅
	Adult commercial workers [4]	√	√	√	√	√	∅	∅	∅	∅
	Adult and child recreationalists	√	√	∅	√	√	∅	∅	∅	∅
	Adult and child residents	√	√	√	√	√	√	√	∅	∅
	Adult construction worker[1]	√	√	∅	√	√	√	√	∅	∅
	Adult nearby utility worker[1]	√	√	∅	√	√	√	√	∅	∅

∅ Incomplete Pathway / Route
√ Potentially Complete Pathway / Route

[1] Future exposure scenario. All other scenarios listed are current exposure scenarios that may also be applicable under future land use conditions.
[2] KeySpan maintains a policy that only trained workers are used for excavation work at active facilities, *i.e.,* a "no dig" policy is in effect at the site.
[3] Includes visitors to car lots as well as commercial businesses in the vicinity of the site.
[4] Includes employees of car dealerships and commercial establishments (*e.g.,* body shops) in the vicinity of the site.

Table 3-1
Fish and Wildlife Resources Impact Analysis Decision Key

	Yes	No
1. Is the site or area of concern a discharge or spill event?		√
2. Is the site or area of concern a point source of contamination to the groundwater which will be prevented from discharging to surface water? Soil contamination is not widespread, or if widespread, is confined under buildings and paved areas?		√
3. Is the site and all adjacent property a developed area with buildings, paved surfaces and little or no vegetation?		√
4. Does the site contain habitat of an endangered, threatened, or special concern species?		√
5. Has the contamination gone off-site?	√	
6. Is there any discharge or erosion of contamination or the potential for discharge or erosion of contamination?	√	
7. Are the site contaminants PCBs, pesticides, or other persistent, bioaccumulable substances?		√
8. Does contamination exist at concentrations that could exceed SCGs or be toxic to aquatic life if discharged to surface water?	√	
9. Does the site or any adjacent or downgradient property contain any of the following resources?		
a. any endangered, threatened, or special concern species or rare plants or their habitats		
b. Any NYSDEC designated significant habitats or rare NYS ecological communities	√	
c. Tidal or freshwater wetlands		
d. Streams, creeks, or river	√	
e. Pond, lake or lagoon		
f. Drainage ditch or channel	√	
g. Other surface water features		√
h. Other marine or freshwater habitats		√
i. Forest		√
j. Grassland or grassy field		√
k. Parkland or woodland		√
l. Shrubby area		√
m. Urban wildlife habitat	√	
n. Other terrestrial habitat	√	
	√	
	√	
		√
10. Is the lack of resources due to contamination		√
11. Is the contamination a localized source which has not migrated from the source to impact any on-site or off-site resources?		√
12. Does the site have widespread soil contamination that is not confined under and around buildings or paved areas?		√
13. Does the contamination at the site or area of concern have the potential to migrate to, erode into or otherwise impact any on-site or off-site habitat of endangered, threatened or special concern species or other fish and wildlife resources?	√	
14. Fish and wildlife resources impact analysis needed?	√	

Table 3-2
Plant Species Identified During Field Reconnaissance

Common Name	Scientific Name	Common Name	Scientific Name
Cottonwood	*Populus deltoides*	Black Walnut	*Juglans nigra*
Sugar maple	*Acer saccharum*	Common Buckthorn	*Rhamnus cathartica*
Japanese honeysuckle	*Lonicera japinica*	Small white aster	*Aster vimineus*
Honey locust	*Gleditsia triacanthos*	Yellow wood sorrel	*Oxalis europaea*
Choke cherry	*Prunus virginiana*	Butter-n-eggs	*Linaria vulgaris*
Multi-flora rose	*Rosa multiflora*	Hop clover	*Trifolium agrarium*
Red oak	*Quercus rubra*	St John's Wort	*Hypericum perforatum*
Virginia creeper	*Parthenocissus quinquefolia*	Bitter nightshade	*Solanum dulcamara*
Green briar	*Smilax rotundifolia*	Common plantain	*Plantago major*
Dandelion	*Taraxacum officinale*	Goldenrod	*Solidago sp.*
English Plantain	*Plantago lanceolata*	Ragweed	*Ambrosia artemisiifolia*
Crab grass	*Digitaria sanguinalis*	White clover	*Trifolium repens*
Queen Anne's lace	*Daucus carota*	Heal-all	*Prunella vulgaris*
Silvery cinquefoil	*Potentilla argentea*	White-sweet clover	*Melilotus alba*
Evening primrose	*Oenothera biennis*	Pokeweed	*Phytolacca americana*
Kentucky bluegrass	*Poa pratensis*	Smartweed	*Polygonum persicaria*
Chickweed	*Stekkaria media*	Mugwort	*Artemisia vulgaris*
Red maple	*Acer rubrum*	Hop horn beam	*Ostrya virginiania*
Poison ivy	*Rhus radicans*	Chinese elm	*Solanum nigrum*
Nutsedge	*Cyperus esculentus*	Norway spruce	*Picea abies*
Mulberry	*Morus rubra*	Black cherry	*Prunus serotina*
White pine	*Pinus strobus*	White ash	*Fraxinus americana*
American Yew	*Taxus canadensis*	Red pine	*Pinus resinosa*
Black raspberry	*Tubus occidentalis*	Summer grape	*Vitis aestivalis*

Table 3-3
Endangered and Threatened Species in the Vicinity of the Hempstead/Intersection Street Site

Common Name	Scientific Name	NYS Legal Status	Last Seen	Location	Distance From Site
Fringed boneset	*Eupatorium hyssopifolium* var *laciniatum*	Threatened		Hempstead Lake	2 miles south
Slender crabgrass	*Digitaria filiformis*	Threatened	1922	Hempstead Lake	2 miles south
Soapwort gentian	*Gentiana saponaria*	Endangered	1923	Hempstead Lake, NE watertower	2 miles south
Swamp sunflower	*Threatened*	Threatened	1919	Hempstead Lake, E of pumping station	2 miles south
Slender crabgrass	*Digitaria filiformis*	Threatened	1903	East side of Hempstead Lake	2 miles south
Opelousa smartweed	*Polygonium hydropiperoides* var *opelousanum*	Threatened	2001	Hempstead Lake	2 miles south
Variable sedge	*Carex polymorpha*	Unprotected	1922	Hempstead Lake	2 miles south
Tiny blue-curls	*Trichostema setaceum*	Endangered	1906	Hempstead Lake	2 miles south
Green Milkweed	*Asclepias viridiflora*	Threatened	1986	Mercy Hospital Meadow	2 miles south
Soapwort gentian	*Gentiana saponaria*	Endangered	1925	Parsons Woods	2 miles south
Coastal Plain Pond Shore		Unprotected	2001	Hempstead Lake	2 miles south

Source: Ketcham, 2002

Table 3-4
Herptile Species That May Be Present Based on Cover Types

Common Name	Scientific Name	Habitat Requirements
Eastern spadefoot	*Scaphiopus holbrookii*	Sandy soils with temporary pools for breeding.
Northern spring peeper	*Hyla crucifer*	Second growth woodlots.
Gray treefrog	*Hyla veriscolor*	Forested regions with small trees, shrubs and bushes near or in shallow water. Will breed in roadside ditches.
Marbled salamander	*Ambystoma opacum*	Sandy and gravelly areas of mixed deciduous woodlands, especially oak-maple and oak-hickory.
Redback salamander	*Plethodon cinerus*	Entirely terrestrial. Mixed deciduous or coniferous woods, inhabiting interiors of decaying logs and stumps.
Eastern box turtle	*Terrapene carolina*	Typically found in well-drained forest bottomlands.
Northern brown snake	*Storeria dekayi*	Ubiquitous.
Northern ringneck snake	*Diadophis punctatus*	Secretive. Found hiding in stony woodland pastures, rocks, stone walls, junk piles, logs, debris, stumps and logs.
Northern black racer	*Coluber constrictor*	Moist or dry areas, forests and wooded areas, fields, roadsides, near old buildings.
Eastern worm snake	*Carpophis amoenus*	Dry to moist forests, often near streams, in the loose soil of gardens or weedy pastures. Sandy areas are favored.
Eastern garter snake	*Thamnophis srtalis*	Ubiquitous.
Eastern hognose snake	*Heterodon platyrhinos*	Where sandy soils predominate, such as beaches, open fields, dry open woods.
Eastern milk snake	*Lampropeltis triangulum*	Various habitats, usually with brushy or woody cover.

Source: DeGraaf and Rudis, 1983

Table 3-5

Bird Species That May Be Present Based on Cover Types

Common Name	Scientific Name	Habitat Requirements	N or M
Red-tailed hawk	*Buteo jamaicensis*	Mixed woodlands interspersed with meadows.	N
Killdeer	*Charadrius vociferus*	Fields, roadsides lawns.	N
Rock dove[a]	*Columbia livia*	Near human habitation.	N
Mourning dove[a]	*Zenaida macroura*	Suburbs, cities, open woodlands.	N
Chiney swift	*Chaetura pelagica*	Buildings, cities.	N
Ruby-throated hummingbird	*Archilochus colubris*	Shade trees in residential landscapes.	N
Downy woodpecker	*Picoides pubescens*	Shade trees in towns and suburbs.	N
Hairy woodpecker	*Picoides villosus*	Open coniferous, deciduous and mixed woodlots	N
Northern flicker	*Colaptes auratus*	Suburbs, woodland edges.	N
Eastern wood peewee	*Contopus virens*	Roadsides, parks. Closely associated with oaks.	N
Eastern phoebe	*Sayornis phoebe*	Suburban areas.	N
Purple martin	*Progne subis*	Suburban areas near water.	N
Blue jay	*Cyanocitta cristata*	Suburbs, cities, parks and gardens.	N
American crow	*Corvus brachyrhynchos*	Edges of woodlots, coastal areas.	N
Black-capped chickadee	*Parus atricapilus*	Residential areas, woodlands.	N
Tufted titmouse	*Parus bicolor*	Residential areas in shade trees.	N
White-breasted nuthatch	*Sitta carolinensis*	Shade trees in villages.	N
House wren	*Troglodytes aedon*	Near human dwellings.	N
American robin	*Turdus migratorius*	Shade trees in residential areas.	N
Gray catbird	*Dumetella carolinensis*	Shrubbery around buildings.	N
Mockingbird[a]	*Mimus polyglottos*	Fruit-bearing shrubs in cities and towns.	N
Cedar waxing	*Bombycilla cedrorum*	Shade trees in residential areas.	N
Common grackle	*Quiscalus quiscula*	Suburbs.	N
Northern oriole	*Icterus galbula*	Shade trees in residential areas.	N
Purple finch	*Carpodacus purpureus*	Residential areas.	N
House finch	*Carpodacus mexicanus*	Suburban and urban yards.	N
American goldfinch	*Cardeulis tristis*	Suburban gardens, shade trees.	N
Starling	*Sturnus vulgaris*	Cities, gardens, parks.	N
Northern cardinal[a]	*Cardinalis cardinalis*	Suburban gardens.	N
Scarlet tanager	*Piranga olivacea*	Roadside shade trees.	N
Rose-breasted grosbeak	*Pheucticus ludovicianus*	Shade trees in suburban areas.	N
House sparrow[a]	*Passer domesticus*	Cities, parks.	N
Chipping sparrow	*Spizella paserina*	Suburban residential areas.	N
Song sparrow	*Melospiza melodia*	Suburbs, cities.	N
Brown-headed cowbird	*Molothrus ater*	Open coniferous and deciduous woodlands.	N
Brown thrasher	*Toxostoma rufum*	Woodland edges. Often in cities.	N
Barn swallow	*Hirundo rustica*	Man-made structures for nesting.	N

Source: DeGraaf and Rudis, 1983; Peterson, 1980; NYSDEC, 2000.

[a]Species observed during field reconnaissance.

Table 3-6
Mammals That May Be Present Based on Cover Types

Common Name	Scientific Name	Habitat Requirements
Virginia opossum	*Didlphis virginiana*	Near human habitation.
Eastern moles	*Scalopus aquaticus*	Lawns, sandy soils.
Star-nosed moles	*Condylura cristata*	Prefers low wet ground.
Little brown myotis	*Myotis lucifugus*	Dark warm sites for maternity colonies.
Big brown bat	*Eptesicus fuscus*	Buildings, bridges, tunnels.
Eastern cottontail[a]	*Sylvilagus floridanus*	Suburban areas with adequate food and cover.
Eastern chipmunk	*Tamias striatus*	Tree or shrub cover with elevated perches.
Woodchuck	*Marmota monax*	Edges of woodlands, open cultivated land, meadows, open brushy hillsides.
Gray squirrel[a]	*Sciurus carolinensis*	Suburban parks, shade trees especially oaks.
Deer mouse	*Peromyscus maniculatus*	Near out-buildings in shrubs.
White-footed mouse	*Peromyscus leucopus*	Edges of woodlands.
Meadow vole	*Microtus pennsylvanicus*	Freshwater and salt water marshes.
Norway rat	*Rattus morevegicus*	Buildings, dumps, cities.
House mouse[a]	*Mus musculus*	Buildings.
Raccoon	*Procyon lotor*	Found in wetlands near human habitation.
Striped skunk	*Mephitis mephitis*	Suburban areas.

Source: DeGraaf and Rudis, 1983

[a]Species observed during field reconnaissance

Table 3-7
Comparison of Hempstead/Intersection Street Surface Soil Data to Toxicological Benchmark Values

Parameter	Toxicological Benchmark			On-Site Surface Soil *		Off-Site Surface Soil *	
	Earth Worms	Terrestrial Plants	Meadow Vole	Frequency of Detection	Range of Detected Concentrations	Frequency of Detection	Range of Detected Concentrations
Volatile Organic Compounds (mg/kg)							
Benzene			211	5/9	0.6-94	2/10	0.041-0.058
Ethylbenzene			**2003**	6/9	12-400	1/10	0.003-0.003
Toluene		200	208	7/9	0.001-320	2/10	0.006-0.021
Xylene (total)			2.5	6/9	35-530	2/10	0.004-0.008
Semivolatile Organic Compounds (mg/kg)							
2-Methylnaphthalene			**18**	15/20	0.069-2000	4/15	0.046-20
Acenaphthene		20	**1395**	9/20	0.12-640	2/15	0.049-0.067
Acenaphthylene			**1395**	18/20	0.1-290	13/15	0.083-10
Anthracene			**7971**	18/20	0.064-360	12/15	0.043-5
Benzo(a)anthracene			**8**	19/20	0.053-230	13/15	0.057-15
Benzo(a)pyrene			8	18/20	0.24-180	13/15	0.061-12
Benzo(b)fluoranthene			**996**	18/20	0.37-120	13/15	0.11-18
Benzo(g,h,i)perylene			**598**	17/20	0.11-67	13/15	0.074-5.7
Benzo(k)fluoranthene			**996**	17/20	0.16-56	12/15	0.071-8.6
Chrysene			**8**	19/20	0.061-220	13/15	0.072-18
Dibenzo(a,h)anthracene			**8**	9/20	0.15-4.2	7/15	0.06-2.3
Dibenzofuran			**8**	7/20	1.5-72	1/15	0.79-0.79
Fluoranthene			**996**	19/20	0.062-390	13/15	0.076-11
Fluorene			**996**	14/20	0.076-480	3/15	0.085-2.5
Indeno(1,2,3-cd)pyrene			**996**	17/20	0.099-49	12/15	0.11-5.7
Naphthalene			**1473**	14/20	0.09-2600	8/15	0.045-26
Phenanthrene			**20**	19/20	0.065-1500	14/15	0.051-8
Pyrene			**598**	19/20	0.13-940	15/15	0.04-28
Inorganic Compounds (mg/kg)							
Arsenic	60	10	1.008	19/20	1.6-74.3	15/15	0.54-43
Barium		500	79.6	20/20	11.7-68.2	15/15	13.4-65.5
Cadmium	20	4	14.255	20/20	0.2-4.8	15/15	0.32-1.5
Chromium	0.4	1	40449	20/20	1.9-21.8	15/15	4-19.9
Cyanide, total			945.2	17/20	0.31-41.3	8/15	0.22-2.7
Lead	500	50	118.23	20/20	2.1-737	15/15	4.5-297
Mercury	0.1	0.3	19.21	19/20	0.019-2.2	14/15	0.02-1
Selenium	70	1	2.956	13/20	0.63-8.3	13/15	0.83-5.6
Silver		2	**14.7**	12/20	0.66-3.5	14/15	0.48-3.3

Notes:
* Surface soil includes soils collected to a depth of 4 feet below ground surface
Bolded values are derived benchmarks. See Tables 3-8 and 3-9.

Table 3-8
Parameters for Calculation of Toxicological Benchmarks

Organism	Body Weight (kg)	Food Intake (kg/day)	Food Factor *(f)*
Mouse	0.03	0.0055	0.18
Rat	0.35	0.028	0.08
Meadow vole	0.044	0.005	0.114

Source: ORNL; Oak Ridge National Laboratory, Sample et al. 1996.

Table 3-9
Derivation of Toxicological Benchmarks for Meadow Vole

Chemical	Test Organism	Endpoint	NOAELt (mg/kg/day)	Reference for Test Species	NOAEL for Meadow Vole (mg/kg/day)	Toxicological Benchmark for Meadow Vole (mg/kg)
Ethylbenzene	Rat	NOAEL	136	IRIS	228.4	2003
2-Methylnaphthalene	Rat	LD50 (1630 mg/kg)	1.20	NTP	2.0	18
Acenaphthene	Mouse	NOAEL	175	IRIS	159.0	1395
Acenaphthylenea	Mouse	NOAEL	175	HEAST	159.0	1395
Anthracene	Mouse	NOAEL	1000	IRIS	908.7	7971
Benzo(a)anthracenec	Mouse	NOAEL	1	ORNL	0.9	8
Benzo(b)fluorantheneb	Mouse	NOAEL	125	IRIS	113.6	996
Benzo(g,h,i)perylened	Mouse	NOAEL	75	IRIS	68.2	598
Benzo(k)fluorantheneb	Mouse	NOAEL	125	IRIS	113.6	996
Chrysenec	Mouse	NOAEL	1	ORNL	0.9	8
Dibenzo(a,h)anthracenec	Mouse	NOAEL	1	ORNL	0.9	8
Dibenzofuranc	Mouse	NOAEL	1	ORNL	0.9	8
Fluoranthene	Mouse	NOAEL	125	IRIS	113.6	996
Fluorene	Mouse	NOAEL	125	IRIS	113.6	996
Indeno(1,2,3-cd)pyreneb	Mouse	NOAEL	125	IRIS	113.6	996
Naphthalene	Rat	NOAEL	100	IRIS	167.9	1473
Phenanthrene	Mouse	LD50 (700 mg/kg)	2.6	NTP	2.3	20
Pyrene	Mouse	NOAEL	75	IRIS	68.2	598
Silvere	Rat	NOAEL	1	ORNL	1.7	15

Sources:
IRIS: USEPA, 2000:
HEAST: USEPA, 1997.
NTP: National Toxicology Program's Chemical Health and Safety Data Website: http://ntp-server.niehs.nih.gov/Main_Pages/Chem-HS.html
ORNL; Oak Ridge National Laboratory, Sample et al. 1996.

a Value for acenaphthene used
b Value for fluoranthene used
c Value for benzo(a)pyrene used
d Value for pyrene used
e Value for cadmium used

To convert mg diet/kg body weight, divide the diet component by the food factor times the uncertainty factor

Attachments

Map Key

- Approximate Location of Former MGP Structures
- Current Site Boundary (2002)
- Formerly Owned Property
- Fence
- Approximate Groundwater Flow Direction

SOURCE:

ATTACHMENT 1A "CONCEPTUAL SITE MODEL - CURRENT SITE PLAN" DATED SEPTEMBER 2002, SCALE: 1"=110', COMPILED BY VANASSE HANGEN BRUSTLIN, INC.

0 110 220

SCALE, FEET

GEI Consultants, Inc.

ATTACHMENT 1-1A
CONCEPTUAL SITE MODEL - CURRENT SITE PLAN

KEYSPAN CORPORATION
HEMPSTEAD FORMER MGP SITE
HEMPSTEAD, NEW YORK

KEYSPAN\HEMPSTEAD\FIGS\HEMP-SPLAN.CDR

SOURCE:
ATTACHMENT 1B "CONCEPTUAL SITE MODEL - HISTORICAL AERIAL PHOTO" DATED SEPTEMBER 2002, APPROXIMATE SCALE: 1"=110', COMPILED BY VANASSE HANGEN BRUSTLIN, INC.

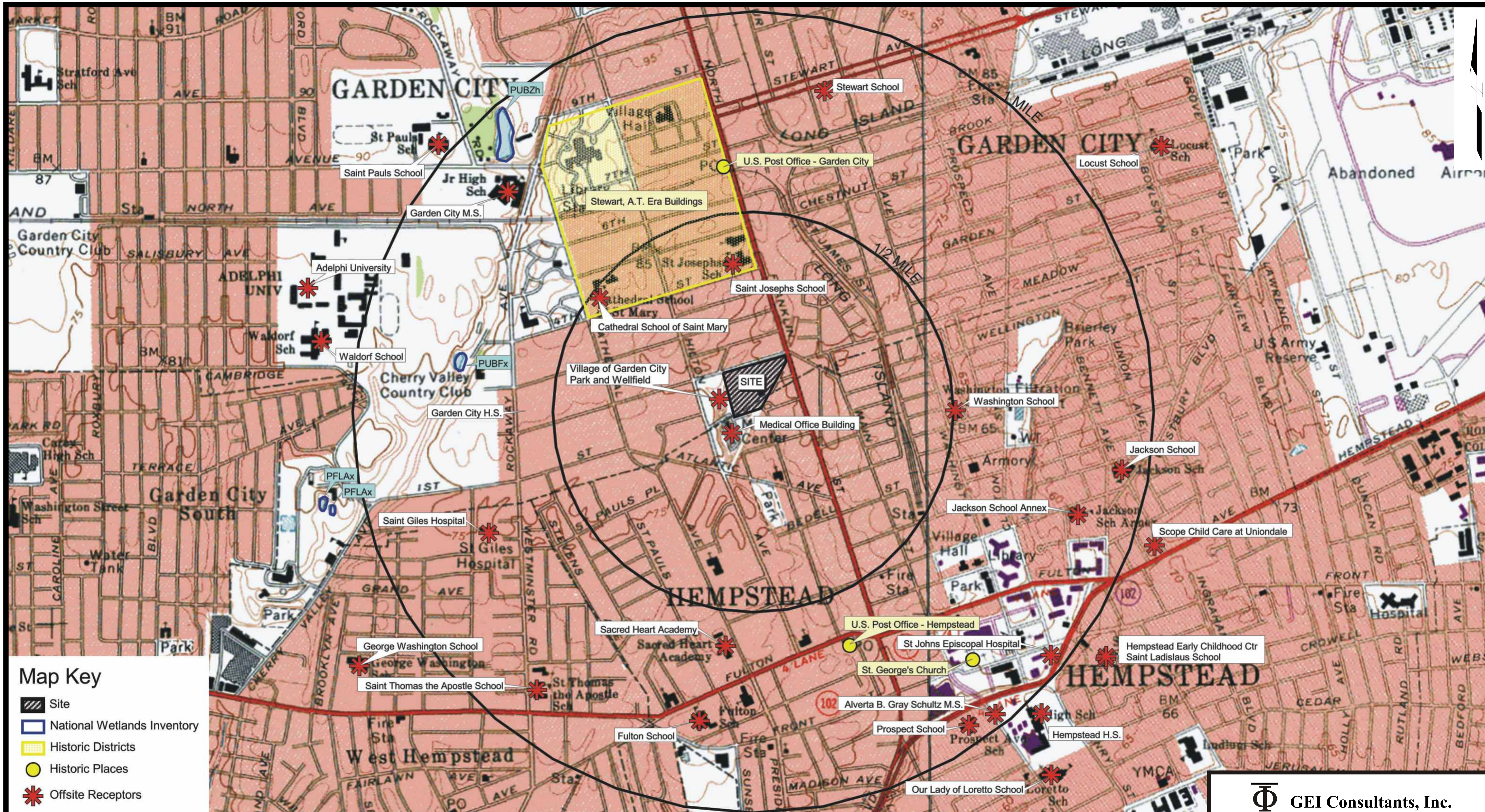
0 110 220
APPROXIMATE SCALE, FEET

Φ GEI Consultants, Inc.

ATTACHMENT 1-1B
CONCEPTUAL SITE MODEL - HISTORICAL AERIAL PHOTO

KEYSPAN CORPORATION
HEMPSTEAD FORMER MGP SITE
HEMPSTEAD, NEW YORK

KEYSPAN\HEMPSTEAD\FIGS\HEMP-SPLAN.CDR



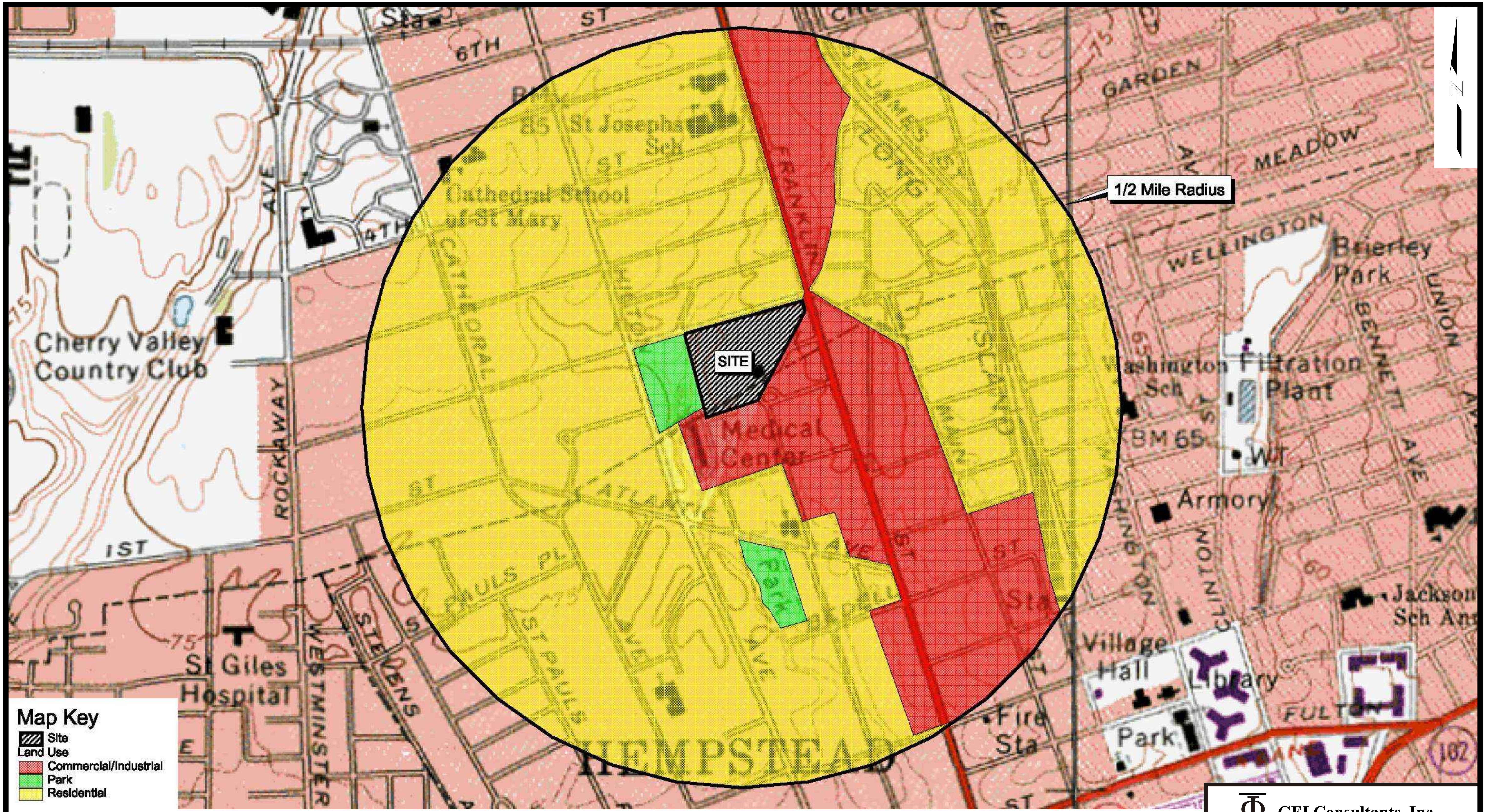
SOURCE:
ATTACHMENT 1C "CONCEPTUAL SITE MODEL - ENVIRONMENTAL ATTRIBUTES AND SENSITIVE RECEPTORS" DATED SEPTEMBER 2002, SCALE: 1"=1250', COMPILED BY VANASSE HANGEN BRUSTLIN, INC.

GEI Consultants, Inc.

ATTACHMENT 1-1C
CONCEPTUAL SITE MODEL - ENVIRONMENTAL ATTRIBUTES AND SENSITIVE RECEPTORS

KEYSPAN CORPORATION
HEMPSTEAD FORMER MGP SITE
HEMPSTEAD, NEW YORK

KEYSPAN\HEMPSTEAD\FIGS\HEMP-SPLAN.CDR



SOURCE:
ATTACHMENT 1D "CONCEPTUAL SITE MODEL - LAND COVER/LAND USE MAP" DATED SEPTEMBER 2002, SCALE: 1"=650', COMPILED BY VANASSE HANGEN BRUSTLIN, INC.

0 650 1300
SCALE, FEET

GEI Consultants, Inc.

ATTACHMENT 1-1D
CONCEPTUAL SITE MODEL - LAND COVER/LAND USE MAP

KEYSPAN CORPORATION
HEMPSTEAD FORMER MGP SITE
HEMPSTEAD, NEW YORK

KEYSPAN\HEMPSTEAD\FIGS\HEMP-SPLAN.CDR