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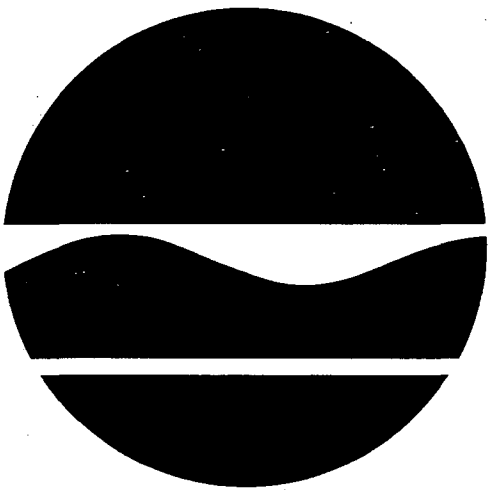
PROPOSED REMEDIAL ACTION PLAN
Quanta Resources Site
(a.k.a. Review Avenue Development II)
Long Island City, Queens, New York
Site No. 2-41-005

June 2006



Prepared by:

Division of Environmental Remediation
New York State Department of Environmental Conservation

PROPOSED REMEDIAL ACTION PLAN

Quanta Resources Site
Long Island City, Queens, New York
Site No. 2-41-005
May 2006

SECTION 1: SUMMARY AND PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (NYSDEC), in consultation with the New York State Department of Health (NYSDOH), is proposing a remedy for the Quanta Resources Site. The presence of hazardous waste has created significant threats to human health and/or the environment that are addressed by this proposed remedy. As more fully described in Sections 3 and 5 of this document, improper storage of waste oil and spillage of waste oil during oil recycling operations have resulted in the disposal of hazardous wastes, including volatile organic compounds, semivolatile organic compounds, and petroleum hydrocarbons. These wastes have contaminated the soil and groundwater at the site, and have resulted in:

- a significant threat to human health associated with potential exposure to gases in the soil vapor.
- a significant environmental threat associated with the impacts of contaminants to groundwater and soil from the hydrocarbon compounds in the light non-aqueous phase liquid (LNAPL) on the watertable.

To eliminate or mitigate these threats, the NYSDEC proposes the following remedy:

- A remedial design program to provide the details necessary to implement the remedial program.
- LNAPL recovery via a combination of single phase, vacuum-enhanced, and localized soil heating LNAPL recovery methods.
- Demolition and removal of buildings and tanks, and site regrading.
- Covering all vegetated areas with clean soil and all non-vegetated areas with either concrete or a paving system.
- Development of a site management plan to address residual contamination and any use restrictions.
- Imposition of an environmental easement.
- Periodic certification of the institutional and engineering controls.
- Long term monitoring.

The proposed remedy, discussed in detail in Section 8, is intended to attain the remediation goals identified for this site in Section 6. The remedy must conform with officially promulgated standards and criteria that are directly applicable, or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, criteria and

guidance are hereafter called SCGs. This Proposed Remedial Action Plan (PRAP) identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for this preference. The NYSDEC will select a final remedy for the site only after careful consideration of all comments received during the public comment period.

The NYSDEC has issued this PRAP as a component of the Citizen Participation Plan developed pursuant to the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375. This document is a summary of the information that can be found in greater detail in the June 2005 "Remedial Investigation (RI) Report, and the July 2005 "Feasibility Study" (FS) Report, and other relevant documents. The public is encouraged to review the project documents, which are available at the following repositories:

Queens Borough Public Library,
Sunny Side Branch
4306 Greenpoint Avenue
Long Island City, NY 11104
(718) 784-3033
Hours: Mon.1-8; Tues. 1-6; Wed. 10-6; Thurs 1-8; Fri.10-6; & Sat 10-5
Ann Bangal, Head Librarian (Contact person)

NYSDEC
625 Broadway, 12th Floor
Albany, New York 12233-7016
Hours: Mon. - Fri. 8-5
Brian Davidson (Contact Person)

The NYSDEC seeks input from the community on all PRAPs. A public comment period has been set from June 19, 2006 to August 3, 2006 to provide an opportunity for public participation in the remedy selection process. A public meeting is scheduled for June 28, 2006 at the NYSDEC Annex Building, 11-15 47th Ave, Long Island City, New York beginning at 7:00 PM.

At the meeting, the results of the RI/FS will be presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period will be held, during which verbal or written comments may be submitted on the PRAP. Written comments may also be sent to Mr. Brian Davidson at the above address through August 3, 2006.

The NYSDEC may modify the proposed remedy or select another of the alternatives presented in this PRAP, based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives identified here.

Comments will be summarized and addressed in the responsiveness summary section of the Record of Decision (ROD). The ROD is the NYSDEC's final selection of the remedy for this site.

SECTION 2: SITE LOCATION AND DESCRIPTION

The Quanta Resources Site is an approximately 1.8 acre parcel located at 37-80 Review Avenue, within a highly industrialized area of Long Island City, Queens, New York. Zoning in this area is designated as heavy manufacturing.

The site is bounded on the northeast by Review Avenue and on the southwest by the Southern Line of the Long Island Rail Road (LIRR). On the northwest it is bounded by an alley (Preston Street) that runs from Review Avenue to the LIRR tracks. On the southeast it is bounded by the property currently owned by Phoenix Beverages (an imported beer distributor). Farther to the northeast, across Review Avenue, is Calvary Cemetery. Farther to the northwest, across the alley, is the "North Capasso" property, also referred to as Review Avenue Development I (RADI). Farther to the southwest, across the

LIRR tracks is the "South Capasso" property. Newtown Creek lies beyond the South Capasso property farther to the southeast approximately 450 feet from the site. Fencing bounds the property on all sides.

Figure 1 is a site location map.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

The Quanta Resources property and surrounding properties have been used for a variety of industrial purposes since the late 19th century. A Sanborn Fire Insurance Map from 1898 indicates that the site was partially occupied by vacant and dilapidated brick wrecks of an oil refinery. Available information indicates the earliest recorded actual owner of the property was American Agricultural Chemical Company. In 1931 the property was transferred to Triplex Oil. Triplex Oil used the property for refining of used crank case oil for approximately 40 years. From 1972 until 1980 the facility was operated by several different owners including Pentalic Corporation, Sea Lion Corporation, Ag-met Oil Service, Inc., Hudson Oil Refining Corp., and Portland Holding Corp. In 1980 Quanta Resources acquired the property, and used the property for the re-refining of used crankcase oil and other liquid recycling before filing for bankruptcy on October 6, 1981. The property was abandoned in November 1981.

A number of potential LNAPL source areas existed on the Quanta Resources Site throughout its operational history, however, the primary suspected source area is the tank farm area located in the northeastern portion of the site.

It is believed that most of the contamination at the site resulted from leaking pipes and improper storage of waste oils.

3.2: Remedial History

In June1980, the site was listed on the New York State Registry of Inactive Hazardous Waste Disposal Sites (the Registry). The site was listed as "Hudson Oil Refinery/Newtown Refinery" as a Code B site. A Code B site is the equivalent of what would be currently listed as a Class 2a site. Class 2a is a temporary classification assigned to a site that has inadequate and/or insufficient data for inclusion in any of the other classifications.

The New York City Department of Environmental Protection (NYCDEP) completed an Emergency Removal Action in 1982 to address the immediate risks posed by the Site, due to the various waste materials left behind in tanks and related structures. Over 500,000 gallons of liquids and approximately 900 cubic yards of solids were removed from the site. Portions of the material removed were impacted with polychlorinated biphenyls (PCBs), chlorinated solvents, heavy metals and/or cyanide. Following the removal, above ground storage tanks (ASTs), underground storage tanks (USTs), piping, separators, and the buildings were decontaminated. After the initial removal action, an environmental investigation was conducted, with the results presented in a report prepared for the NYCDEP dated January 7,1983. In 1983 the site's classification was changed to a Class 3. A Class 3 site is a site which does not pose a threat to public health or the environment, and action may be deferred. Following a Phase I investigation performed for the NYSDEC in 1984, the site's classification was changed to a Class 2a. The Phase I and NYCDEP Reports were supplemented by a Phase II investigation conducted by the NYSDEC. Investigatory work was conducted from 1988 through 1990 and reported similar contamination, soil and groundwater data as was reported previously.

As a result of the Phase II Investigation the site's classification was changed from a Class 2a site to a Class 2 site on the Registry. A Class 2 site is a

site where hazardous waste presents a significant threat to the public health or the environment and action is required.

Based on the site reclassification, a Remedial Investigation (RI) was initiated to define the nature and extent of contamination.

SECTION 4: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers. The NYSDEC has identified a number of PRPs associated with the Site. These parties make up the Quanta Site Administrative Group (QSAG).

The NYSDEC and the QSAG entered into a Consent Order in May 2002 to conduct the RI/FS. In June 2005, the site was conveyed to DMJ Associates, LLC. The site was subsequently conveyed to 37-80 Review, LLC. DMJ Associates, LLC, 37-80 Review, LLC, and Cresswood Environmental Consultants, LLC are Volunteer Applicants to the BCP for the former Quanta Resources property (referred to as Review Avenue Development II or RADII). A Brownfields Cleanup Agreement (BCA # C241005), executed on December 2, 2005, requires the Applicant to remediate the RADII property. In addition, Cresswood Environmental Consultants, LLC, DMJ Associates, LLC, and Review Railroad, LLC are Volunteer Applicants to the BCP for the former the former North Capasso property (referred to as Review Avenue Development I or RADI). A Brownfields Cleanup Agreement (BCA # C241089), executed on December 2, 2005, requires the Volunteer to remediate the RADI property.

A parking lot is proposed for the Quanta Resources Site.

SECTION 5: SITE CONTAMINATION

A remedial investigation/feasibility study (RI/FS) has been conducted to evaluate the alternatives for addressing the significant threats to human health and the environment.

5.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site.

In the fall of 2003, the NYSDEC approved a Remedial Investigation (RI) and Feasibility Study (FS) Work Plan, prepared by the PRPs, to define the nature and extent of any contamination resulting from previous activities at the Quanta Resources Site. The RI was completed in two phases: Phase I (approved RI/FS Work Plan and addendum's No. 1 and 2); and Phase II (Work Plan approved in February 2005). The RI field activities commenced on October 13, 2003 and were completed on April 17, 2005. Addendum No. 2 work was performed to better understand and define the distribution and behavior of the LNAPL in the subsurface and included a LNAPL removal system pilot study to better understand the recoverability of the LNAPL in the subsurface. The Phase II RI work was then conducted to address data gaps.

A Supplemental RI, completed in September 2005, confirmed the RI conclusion that groundwater downgradient from the site is not significantly impacted from the Quanta Resources Site contamination. The field activities and findings of the investigation are described in the RI Report dated June 2005 and Supplemental RI Report dated November 2005.

The RI work included the following activities:

- Research of historical information;
- Site preparation and reconnaissance;

- Installation of 30 on-site and off-site LNAPL monitoring wells for analysis of soils and LNAPL on groundwater;
- Installation of 10 on-site and off-site groundwater monitoring wells for analysis of soils and groundwater as well as physical properties of soil and hydrogeologic conditions;
- Hydrogeologic testing of the monitoring wells to collect data to determine hydraulic conductivity of the glacial deposits;
- Installation of 16 soil borings in addition to the borings completed for the monitoring well installation and analysis of soils and as well as physical properties of soil;
- Surveying to precisely locate the elevation and location of all monitoring wells and sample locations;
- Sampling of 46 new and existing monitoring wells;
- LNAPL baildown testing to determine the mobility and recoverability of the LNAPL,
- Groundwater modeling to predict groundwater movement and contaminant transport;
- Collection and analysis of 5 surface soil samples;
- Collection and analysis of 10 soil vapor samples;

The RI work also included the installation of 2 LNAPL observation wells and performance of an LNAPL Recovery Pilot Study to further assess the recoverability of the LNAPL. The LNAPL recovery system was operated from April 2004 through July 2004.

Figure 2 is a site map with the Remedial Investigation monitoring points. The Remedial Investigation (RI) Report, Feasibility Study (FS) Report, and Supplemental RI Report are available in the document repository.

To determine whether the surface soil, subsurface soil, groundwater, or soil vapor contain contamination at levels of concern, data from the investigation were compared to the following regulatory standards, criteria, and guidance values (SCGs):

- Groundwater, drinking water, and surface water SCGs are based on NYSDEC "Ambient Water Quality Standards and Guidance Values" and Part 5 of the New York State Sanitary Code.
- Soil SCGs are based on the NYSDEC "Technical and Administrative Guidance Memorandum (TAGM) 4046; Determination of Soil Cleanup Objectives and Cleanup Levels". Site-specific cleanup levels for metals were determined using Eastern United States background values, New York State background values, and values from boring GAGW-04 located on the west side of Review Avenue next to Calvary Cemetery. Using this data, site specific Recommended Soil Cleanup Objectives (RSCOs) for metals were determined.
- Background soil and groundwater samples were taken from four locations on the west side of Review Avenue next to Calvary Cemetery that are upgradient of the Quanta Resources property. These locations were unaffected by historic or current operations at site. Monitoring wells were installed at three of these locations to monitor groundwater quality

downgradient of Roehr Chemical, a facility located to the northwest, on the other side of Calvary Cemetery, during an off-site investigation of the facility. Samples were collected and analyzed for VOCs, SVOCs, polychlorinated biphenyls (PCBs), and metals. The results of the analysis were compared to data from the RI (Table 1).

Based on the RI results, in comparison to the SCGs and potential public health and environmental exposure routes, certain media and areas of the site require remediation. These are summarized below. More complete information can be found in the RI report.

5.1.1: Site Geology and Hydrogeology

The site is underlain by urban fill which ranges from about 3 to 16 feet thick. The urban fill generally consists of a mixture of heterogenous soil intermixed with various debris including brick fragments, glass, asphalt, wire and plastic. The fill overlies unconsolidated glacial deposits, predominately interbedded fine to course sand with some discrete and laterally discontinuous horizons of silt and silty clay. The glacial sand deposit can be subdivided into two distinct units based on color, but the units have essentially the same hydraulic characteristics. These deposits overlie a laterally continuous clay unit (the Raritan clay) which occurs at depths ranging from 71 to 85 feet below grade.

The Quanta Resources site lies between a local topographic high area to the northeast (Calvary Cemetery) and Newtown Creek (a tidally influenced regional groundwater discharge area).

Groundwater occurs at a depth of about 15 to 20 feet below the ground surface across the site. The general direction of groundwater flow is to the south-southwest, toward Newtown Creek. Horizontal hydraulic gradients are nearly flat (0.0015 ft/ft) and vertical gradients are minimal suggesting nearly horizontal flow. A viscous light non-aqueous phase liquid (LNAPL) is present at the watertable over the entire site.

A localized groundwater mound exists just southwest of the site on the South Capasso property. This groundwater mound is presumed to be caused by a discontinuous clay lens in the shallow glacial interbedded sands. The mound results in localized radial flow of shallow downgradient groundwater which may help to prevent migration of the LNAPL.

Figure 3 depicts a generalized conceptual hydrogeologic model for the site area. Groundwater flow direction is also depicted in Figure 4.

5.1.2: Nature of Contamination

As described in the RI report, many soil, groundwater, LNAPL and soil gas samples were collected to characterize the nature and extent of contamination. As summarized in Table 1, the main categories of contaminants that exceed their SCGs are volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and inorganics (metals).

Weathered petroleum oil is at this site in the form of a dense, oily liquid that does not readily dissolve in water. Materials such as this are typically found at old oil terminals and are referred to as nonaqueous phase liquids or NAPL. Since this NAPL is less dense than water, it is also referred to as light NAPL or LNAPL. LNAPL can coincide with high VOC and SVOC concentrations in soil, groundwater, and soil gas.

The VOCs of concern related to the site include aromatic hydrocarbons such as benzene, ethylbenzene, toluene, and xylene present in the LNAPL. Total VOC concentrations in the LNAPL range up to 2,205 ppm off site on the

North Capasso Property. The LNAPL present on the Quanta Resources Site contains lower concentrations of VOCs and numerous unspecified aliphatic hydrocarbons. Polycyclic aromatic hydrocarbons (PAHs) comprise nearly 100 % of the SVOCs identified, and included benzo(a)anthracene, chrysene, and pyrene. The VOCs detected are often very mobile in groundwater.

The LNAPL is presumed to be mostly from spills and leaks during the used crackcase oil re-refining operations. A considerable volume of LNAPL has been delineated. The LNAPL mass appears stable, and a large portion of the mass of LNAPL is non-recoverable It is a viscous weathered and heterogeneous petroleum material made up of predominantly high boiling point and low solubility petroleum hydrocarbons. The source of the LNAPL was removed from the site 24 years ago when the site was decommissioned in 1982. This fact combined with the high viscosity of the LNAPL and possibly the effects of the downgradient groundwater mound have limited the downgradient migration of the LNAPL. The majority of the LNAPL mass appears to be stable, and to some extent is being naturally contained to the site. LNAPL migration does not pose a significant threat to Newtown Creek.

Groundwater at or in the vicinity of the site is not used as a source of drinking water.

The RI report concluded that the low solubility of LNAPL constituents and the ongoing natural attenuation of these constituents in groundwater are effectively mitigating potential chemical impacts to groundwater from LNAPL.

5.1.3: Extent of Contamination

This section describes the findings of the investigation for all environmental media that were investigated.

Radial flow from the tank farm area appears to be the primary cause of the presence of LNAPL upgradient to the northeast. An additional source of LNAPL having more volatile and lower viscosity characteristics is expected from the North Capasso property. Given that the LNAPL sources have been removed, the low groundwater gradient and high viscosity of the LNAPL, further radial expansion of LNAPL is not expected.

As is stated in Section 5.1.1 above and is indicated on Figure 3 and Figure 4, groundwater flow from the Quanta Resources property is to the south-south west toward the Newtown Creek with a very low (nearly horizontal) gradient. The Newtown Creek is classified as a Class SD surface water which is the lowest classification for saline surface water in New York State. Based on the RI Report contaminants from the site are not impacting the Newtown Creek.

Table 1 summarizes the range of concentrations for the contaminants of concern in soil and groundwater and compares the data with the SCGs for the Site. Chemical concentrations are reported in parts per billion (ppb) for water, parts per million (ppm) for waste, soil, and sediment, and micrograms per cubic meter ($\mu g/m^3$) for air samples. For comparison purposes, where applicable, SCGs are provided for each medium. The following are the media which were investigated and a summary of the findings of the investigation.

Waste Materials (LNAPL)

As previously discussed, light nonaqueous phase liquid (LNAPL) is present on the watertable under the entire site and the property to the north, the North Capasso property. The LNAPL is not present at locations 100 feet downgradient to the southwest, on the other of the Long Island Railroad tracks.

Considerable effort during the RI was devoted to characterizing the LNAPL. As stated previously,

the LNAPL on the Quanta Resources site generally has a higher viscosity than the LNAPL on the North Capasso property. This could be indicative of different sources of the LNAPL under the two properties.

Although free product was found at the watertable throughout the site, apparent product thicknesses were greatest in the southwestern portion of the Quanta Resources Site. An apparent thickness of 8 feet of LNAPL was measured in LNAPL monitoring well GAL-07. LNAPL saturation is variable depending on a number of site-specific factors including soil type, hydrogeological conditions, and LNAPL properties. The measured apparent thickness of LNAPL in a monitoring well is influenced by a number of these same factors as well as by groundwater elevation fluctuations. Therefore, the measured apparent thickness of LNAPL in a well may not be representative of the total volume of LNAPL present in soil at a given location. A more realistic expression of the volume of LNAPL in soil is called the "specific free-product volume." This is defined as the volume of product per unit of surface area. When expressed in cubic feet, it is the volume of LNAPL contained in a 1 foot by 1 foot area. The specific free-product volume of LNAPL ranges from 0. 096 to 1.327 cubic feet across the Quanta Resources Site.

Although sampling in 1982 by NYCDEP indicated 143 ppm of PCBs in the LNAPL, sampling during the RI indicated PCBs only in the southwestern portion of the site with concentrations of PCBs ranging from 7.1 ppm to 80 ppm. Metals detected in the LNAPL above guidance values were barium, calcium, chromium, iron, manganese and zinc.

Table 1 contains a description of the distribution, characterization, and mobility, and provides a range for observed LNAPL viscosity, specific free-product volume measurements and total concentrations of total VOCs, total SVOCs, and total PCBs.

Surface Soil

Five surface soil samples were collected at depths of 0 to 2 inches below ground surface (bgs) from unpaved areas at the Quanta Resources Site. These samples showed five PAH compounds above TAGM 4046 guidance values including benzo(a)anthracene (0.25 to 1.4 ppm), benzo(a)pyrene (0.28 to 0.94 ppm), benzo(k)fluoranthene (0.29 to 1.2 ppm), chrysene (0.3 to 1.3 ppm), and dibenz(a,h)anthracene (not detected (ND) to 0.14 ppm).

Only one of the five samples had PCBs above the 1 ppm guidance value for surface soil with SS-01 containing 15 ppm of the PCB aroclor 1260. The metals calcium, chromium, copper, lead, magnesium, nickel, and zinc were detected in the surface soils on RADII property above average background levels.

Table 1 contains a summary of concentrations of constituents of concern surface soil.

Subsurface Soil

The TAGM 4046 soil clean up guidance values for organic chemicals are based upon the lower of two criteria: the groundwater protection criteria or the USEPA health based criteria. For heavy metals, they are based on the lower of the USEPA health based criteria or background. Eleven VOCs were detected above TAGM 4046 values that were based on protection of groundwater. These VOCs were acetone (ND to 8.4 ppm), benzene (ND to 0.63 ppm), 1,2 dichlorobenzene (ND to 11 ppm) 1,1-dichloroethane (ND to 13 ppm), ethylbenzene (ND to 11 ppm), methylene chloride (ND to 1.1 ppm), tetrachloroethene (ND to 5.5 ppm), toluene (ND to 6.9 ppm), trichloroethylene (ND to 3.5 ppm), vinyl chloride (ND to 1.7 ppm), and xylenes (ND to 33 ppm). None of the VOCs that were detected in

subsurface soil exceeded guidance values that were generated based on USEPA health based criteria.

Twelve SVOC compounds were detected at concentrations above TAGM 4046 objectives. The three SVOC compounds that were detected at the highest concentrations were 2-methylnapthalene (ND - 56 ppm), benzo(a)pyrene (ND - 52 ppm), and bis 2-ethylhexyl-phthalate (ND - 120 ppm). Only 1 subsurface soil sample, SB-14, which contained a concentration of 10.2 ppm at a depth of 5 feet bgs, exceeded the TAGM 4046 soil objective of 10 ppm for PCBs.

Several metals, including antimony, arsenic, cadmium, calcium, chromium, magnesium, mercury, nickel, selenium and zinc, were detected in the urban fill above TAGM 4046 background objectives, however, these concentrations are consistent with those typically associated with urban fill. Given the ubiquitous distribution of urban fill across the RADII property and adjacent properties, restoration to background is not believed to be a realistic objective. Several chemicals in the urban fill were detected above TAGM 4046 objectives based on groundwater protection. Given the presence of LNAPL below the urban fill and the minimal impacts to groundwater beneath the Quanta Resources site, leaching of contaminants from the urban fill into groundwater is not expected to be significant.

A summary of concentrations of constituents of concern in subsurface soil can be seen on Table 1.

Groundwater

A total of seven VOCs were detected in groundwater at concentrations above groundwater standards. These VOCs include benzene (maximum observed concentration during the RI of 7.8 ppb, exceeding the guidance value of 1 ppb), chloroform (7.9 ppb, exceeding the guidance value of 7 ppb), cis-1,2, dichloroethene (5.1 ppb, exceeding the guidance value of 5 ppb), trichloroethene (21 ppb, exceeding the guidance value of 5 ppb), vinyl chloride (2.1 ppb, exceeding the guidance value of 2 ppb), and MTBE (270 ppb, exceeding the guidance value of 10 ppb). Three VOCs, benzene, ethylbenzene and xylene, were detected in upgradient wells along Review Avenue at or slightly above guidance values. These wells were installed as downgradient monitoring wells for the Roehr Chemical property investigation.

Xylene and MTBE have been detected in upgradient groundwater samples along Review Avenue. The primary contaminant from the Roehr Chemical facility, located about 900 feet north of the Quanta Resources site, is xylene. Downgradient groundwater samples from well GAGW-09D indicate the presence of MTBE (250 ppb) and trichloroethene (16 ppb) deep in the glacial aquifer just above the Raritian clay. MTBE is a relatively recent gasoline additive, and its presence is not attributable to the past waste oil recycling activities at the Quanta Resources site. MTBE and TCE were detected in groundwater upgradient and downgradient of the Quanta Resources site. In addition to MTBE and TCE, chloroethane (20 ppb) and benzene (7 ppb) were detected in downgradient groundwater above SCGs.

Five SVOC compounds were detected at concentrations that slightly exceed groundwater standards including chrysene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene on the Quanta Resources site. The TOGS Criteria for all of these compounds are less than 1 ppb. Each of these constituents was detected at a concentration exceeding the criteria but below 1 ppb. There were no exceedances in downgradient wells GAGW-09S and 9D.

Metals detected in groundwater above guidance values were antimony, iron, magnesium,

manganese, and sodium. These metals are all naturally occurring. No PCBs were detected in groundwater.

Table 1 contains a summary of concentrations of constituents of concern. A summary of the groundwater exceedances is shown on Figure 4.

Soil Gas/Sub-Slab Vapor/Air

Soil vapor sampling was completed on December 15, 2005. Ten samples were collected for analysis, along the perimeter of the site, at a depth of approximately five to six feet below grade surface.

Benzene in soil vapor samples was observed at concentrations ranging between non-detect (ND) and 260 $\mu g/m^3$ for soil vapor sampling locations SV1 through SV9. A concentration of 6,100 $\mu g/m^3$ was observed at location SV10. Tetrachloroethene in soil vapor samples was observed at concentrations ranging between ND and 48 $\mu g/m^3$ for soil vapor sampling locations SV1 through SV9. A concentration of 11,000 $\mu g/m^3$ was observed at SV10, located off the northeast corner of the old above ground tanks. Trichloroethene in soil vapor samples was observed at concentrations ranging between ND and 190 $\mu g/m^3$ for soil vapor sampling locations SV1 through SV9. A concentration of 30,000 $\mu g/m^3$ was observed at SV10. Vinyl chloride in soil vapor samples was observed at concentrations ranging between ND and 1600 $\mu g/m^3$.

In addition to the soil vapor sampling, soil vapor sampling points were screened with a combustible gas indicator.

Table 1 contains a summary of concentrations of constituents of concern in soil vapor.

5.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS.

As discussed in Section 3.2, Remedial History, the NYCDEP and NYSDEC completed an Emergency Removal Action in 1982. The only other IRM conducted during the RI was the removal of approximately 140 gallons of LNAPL from the concrete sump on site.

5.3: Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the Quanta Resources site. A more detailed discussion of the human exposure pathways can be found in Appendix A of the FS Report.

An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site. An exposure pathway has five elements: [1] a contaminant source, [2] contaminant release and transport mechanisms, [3] a point of exposure, [4] a route of exposure, and [5] a receptor population.

The source of contamination is the location where contaminants were released to the environment (any waste disposal area or point of discharge). Contaminant release and transport mechanisms carry contaminants from the source to a point where people may be exposed. The exposure point is a location where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (e.g., ingestion, inhalation, or direct contact). The receptor population is the people who are, or may be, exposed to contaminants at a point of exposure.

An exposure pathway is complete when all five elements of an exposure pathway exist. An exposure pathway is considered a potential pathway when one or more of the elements currently does not exist, but could in the future.

A potential future exposure pathway exists at the Quanta Resources site. Elevated levels of VOCs exist in soil vapor at the site.

Surface soil samples show PAH, PCB and metal contamination at levels above TAGM 4046. Contact is possible since contamination exists in soil at depths of 0 to 2 inches below ground surface. Receptors could come into direct contact with contaminated surface soils and incidentally ingest the contaminated media. Current exposures have been eliminated by fencing the site and limiting access to only those individuals necessary for investigatory field work.

Subsurface soils are contaminated with VOCs, SVOCs, and metals. However, exposure is not likely since the contaminated soil is below ground surface.

Groundwater at the site is contaminated with VOCs, SVOCs and metals. This pathway is incomplete because there is no exposure point at which people may come in contact with the contamination. Currently, groundwater at the site is not used for drinking because a public water supply serves the area.

5.4: Summary of Environmental Impacts

This section summarizes the existing and potential future environmental impacts presented by the site. Environmental impacts include existing and potential future exposure pathways to fish and wildlife receptors, as well as damage to natural resources such as aquifers and wetlands.

The following environmental exposure pathways and ecological risks have been identified:

- LNAPL has impacted the groundwater resource in the shallow aquifer at the site.

The site is located approximately 450 feet away from the Newtown Creek in a highly industrialized area. No impacts to fish and wildlife receptors could be attributed to site contaminants. Although it is possible that contaminants in the urban fill and surface soils could impact invertebrates living in the soil or small mammals such as mice and moles, none were identified. Any detrimental impacts to fish and wildlife could be linked more to destruction of habitat in the area than to contaminants from site activities.

Most of the contamination associated with the site is contained in the LNAPL which is present on the watertable underlying the site. Because of the localized downgradient shallow groundwater mound and the thick viscous nature of the LNAPL, the LNAPL has not migrated far downgradient. Groundwater monitoring wells installed between the site and the Newtown Creek show MTBE and trichloroethene in groundwater at depth. MTBE is a gasoline additive which is highly mobile when dissolved in groundwater. Site contamination has only slightly impacted the groundwater resource in the unconsolidated glacial sand aquifer. The unconsolidated glacial sand aquifer is no longer used as a water supply in the vicinity of the site and the degradation of this resource is more of a regional issue.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the

hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The remediation goals for this site are to eliminate or reduce to the extent practicable:

- the presence of LNAPL as a potential source of soil, groundwater, and soil gas contamination;
- potential further migration of LNAPL that could result in soil, groundwater, or soil gas contamination;
- exposures of persons at or around the site to VOCs or explosive gas in soil vapor;
- the potential for ingestion/direct contact with contaminated soil;
- the release of contaminants from the urban soil and LNAPL into groundwater that may create exceedances of groundwater quality standards over time.

Further, the remediation goals for the site include attaining to the extent practicable:

- ambient groundwater quality standards and
- SCGs for soil.

The remedial goals included in this Proposed Remedial Action Plan for LNAPL removal include the Quanta Resources site and off site areas. Off site areas include other sources of contamination on the RADI property to the northwest. A separate Data Gap Investigation, which will investigate soil vapor conditions at the RADI property, and an Interim Remedial Measure, which will involve the removal of underground storage tanks and contaminated soil, are being undertaken on the RADI property. The Remedial Alternatives evaluated for the Quanta Resources site will also address the off-site LNAPL contamination found on the adjacent RADI property.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the Quanta Resources Site were identified, screened and evaluated in the FS report which is available at the document repositories identified in Section 1.

A summary of the remedial alternatives that were considered for this site are discussed below. The present worth represents the amount of money invested in the current year that would be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth costs for alternatives with an indefinite duration. This does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals were not achieved.

7.1: Description of Remedial Alternatives

An initial screening process was used to determine a list of reasonable alternatives for LNAPL recovery at the Quanta Resources and RADI properties. Based on a thorough review of all possible remedial approaches in the feasibility study, there are no viable remedial technologies that would effectively address all of the free-phase and residual LNAPL and thus achieve a "pre-

release condition". A large portion of the estimated 475,000 gallons of LNAPL is non-recoverable (non-mobile) residual LNAPL trapped within the soil pore spaces. This non-recoverable portion is held in place by surface tension and can not be extracted using LNAPL removal technologies. Because of the viscous nature of the recoverable LNAPL located in the subsurface of the RADI and the Quanta Resources sites, enhanced recovery techniques would be expected to provide some benefit. The theoretical volume of LNAPL that could be recovered through each remedial alternative is shown on Table 2.

Complete excavation with off site disposal or treatment is not a viable alternative for the RADII property due to the long remediation time, difficult logistics associated with deep excavation adjacent to buildings and active railroad tracks, and the enormous cost for excavation to depths that would remove all residual LNAPL and disposal of the excavated material. Excavation below the water table would generate large volumes of water and excavated material would require dewatering and treatment. The cost of complete excavation of the RADII property to remove all LNAPL is estimated at approximately 250 to 350 million dollars.

The following viable potential remedies evaluated in detail in the FS report would address the LNAPL, soil, groundwater, and soil gas at the RADI property and the Quanta Resources site.

Alternative A: No Further Action

Annual OM&M:
(Years 1-5): $94,000
(Years 6-30): $14,000

The No Further Action alternative recognizes remediation of the Quanta Resources site conducted under the previously completed IRM. To evaluate the effectiveness of the remediation completed during the IRM, only continued monitoring is necessary.

Alternative A would leave the site in its present condition and would involve the imposition of institutional and engineering controls, in the form of environmental easements and deed restrictions, for the protection of human health.

Alternative B : Perimeter LNAPL Recovery via Single-Phase LNAPL Extraction

Present Worth:..... $6,143,000
Capital Cost: $4,323,000
Annual OM&M:
(Years 1-5): $138,000
(Years 6-30): $45,200

Alternative B would provide perimeter LNAPL recovery by installing a series of single-phase LNAPL recovery wells along the downgradient boundaries of the Quanta Resources site and the property to the north, the North Capasso property. Pneumatic specific gravity skimmer pumps would be installed in each perimeter well to remove free LNAPL entering the well. LNAPL flow into each single phase recovery well would be induced by the local gradient between the lowered LNAPL in the extraction well and the higher LNAPL immediately outside the well. The skimmer pumps would be designed to pump only LNAPL, thereby eliminating the need for water handling and treatment systems.

Recovered LNAPL would be pumped through underground conveyance lines to an aboveground facility for storage prior to off-site disposal or reuse. Some treatment, such as oil/water separation and filtration may be performed prior to storage. Any LNAPL with PCBs greater than 50 ppm would be segregated for incineration in accordance with the Toxic Substances Control Act (TSCA).

The results of the pilot study conducted during the RI indicated effective recovery of LNAPL with different viscosities at two locations. LNAPL recovery rates at the end of the pilot study ranged between 10 and 25 gallons per day (gpd). These rates would be expected to decrease over time. Both the radius of influence and the recovery rate are expected to vary across the property due to varying conditions such as LNAPL viscosity, LNAPL volume in soil, and hydraulic conductivity.

The theoretical maximum removal of LNAPL is estimated at 17,000 gallons over a 30 year operating period. The majority of LNAPL recovery would be expected to occur during the first 2 years of operation, declining asymptotically thereafter.

Alternative C : Area-Wide LNAPL Recovery via Single-Phase LNAPL Extraction

Present Worth: $10,090,000
Capital Cost: $6,860,000
Annual OM&M:
(Years 1-5): $204,000
(Years 6-30): $88,400

Alternative C combines the same remedial elements as Alternative B with area-wide recovery of LNAPL via single-phase recovery wells on the Quanta Resources site and the North Capasso property. Alternative C would collect LNAPL via 100 LNAPL recovery wells from three conceptual recovery zones (Figure 5).

The theoretical maximum removal of LNAPL is estimated at 50,000 gallons over a 30 year operating period. As with Alternative B, the majority of LNAPL recovery would be expected to occur during the first 2 years of operation, declining asymptotically thereafter.

Alternative D : Area-Wide LNAPL Recovery via Vacuum-Enhanced Recovery

Present Worth: $13,100,000
Capital Cost: $9,950,000
Annual OM&M:
(Years 1-5): $618,000
(Years 6-30): $2,400

Alternative D would provide perimeter containment and area-wide removal of LNAPL via vacuum-enhanced recovery (VER) from an array of VER wells at the Quanta Resources site and the North Capasso property. Vacuum enhanced pumping creates a cone of reduced pressure (vacuum) around the well, resulting in a pressure induced gradient. When LNAPL levels decline in the well, a drop tube draws in vapor (vapor extraction) and promotes air movement and aerobic biodegradation processes (bioventing) in the vadose zone. When the vacuum creates a slight localized mounding in the shallow groundwater table elevation, some water is collected in the drop tube. The cycling between vapor and liquid removal creates a slurping sound, thus the term "bioslurping" is used to describe this technology. The VER system is highly flexible because it could target the zone where vacuum could be applied; could be adjusted to minimize the inadvertent collection of groundwater; could address vapors in the unsaturated zone; and could be converted to a soil vapor recovery system at the end of the LNAPL recovery phase.

Extracted vapors would be separated from the liquids and treated using activated carbon. Extracted liquids would be separated and treated. As with alternatives B and C, recovered product would be collected in above ground storage tanks for characterization and off site disposal.

The theoretical maximum removal of LNAPL is estimated at 175,000 gallons over a 5 year operating period. As with Alternative B, the majority of LNAPL recovery would be expected to occur during the first 2 years of operation, declining asymptotically thereafter.

Alternative E : Area-Wide LNAPL Recovery via Vacuum-Enhanced Recovery and Localized Soil Heating

Present Worth: $13,600,000
Capital Cost: $10,930,000
Annual OM&M:
(Years 1-5): $522,000
(Years 6-30): $2,400

Alternative E would combine Alternative D with the application of localized soil heating in recovery zone 1 to thermally enhance the recovery of the high viscosity LNAPL. Heating included with Alternative E would only be applied to the extent necessary to overcome potential technical limitations associated with applying the vacuum enhanced recovery explained in Alternative D within recovery Zone 1 (see Figure 5).

The LNAPL exists in essentially three phases-mobile, immobile, and residual. Heating the soil will reduce viscosity and will therfore increase the amount of mobile LNAPL while reducing the amount of immobile and residual LNAPL.

Soil heating would be accomplished by using electrical conductive heating to achieve soil temperatures of 60 degrees Celsius over an approximately 25,000 sq. ft. area within the conceptual LNAPL recovery zone 1.

The theoretical maximum removal of LNAPL that could be recovered by Alternative E. is estimated at 180,000 gallons.

Alternative F : Area-Wide LNAPL Recovery via a Combination of Single-Phase,Vacuum-Enhanced Recovery and Localized Soil Heating Enhancement Methods

Present Worth: $15,650,000
Capital Cost: $12,280,000
Annual OM&M:
(Years 1-5): $530,000
(Years 6-30): $28,800

Alternative F would provide the greatest design flexibility for efficient LNAPL recovery technology in specific portions of the Quanta Resources site. It includes several possible configurations and combinations of the various LNAPL recovery technologies described in Alternatives C, D, and E. The specific LNAPL recovery configuration would be determined during remedial design.

Engineering and institutional controls, in the form of environmental easements and deed restrictions, for the long-term protection of human health would be implemented.

The theoretical maximum removal of LNAPL that could be recovered by Alternative F is estimated at 195,000 gallons. The majority of LNAPL recovery would be expected to occur during the first 2 years of operation, declining asymptotically thereafter.

7.2 Evaluation of Remedial Alternatives

The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375, which governs the remediation of inactive hazardous waste disposal sites in New York State. A detailed discussion of the evaluation criteria and comparative analysis is included in the FS report.

The first two evaluation criteria are termed "threshold criteria" and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

All five alternatives provide protection of public health except Alternative A which does not provide any additional protection to human health or the environment.

2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the NYSDEC has determined to be applicable on a case-specific basis.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

None of the alternatives are expected to pose substantial adverse impacts to the community, workers or the environment. Thermal enhancement included in Alternatives E and F will result in the greatest potential adverse effects. Alternatives D, E, and F all have the capability of completing recovery at the site in 5 years or less. A portion of Alternative F may have an operational life of 30 years should single-phase recovery be utilized as one of the remedial elements. Alternatives A, B, and C all have major technology components that would require operation for 30 years or more.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

Alternatives D, E, and F offer the highest level of LNAPL recovery and as such afford the highest degree of long-term effectiveness and permanence. Laboratory tests and pilot studies are required to verify the effectiveness of Alternative D for high viscosity LNAPL and to verify whether the thermal enhancements provided by Alternative E are necessary and will be effective for lowering LNAPL viscosity. In general, pilot tests are required to verify the effectiveness and/or provide design details for each LNAPL recovery technology.

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

The multi-phase LNAPL removal provided by vacuum enhanced recovery (VER) in Alternatives D, E, and F provide the highest level of treatment to reduce the toxicity, mobility and volume.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

No specialized equipment, methods or materials are required for implementation of any of the proposed alternatives, with the exception of the electrical conductive heating included in Alternatives E and F. Field-scale pilot testing would be required to finalize the design for all LNAPL recovery technologies, in particular VER and localized soil heating components proposed under Alternatives D, E, And F. There are no administrative feasibility issues associated with any of the alternatives.

7. Cost-Effectivness. Capital costs and operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision. The costs for each alternative are presented in Table 2.

This final criterion is considered a "modifying criterion" and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

8. Community Acceptance - Concerns of the community regarding the RI/FS reports and the PRAP are evaluated. A responsiveness summary will be prepared that describes public comments received and the manner in which the NYSDEC will address the concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

SECTION 8: SUMMARY OF THE PROPOSED REMEDY

The NYSDEC is proposing Alternative F, Area-Wide LNAPL Recovery via a Combination of Single-Phase, Vacuum-Enhanced Recovery and Localized Soil Heating Enhancement Methods, as the remedy for this site. The proposed remedy is based on the results of the RI and the evaluation of alternatives presented in the FS. The elements of this remedy are described at the end of this section. The principal reasons for selecting Alternative F are as follows:

- It provides a high degree of protection of public health and the environment and would achieve all remedial goals, including maximum removal of all LNAPL to the extent technically and practically feasible. It is estimated that 195,000 gallons of LNAPL could be removed;

- It provides a high degree of long-term effectiveness and provides components that achieve permanent treatment. It adequately addresses exposures from wastes remaining at the site utilizing reliable institutional and engineering controls;

- It provides a high degree of reduction of toxicity, mobility, and volume and satisfies the statutory preference for treatment as a principle element;

- Except for the potential use of thermal enhancement, it does not cause any adverse short-term impacts to workers, the community, or the environment that cannot be easily managed using standard Occupational Safety and Health Administration (OSHA) health and safety and engineering practices. It will provide short recovery completion time-frames for the majority of the LNAPL at the site (on the order of 3 - 5 years);

- It is implementable and, except for the potential use of thermal enhancement components, utilizes services and materials that are readily available. There are no administrative restrictions associated with the alternative that would make it administratively infeasible;

- While its predicted costs are at the high end of the range of costs for all of the alternatives evaluated, it provides the greatest potential to improve cost-effectiveness during the remedial design process;

- It offers the most design flexibility in applying the appropriate technology to specific Site conditions that vary across the site; and,

Alternative F allows for several possible configurations and combinations of the various LNAPL recovery technologies described in Alternatives C, D, and E. For example, based

solely on the technical considerations of viscosity, volume and efficiency, single-phase LNAPL extraction could be applied in the lower viscosity and lower LNAPL volume area (Figure 5, zone 3). VER could be applied in the more moderate viscosity and volume area (Figure 5, zone 2), and soil heating and VER could be applied in the higher viscosity and volume area (Figure 5, zone 1). The most effective configuration would be determined through pilot testing and through remedial design.

It should be clarified that local soil heating would only be used to overcome potential technical limitations for implementing VER in high viscosity areas (if necessary based on pilot test results) and/or possibly to reduce recovery completion time-frames to accommodate redevelopment schedules. In addition, soil heating should be implemented with caution as its effectiveness for reducing LNAPL viscosity needs to be verified and there are potential concerns with soil heating resulting in undesired vertical and horizontal migration of LNAPL and increases in chemical concentrations in groundwater due to increased soil temperatures. These factors would need to be carefully considered during pilot testing and remedial design.

The estimated present worth cost to implement the remedy is approximately $15,560,000. The cost to construct the remedy is estimated to be $12,350,000 and the estimated average annual operation, maintenance, and monitoring costs for the first 5 years is $530,000 per year and $28,800 per year thereafter.

The elements of the proposed remedy are as follows:

1. A remedial design program would be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program;

2. Construction of an area wide LNAPL recovery system using a combination of single-phase, vacuum enhanced recovery and localized soil heating methods. The operation of the components of the remedy would continue until the remedial objectives have been achieved, or until the NYSDEC determines that continued operation is technically impracticable or not feasible.

3. The buildings and tanks on site would be demolished, removed, and the demolition debris properly disposed.

4. The site would be covered by a paving system at least 6 inches in thickness. A 2 foot soil cover would be constructed over all vegetated areas (if any) to prevent exposure to contaminated soils. The two foot thick cover would consist of clean soil underlain by an indicator such as orange plastic snow fence to demarcate the cover soil from the subsurface soil. The top six inches of soil would be of sufficient quality to support vegetation. Clean soil would constitute soil with no analytes in exceedance of NYSDEC TAGM 4046 soil cleanup objectives, or local site background, as determined by the procedure in NYSDEC Division of Environmental Remediation draft DER-10 Technical Guidance for Site Investigation and Remediation ("Technical Guidance").

5. Development of a site management plan to: (a) address residual contaminated soils that may be excavated from the Quanta Resources site during future redevelopment. The plan would require soil characterization and, where applicable, disposal/reuse in accordance with NYSDEC regulations; (b) evaluate the potential for vapor intrusion for any buildings developed on the Quanta

Resources site, including provision for mitigation of any impacts identified; (c) identify any use restrictions; and (d) provide for the operation and maintenance of the components of the remedy.

6. Imposition of an institutional control in the form of an environmental easement that would (a) require compliance with the approved site management plan; (b) limit the use and development of the property to commercial or industrial uses only; (c) restrict the use of groundwater as a source of potable water, without necessary water quality treatment as determined by NYSDOH; and (d) require the property owner to complete and submit to the NYSDEC periodic certifications.

7. The property owner would provide periodic certifications, prepared and submitted by a professional engineer or such other expert acceptable to the NYSDEC, until the NYSDEC notifies the property owner in writing that this certification is no longer needed. This submittal would contain certification that the institutional and engineering controls are still in place, allow the NYSDEC access to the Quanta Resources site, and that nothing has occurred that would impair the ability of the control to protect public health or the environment, or constitute a violation or failure to comply with the site management plan.

8. Since the remedy may result in some untreated hazardous waste remaining at the Quanta Resources site, a long term monitoring program would be instituted. This program would allow the effectiveness of the area wide LNAPL recovery system to be monitored and would be a component of the operation, maintenance, and monitoring for the property.

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TABLE 1
Nature and Extent of Contamination
September 2003 - December 2005

GROUNDWATER – Unfiltered – 3 Wells (Upgradient)	Constituents of Concern	Concentration Range Detected (ppb)[a]	SCG[1] (ppb)[a]	Frequency of Exceeding SCG
VOCs	MTBE	1 – 240	10	2 of 3
	TCE	ND – 21	5	2 of 3
Metals	Iron	73.9 – 4,370	300	2 of 3
	Manganese	48,700 – 63,100	300	3 of 3
	Sodium	145,000 – 213,000	20,000	3 of 3

GROUNDWATER – Unfiltered – 5 Wells (RADII Property)	Constituents of Concern	Concentration Range Detected (ppb)[a]	SCG[1] (ppb)[a]	Frequency of Exceeding SCG
VOCs	Chloroform	ND - 7.9	7	1 of 5
	1,2-dichloroethene	ND – 5.1	5	1 of 5
	MTBE	1.4 - 270	10	4 of 5
	Trichloroethene	ND - 17	5	1 of 5
	Vinyl Chloride	ND – 2.1	2	1 of 5
SVOCs	Benzo(a)pyrene	ND - 0.3	0.0	1 of 5
	Benzo(b)fluoranthene	ND - 0.3	0.002	1 of 5
	Benzo(k)fluoranthene	ND – 0.4	0.002	1 of 5
	Chrysene	ND - 0.3	0.002	1 of 5
	Indeno(1,2,3-cd)pyrene	ND - 0.3	0.002	1 of 5
Metals	Iron	266 – 19,200	300	4 of 5
	Magnesium	17,700 - 66,600	35,000	4 of 5
	Manganese	277 – 1,100	300	4 of 5
	Sodium	74,300 - 205,000	20,000	4 of 5

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TABLE 1

Nature and Extent of Contamination (Continued)

GROUNDWATER – Unfiltered – 2 Wells (Downgradient)	Constituents of Concern	Concentration Range Detected (ppb)[a]	SCG[1] (ppb)[a]	Frequency of Exceeding SCG
VOCs	Benzene	ND – 7.8	1	1 of 2
	Chloroethane	ND – 20	5	1 of 2
	MTBE	14 – 250	10	2 of 2
	TCE	ND – 16	5	1 of 2
Metals	Antimony	7.1 – 9.5	3	2 of 2
	Iron	631 – 28,900	300	2 of 2
	Manganese	977 – 1,040	300	2 of 2
	Sodium	43,400 – 172,000	20,000	2 of 2

SURFACE SOIL – (0-2 Inches)	Constituents of Concern	Concentration Range Detected (ppm)[b]	SCG[2] (ppm)[b]	Frequency of Exceeding SCG
PAH's (SVOCs)	Benzo(a)anthracene	0.25 - 1.4	0.224	5 of 5
	Benzo(a)pyrene	0.28 – 0.94	0.0609	5 of 5
	Benzo(k)fluoranthene	0.29 - 1.2	1.1	1 of 5
	Dibenz(a,h)anthracene	ND – 0.14	0.0143	1 of 5
	Chrysene	0.3 - 1.3	0.4	4 of 5
PCB/Pesticides	Total PCBs	ND - 15	1	1 of 5
Inorganic Compounds	Calcium	1,640 - 76,100	35,000	2 of 5
	Chromium	13.6 - 43.3	40	1 of 5
	Copper	25.3 - 388	50	3 of 5
	Lead	46.1 - 913	608	1 of 5
	Magnesium	1,520 - 22,000	5,000	3 of 5
	Nickel	11.7 - 27.3	25	2 of 5
	Zinc	66.2 - 294	50	5 of 5

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TABLE 1

Nature and Extent of Contamination (Continued)

SUBSURFACE SOIL (≥ 5 Feet)	Constituents of Concern	Concentration Range Detected (ppm)[b]	SCG[2] (ppm)[b]	Frequency of Exceeding SCG
VOCs	Acetone	ND - 8.4	0.11	12 of 46
	Benzene	ND - 0.63	0.06	9 of 46
	1,2-Dichlorobenzene	ND - 11	7.9	1 of 46
	1,1-Dichloroethane	ND - 13	0.2	3 of 46
	Ethylbenzene	ND - 11	5.5	3 of 46
	Methylene Chloride	ND - 1.1	0.1	2 of 46
	Tetrachloroethene	ND - 5.5	1.4	1 of 46
	Toluene	ND - 6.9	1.5	4 of 46
	Trichloroethene	ND - 3.5	0.7	3 of 46
	Vinyl Chloride	ND - 1.7	0.12	3 of 46
	Xylene (total)	ND - 33	1.2	16 of 46
SVOCs	2-Methylnaphthalene	ND - 56	36.4	2 of 46
	4-Methylphenol	ND - 2.3	0.9	1 of 46
	Benzo(a)anthracene	ND - 21	0.224	39 of 46
	Benzo(a)pyrene	ND - 52	0.0609	28 of 46
	Benzo(b)fluoranthene	ND - 7.8	1.1	13 of 46
	bis(2-Ethylhexyl)phthalate	ND - 120	435.0	1 of 46
	Chrysene	ND - 29	0.4	43 of 46
	Dibenzo(a,h)anthracene	ND - 14	0.0143	28 of 46
	Dibenzofuran	ND - 6.4	6.2	1 of 46
	Indeno(1,2,3-cd)pyrene	ND - 12	3.2	3 of 46
	Naphthalene	ND - 36	13	2 of 46
	Phenol	ND - 3.7	0.03	3 of 46
PCB/Pesticides	Total PCBs	ND - 10.2	10	1 of 46
Inorganic	Antimony	ND – 76.6	0.6	7 of 46

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TABLE 1

Nature and Extent of Contamination (Continued)

SUBSURFACE SOIL (> 5 Feet)	Constituents of Concern	Concentration Range Detected (ppm)[b]	SCG[2] (ppm)[b]	Frequency of Exceeding SCG
Compounds	Arsenic	ND - 332	15.5	12 of 46
	Beryllium	ND – 6.5	1.75	2 of 46
	Cadmium	ND - 16	1	5 of 46
	Calcium	187 – 37,800	35,000	2 of 46
	Chromium	1.4 – 57.1	40	1 of 46
	Copper	2.2 – 1,130	50	9 of 46
	Magnesium	88.2 – 11,800	5,000	4 of 46
	Mercury	ND - 27	0.2	5 of 46
	Nickel	ND - 98.3	25	4 of 46
	Selenium	ND - 125	3.9	1 of 46
	Zinc	ND – 1,310	50	14 of 46

Light Non-Aqueous Phase Liquid (LNAPL)		
	Distribution	In total, 10 pre-existing wells, and 29 wells that were installed as part of the RI (June 2005,) were utilized to determine the nature and extent of the LNAPL. The majority of the LNAPL mass is located on the Quanta Resources property. The extent of LNAPL diminishes significantly to the north and east. LNAPL was not detected on the South Capasso property which is located southwest (downgradient) of the Quanta Resources property.
	Characterization	The LNAPL detected on the Quanta Resources property is generally characterized as a viscous, weathered, and heterogeneous petroleum material predominately made up of high boiling point and low solubility petroleum hydrocarbons. This same characterization was also observed north (upgradient), east, and west of the Quanta Resources property.

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TABLE 1

Nature and Extent of Contamination (Continued)

Light Non-Aqueous Phase Liquid (LNAPL)		
	Mobility	The primary suspected LNAPL source area is the tank farm located in the northern portion of the Quanta Resources property. An additional source of LNAPL having more volatile and lower viscosity characteristics is also expected to be present on the North Capasso property. All primary sources of LNAPL were removed when the facility was decommissioned in 1982. The majority of the LNAPL mass is considered to be stable because of the high LNAPL viscosities, low LNAPL gradients, a diminished driving force that has resulted from source removal, and a transient groundwater mound located downgradient of the LNAPL on the South Capasso property.
Quanta Resources Property	**Viscosity**[3]	30.72 – 117.6 cSt (Average - 60.17 cSt)
	Specific Free Product Volume[4]	0.096 – 1.327 feet
	Total PCBs	0 – 88 ppm
	Total VOCs	134 – 1,816 ppm (Average – 568 ppm)
	Total SVOCs	1,026 – 2,227 ppm (Average – 1,440 ppm)
North Capasso Property - West	**Viscosity**[3]	21.81 – 54.99 cSt (Average – 35.15 cSt)
	Specific Free Product Volume[4]	0.0 – 0.397 feet
	Total PCBs	0 – 34 ppm
	Total VOCs	245 – 2,205 ppm (Average – 1,516 ppm)
	Total SVOCs	1,112 – 2,327 ppm (Average – 1,907 ppm)
Phoenix Beverages Property - East	**Viscosity**[3]	49.56 – 58.99 cSt (Average – 52.47 cSt)
	Specific Free Product Volume[4]	0.0 – 0.193 feet
	Total PCBs	0 ppm
	Total VOCs	105 – 160 ppm (Average – 135 ppm)
	Total SVOCs	1,195 – 1551 ppm (Average – 1,437 ppm)
South Capasso Property - South	LNAPL was not detected downgradient of the Quanta Resources property.	

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TABLE 1

Nature and Extent of Contamination (Continued)

Soil Vapor	Constituents of Concern	Concentration Range Detected (ug/m^3)	SCG[5]	Frequency of COC Detection
	Benzene	ND – 260 (6,100)*	NA	6 of 10
	Tetrachloroethene	ND – 48 (11,000)*	100	4 of 10
	Trichloroethene	ND – 190 (30,000)*	5	6 of 10
	Vinyl chloride	ND - 1,600	NA	9 of 10

*Ten soil vapor samples were at the RADII property. Concentrations of constituents of concern in soil vapor for samples collected at SV10, which is located immediately south of the western portion of the above ground tank field on the RADII property, are anomalous. Field observations indicate the localized presence of LNAPL at a depth of approximately 6 ft below ground surface (bgs). The concentrations of benzene, tetrachloroethene, and trichloroethene observed in soil vapor at SV-10 are significant higher than the concentrations of these compounds observed in the nine other soil vapor samples collected at the RADII property. The concentration range for constituents of concern provided above indicates the concentration range for soil vapor samples SV1 through SV9, with the concentration observed at SV-10 in parentheses.

Notes:

(a) ppb = parts per billion, which is equivalent to micrograms per liter, µg/L, in water;
(b) ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil

ND – Non-Detect – Indicates the constituent was not detected as qualified by a "U" or "UJ".
SCG – Standards, Criteria, and Guidance Values

(1) Groundwater: The TOGS 1.1.1 GA criteria include constituents that have a groundwater standard in 6 NYCRR Part 703, as well as constituents that have NYSDEC guidance values. Based on a review of the TOGS 1.1.1 GA criteria documentation, Class GA standards based on the protection of the use of groundwater as drinking water. However, groundwater in the near vicinity of the Quanta Resources property is not utilized for drinking water purposes. In fact, the nearest groundwater source used for drinking is expected to lie several miles from the Quanta Resources property. Therefore, comparing the on-property and off-property groundwater sample analysis results to the TOGS 1.1.1 GA criteria is a very conservative screening step since the exposure pathway used to develop the TOGS 1.1.1 GA criteria (groundwater as drinking water) is not applicable to the Quanta Resources property. Further, it should be noted that off-property sources have contributed to the VOCs detected on the Quanta Resources property, as discussed below for MTBE and TCE.

MTBE was detected at concentrations that exceeded the TOGS 1.1.1 GA criteria in deep wells GAGW-01, GAGW-02, and GAGW-05, and the shallow well GAGW-06I on the Quanta Resources property. However, as discussed in the RI Report (Section 5.1), MTBE was also detected in the North Capasso property deep wells GAGW-07 and GAGW-08 (150 ug/l and 240 ug/l, respectively) that are upgradient and / or crossgradient of the Site and upgradient wells MW-14S (21 ug/l) and at well MW-16 (170 ug/l) located along Review Avenue at concentrations exceeding

TOGS 1.1.1 GA groundwater criteria.

TCE was detected in the North Capasso property deep wells GAGW-07 and GAGW-08 (9.3 ug/l and 21 ug/l, respectively) that are upgradient and / or crossgradient of the Quanta Resources property and at upgradient well MW-14D (14 ug/l and 9 ug/l) located along Review Avenue at concentrations exceeding TOGS 1.1.1 GA groundwater criteria. TCE was also detected in Quanta Resources property well GAGW-05 at concentrations lower than in North Capasso well GAGW-08.

(2) Surface Soil and Subsurface Soil: The TAGM 4046 soil objectives are based on the criterion that produces the most stringent value using basis A, B, and C for organic chemicals, and basis A, B, and D for metals. If basis A and/or B are below basis D for a metal, its background value (basis D) should be used as the cleanup objective. Cleanup objectives developed using this approach are, at a minimum, set above the method reporting limit (MDL) and it is preferable to have the TAGM 4046 soil cleanup objectives above the Contract Required Quantitation Limit (CRQL) as defined by NYSDEC.

Basis A, B, and C are conservative for the current and projected future use of the Quanta Resources property. Basis A and B consider a residential exposure scenario, which is not applicable to the Quanta Resources property. The current use of the Quanta Resources and surrounding properties is industrial and the future use of the Quanta Resources property will remain industrial as future commercial/light industrial development is being planned and deed restrictions will prohibit residential development. In addition, current land zoning for the Quanta Resources property is heavy manufacturing. Therefore, since the Quanta Resources property will not be used for residential purposes (Basis A and B) and groundwater will not be used for drinking purposes (Basis C), the exposure pathways on which the TAGM 4046 soil objectives are based do not apply to the Quanta Resources property. Nonetheless, the TAGM 4046 soil objectives are used for comparison to the surface and subsurface fill/soil sample analyses results as a conservative screening step.

(3) cSt – Centistokes – Viscosity measured at 15 degrees C (59 degrees F) which was the average temperature of the LNAPL as measured during the RI. Petroleum products at 15 degrees C and 0% weathering have the following viscosity: Diesel Fuel – 1.5 cSt; #4 Fuel Oil – 33 to 79 cSt; and, Motor Oil – 256 cSt (Environmental Contaminants Encyclopedia, National Parks Service, July 1997).

(4) Based on the American Petroleum Institutes (API) "multiphase" conceptualization, the measured thickness of LNAPL in a well may not be representative of the total volume of LNAPL in the soil at that location. In fact, the volume of LNAPL in the formation is often much less than the measured LNAPL thickness at a monitoring well might suggest (API, 2004). A better, more realistic expression of the volume of LNAPL in soil at a well location has been developed by the API and is called the "specific free-product volume." The specific free-product volume is defined as the total volume of LNAPL per unit area in the vicinity of a monitoring well. This total volume comprises a non-mobile portion (residual phase or residual LNAPL) that is bound within the soil matrix and a potentially mobile portion (free phase or free LNAPL). It is important to note that while a free phase LNAPL may exist at a well, it is not necessarily mobile, since a driving force is necessary for LNAPL migration to occur. Appendix L of the RI Report (June 2005) provides a more detailed discussion on estimation of specific free product volume.

(5) Soil Vapor : SCGs for trichloroethene (TCE) and tetratchloroethene (PCE) are derived from Table 3.1 of the Draft NYSDOH CEH BEEI Soil Vapor Intrusion Guidance (February 2005).

TABLE 2
REMEDIAL ALTERNATIVE COSTS
QUANTA RESOURCES SITE
LONG ISLAND CITY, NEW YORK

Remedial Alternative	Capital Cost	Average Annual OM&M (Year 1-5)	Average Annual OM&M (Year 6-30)	Total Present Worth	Theoretical Volume of LNAPL Recovered[1] (gallon)
A - No Further Action	$0	$0	$0	$0	0
B - Perimeter LNAPL Recovery via Single-Phase LNAPL Extraction	$4,323,000	$138,000	$45,200	$6,143,000	17,000
C - Area-Wide LNAPL Recovery via Single-Phase LNAPL Recovery	$6,860,000	$204,000	$88,400	$10,090,000	50,000
D - Area-Wide LNAPL Recovery via Vacuum Enhanced Recovery	$9,950,000	$618,000	$2,400	$13,100,000	175,000
E - Area-Wide LNAPL Recovery via Vacuum-Enhanced Recovery and Localized Heating	$10,930,000	$522,000	$2,400	$13,600,000	180,000
F - Area-Wide LNAPL Recovery via a Combination of Single-Phase, Vacuum-Enhanced Recovery and Localized Soil	$12,280,000	$530,000	$28,800	$15,650,000	195,000

Notes:

[1] - The theoretical amount recovered by an alternative is a gross estimate based on Golder Associates' experience at other sites and site conditions. The actual amount recovered by an alternative may vary considerably from what is estimated based on the technology's limitations and local site conditions. Therefore, these amounts have only been provided as one of several means to evaluate and compare the alternatives under consideration and should not be used as performance standards or goals for a given alternative.

1000 0 1000
FEET
SCALE

REFERENCES

1.) MAP TAKEN FROM U.S.G.S. 7.5 MINUTE QUADRANGLE OF BROOKLYN, NEW YORK, DATED 1967 (PHOTOREVISED 1979).

2.) COORDINATE SYSTEM IN NEW YORK STATE PLANE NAD 83.

Golder Associates
Philadelphia USA

FILE No.	0236151P001
PROJECT No.	023-6151 REV. 0

SCALE	AS SHOWN
DATE	02/24/06
DESIGN	AM
CADD	AM
CHECK	SDM
REVIEW	RSW

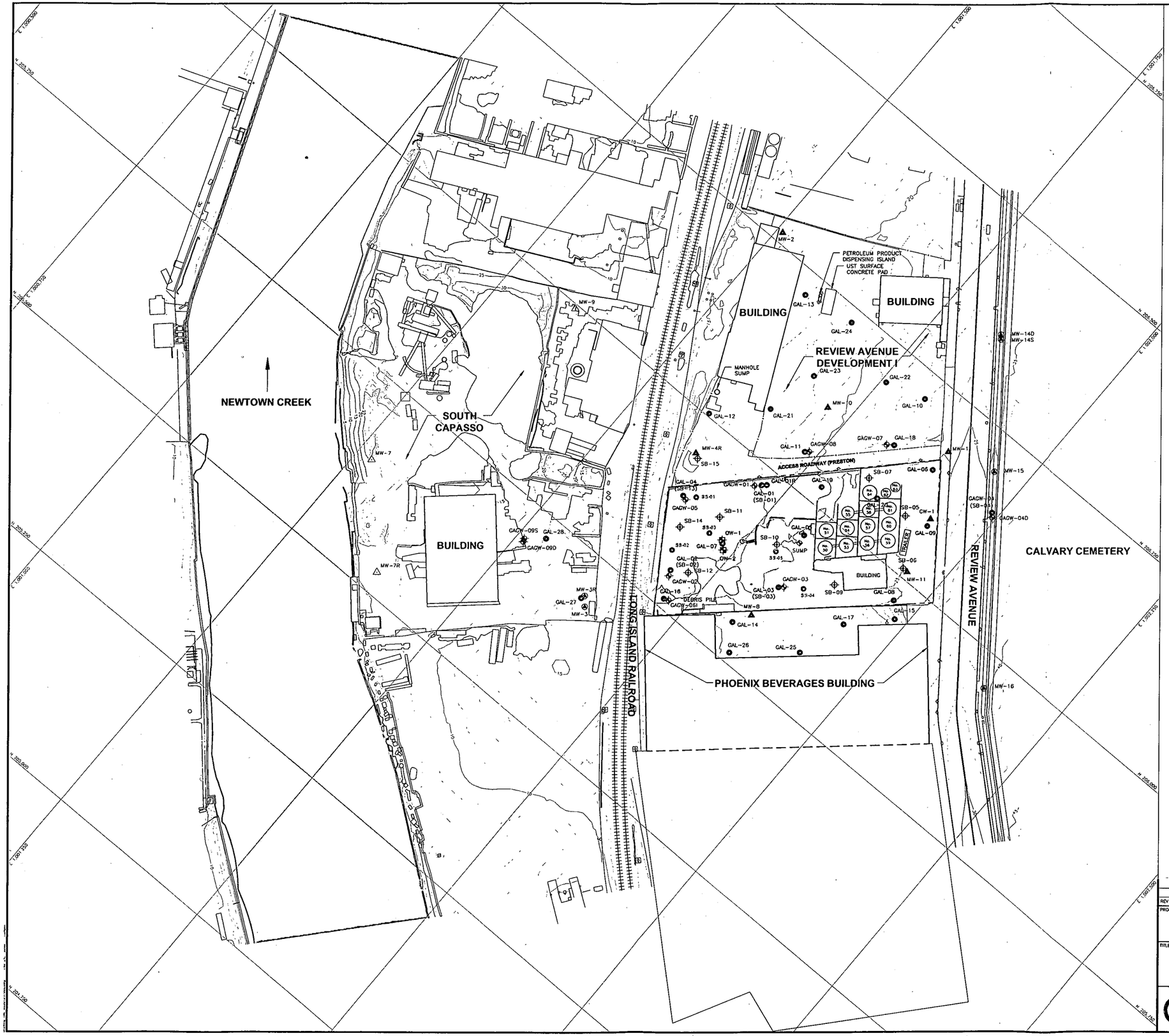
TITLE

QUANTA RESOURCES
REVIEW AVENUE DEVELOPMENT II
SITE NUMBER 2-41-005

QUANTA RESOURCES SITE

FIGURE 1

Drawing file: 0236151P001.dwg Feb 24, 2006 - 1:35pm



LEGEND

- REVIEW AVENUE DEVELOPMENT II
- SURFICIAL SOIL SAMPLE LOCATIONS
- LNAPL MONITORING WELL (GOLDER ASSOCIATES 2003/2004/2005) (SEE REFERENCE 2)
- SHALLOW GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2004 AND 2005) (SEE REFERENCE 2)
- DEEP GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2003/2004/2005) (SEE REFERENCE 2)
- SOIL BORING (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
- ROEHR CHEMICAL INVESTIGATION WELL LOCATION (NOVEMBER 2000) (SEE REFERENCE 2)
- EXISTING ON-SITE AND OFF-SITE MONITORING WELL LOCATION (SEE REFERENCE 2)
- EXISTING OFF-SITE MONITORING WELL LOCATION (LOCATION APPROXIMATE)
- SUMP (SEE REFERENCE 2)
- LNAPL PILOT TEST STUDY OBSERVATION WELL (GOLDER ASSOCIATES 2004) (SEE REFERENCE 2)
- EXISTING OFF-PROPERTY MONITORING WELL LOCATIONS (SEE REFERENCES 5 AND 6)
- EXISTING ABOVE GROUND TANK (REPORTED TO BE EMPTY AND DECONTAMINATED)
- QUANTA PROPERTY BOUNDARY (SEE REFERENCE 3)
- RAILROAD
- FENCE LINE
- 20 — 5 FOOT CONTOUR LINE (FT.-MSL)
- 1 FOOT CONTOUR LINE (FT.-MSL)

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 2148.dwg, ENTITLED TOPOGRAPHIC SURVEY OF QUANTA RESOURCES SUPERFUND SITE, LONG ISLAND CITY, NY, PROVIDED BY GEOD CORPORATION, DATED JANUARY 11, 2004.

2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILES Quanta Samples and Wells.xls, 2148A 8-23-04.xls, 2148A 4-11-05.xls, AND 2340 MONITORING WELLS.XLS, PROVIDED BY GEOD CORP.

3.) PROPERTY BOUNDARY TAKEN FROM DIGITAL FILE 2148 Boundary.dwg, TITLED "MAP SHOWING BOUNDARY OF BLOCK 312 LOT 69", DATED APRIL 29, 2004, PROVIDED BY GEOD CORP.

4.) DEBRIS PILE BOUNDARY REVISED PER FIELD OBSERVATIONS MADE BY GOLDER ASSOCIATES PERSONNEL DURING SITE VISITS.

5.) LOCATION OF MW-9 DIGITIZED FROM HARDCOPY FIGURE TITLED "GROUNDWATER CONTOURS", PROVIDED BY HALEY & ALDRICH, DATED FEBRUARY 2004.

6.) LOCATION OF MW-7 DIGITIZED FROM HARDCOPY FIGURE TITLED "SITE PLAN WITH SITE INVESTIGATION BORING LOCATIONS", PROVIDED BY ENVIRON, DATED SEPTEMBER 2000.

50 0 50 100
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT
QUANTA RESOURCES
REVIEW AVENUE DEVELOPMENT II
SITE NUMBER 2-41-005
QUEENS COUNTY, NEW YORK

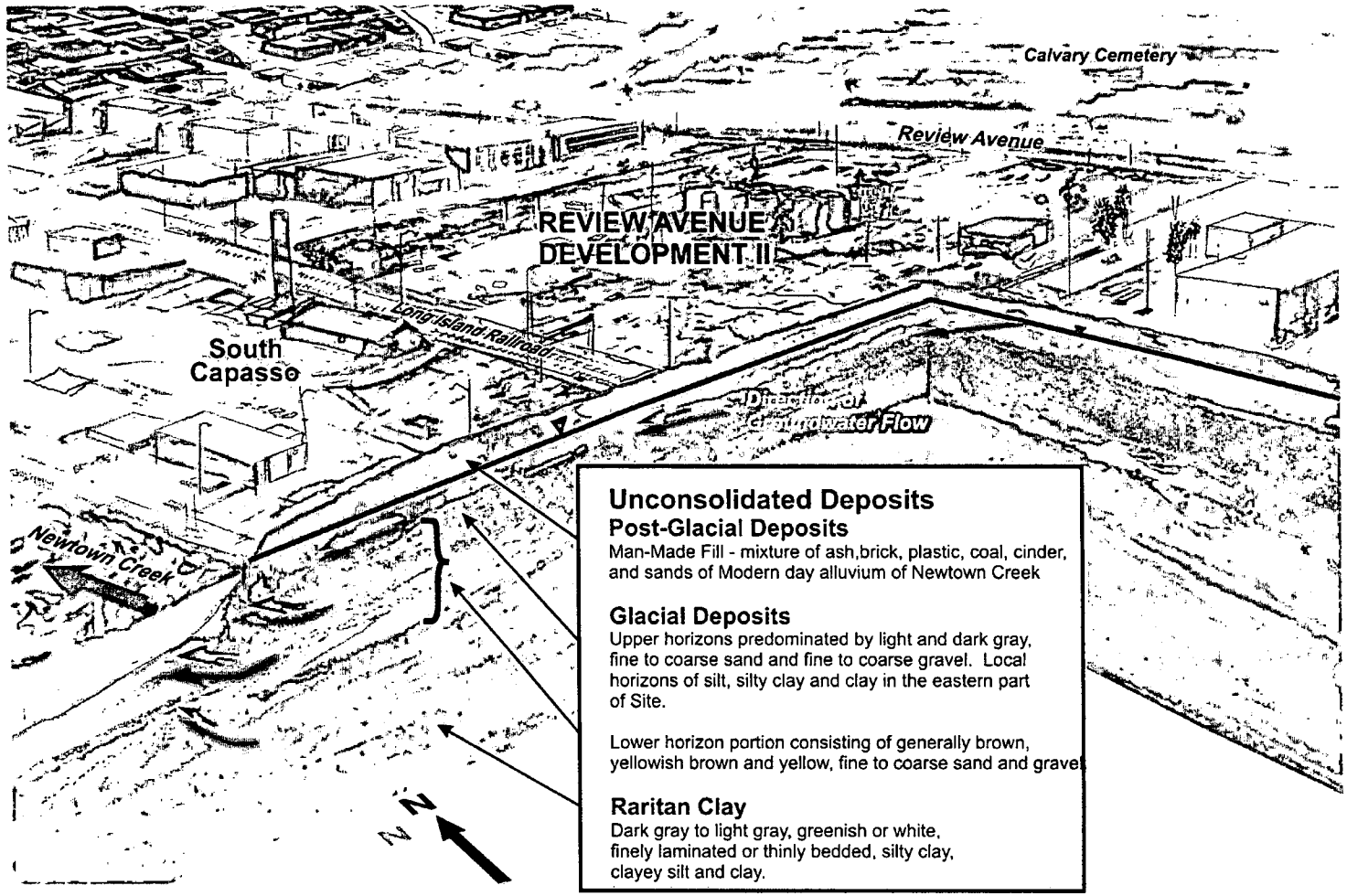
TITLE
REMEDIAL INVESTIGATION MONITORING POINTS AND VICINITY PLAN

Golder Associates
Philadelphia USA

PROJECT No.	023-6151	FILE No.	0236151P002	
DESIGN	SDM	11/03/05	SCALE AS SHOWN	REV. 0
CADD	AM	02/24/06	FIGURE 2	
CHECK	SDM	02/24/06		
REVIEW	RSW	02/24/06		

Drawing file: 0236151P003.dwg Feb 24, 2006 – 1:33pm

CONCEPTUAL SITE HYDROGEOLOGIC MODEL



Unconsolidated Deposits

Post-Glacial Deposits
Man-Made Fill - mixture of ash,brick, plastic, coal, cinder, and sands of Modern day alluvium of Newtown Creek

Glacial Deposits
Upper horizons predominated by light and dark gray, fine to coarse sand and fine to coarse gravel. Local horizons of silt, silty clay and clay in the eastern part of Site.

Lower horizon portion consisting of generally brown, yellowish brown and yellow, fine to coarse sand and gravel

Raritan Clay
Dark gray to light gray, greenish or white, finely laminated or thinly bedded, silty clay, clayey silt and clay.

FIGURE 3

PROJECT No.	023-6151	
FILE No.	0236151P003	
REV. 0	SCALE AS SHOWN	
DESIGN	RV	06/01/05
CADD	AM	02/24/06
CHECK	SDM	02/24/06
REVIEW	RSW	02/24/06

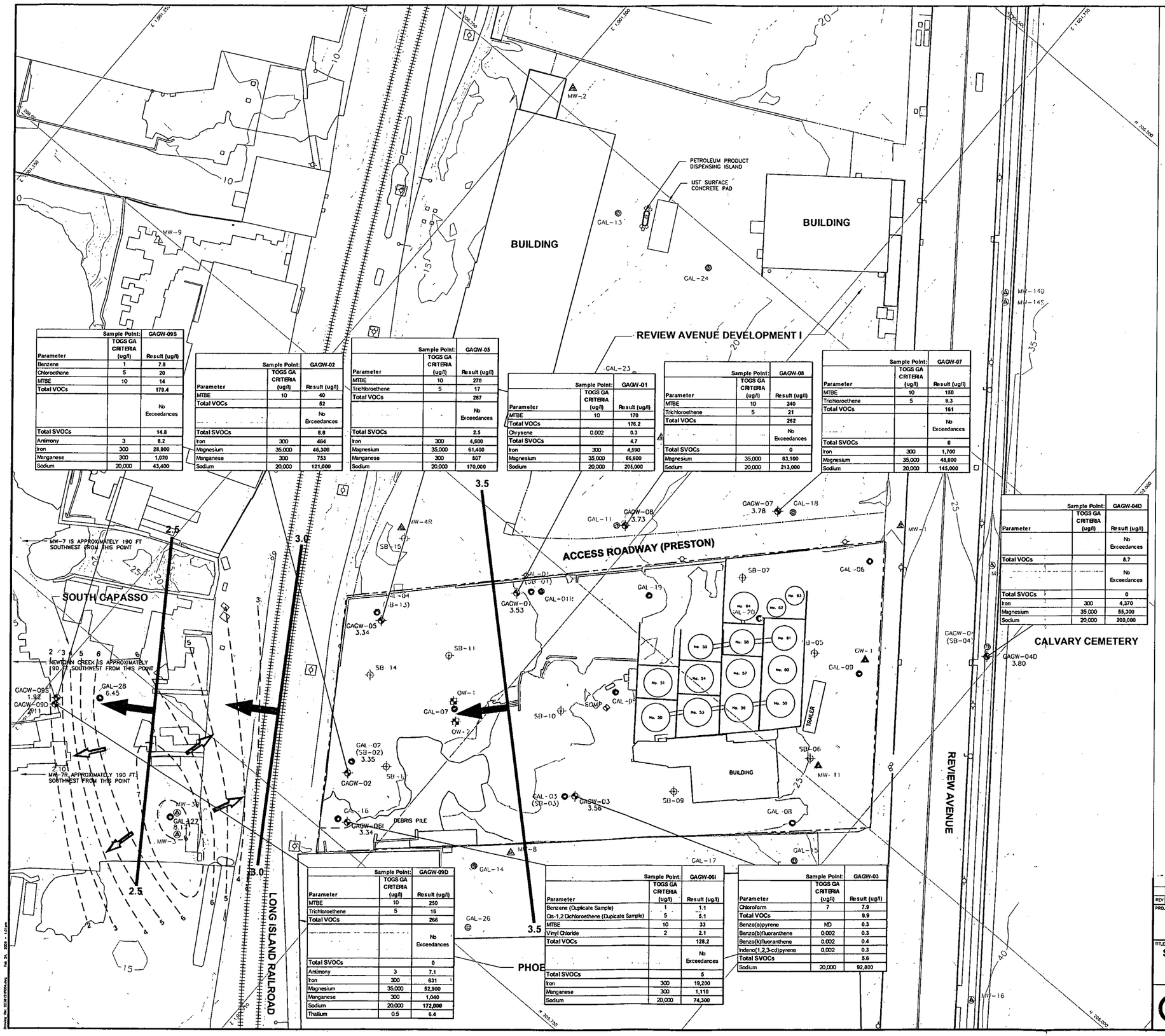
TITLE

CONCEPTUAL SITE HYDROGEOLOGIC MODEL

PROJECT

QUANTA RESOURCES
REVIEW AVENUE DEVELOPMENT II
SITE NUMBER 2-41-005
QUEENS COUNTY, NEW YORK

Golder Associates
Philadelphia USA



Parameter	Sample Point: TOGS GA CRITERIA (ug/l)	GAGW-09S Result (ug/l)
Benzene	1	7.8
Chloroethane	5	20
MTBE	10	14
Total VOCs		179.4
...		No Exceedances
Total SVOCs		14.8
Antimony	3	8.2
Iron	300	28,900
Manganese	300	1,020
Sodium	20,000	43,400

Parameter	Sample Point: TOGS GA CRITERIA (ug/l)	GAGW-02 Result (ug/l)
MTBE	10	40
Total VOCs		52
...		No Exceedances
Total SVOCs		8.8
Iron	300	464
Magnesium	35,000	46,300
Manganese	300	753
Sodium	20,000	121,000

Parameter	Sample Point: TOGS GA CRITERIA (ug/l)	GAGW-05 Result (ug/l)
MTBE	10	270
Trichloroethene	5	17
Total VOCs		287
...		No Exceedances
Total SVOCs		2.5
Iron	300	4,600
Magnesium	35,000	61,400
Manganese	300	807
Sodium	20,000	170,000

Parameter	Sample Point: TOGS GA CRITERIA (ug/l)	GAGW-01 Result (ug/l)
MTBE	10	170
Total VOCs		176.2
Chrysene	0.002	0.3
Total SVOCs		4.7
Iron	300	4,590
Magnesium	35,000	66,600
Sodium	20,000	205,000

Parameter	Sample Point: TOGS GA CRITERIA (ug/l)	GAGW-08 Result (ug/l)
MTBE	10	240
Trichloroethene	5	21
Total VOCs		262
...		No Exceedances
Total SVOCs		0
Magnesium	35,000	63,100
Sodium	20,000	213,000

Parameter	Sample Point: TOGS GA CRITERIA (ug/l)	GAGW-07 Result (ug/l)
MTBE	10	150
Trichloroethene	5	9.3
Total VOCs		161
...		No Exceedances
Total SVOCs		0
Iron	300	1,700
Magnesium	35,000	48,000
Sodium	20,000	145,000

Parameter	Sample Point: TOGS GA CRITERIA (ug/l)	GAGW-04D Result (ug/l)
...		No Exceedances
Total VOCs		8.7
...		No Exceedances
Total SVOCs		0
Iron	300	4,370
Magnesium	35,000	55,300
Sodium	20,000	200,000

Parameter	Sample Point: TOGS GA CRITERIA (ug/l)	GAGW-09D Result (ug/l)
MTBE	10	250
Trichloroethene	5	16
Total VOCs		266
...		No Exceedances
Total SVOCs		0
Antimony	3	7.1
Iron	300	631
Magnesium	35,000	52,900
Manganese	300	1,040
Sodium	20,000	172,000
Thallium	0.5	6.4

Parameter	Sample Point: TOGS GA CRITERIA (ug/l)	GAGW-06I Result (ug/l)
Benzene (Duplicate Sample)	1	1.1
Cis-1,2 Dichloroethene (Dupicate Sample)	5	5.1
MTBE	10	33
Vinyl Chloride	2	2.1
Total VOCs		128.2
...		No Exceedances
Total SVOCs		5
Iron	300	19,200
Manganese	300	1,110
Sodium	20,000	74,300

Parameter	Sample Point: TOGS GA CRITERIA (ug/l)	GAGW-03 Result (ug/l)
Chloroform	7	7.9
Total VOCs		9.9
Benzo(a)pyrene	ND	0.3
Benzo(b)fluoranthene	0.002	0.3
Benzo(k)fluoranthene	0.002	0.4
Indeno(1,2,3-cd)pyrene	0.002	0.3
Total SVOCs		5.6
Sodium	20,000	92,800

LEGEND

- REVIEW AVENUE DEVELOPMENT II
- SHALLOW GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2004 AND 2005) (SEE REFERENCE 2)
- DEEP GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2003/2004/2005) (SEE REFERENCE 2)
- LNAPL MONITORING WELL (GOLDER ASSOCIATES 2003/2004/2005) (SEE REFERENCE 2)
- LNAPL MONITORING WELL (GOLDER ASSOCIATES 2003/2004/2005) (SEE REFERENCE 2)
- SOIL BORING (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
- ROEHR CHEMICAL INVESTIGATION WELL LOCATION (NOVEMBER 2000) (SEE REFERENCE 2)
- EXISTING ON-PROPERTY AND OFF-PROPERTY MONITORING WELL LOCATION (SEE REFERENCE 2)
- EXISTING OFF-PROPERTY MONITORING WELL LOCATION (LOCATION APPROXIMATE)
- SUMP (SEE REFERENCE 2)
- LNAPL PILOT TEST STUDY OBSERVATION WELL (SEE REFERENCE 2)
- EXISTING OFF-PROPERTY MONITORING WELL LOCATIONS (SEE REFERENCES 5 AND 6)
- EXISTING ABOVE GROUND TANK (REPORTED TO BE EMPTY AND DECONTAMINATED)
- 3.6 — INTERPRETED GROUNDWATER CONTOUR (OCTOBER 17, 2005) (DEEP MONITORING WELLS)
- INTERPRETED GROUNDWATER FLOW DIRECTION
- 3.34 — GROUNDWATER ELEVATION (FT.-MSL)
- 6 — INTERPRETED GROUNDWATER CONTOUR (OCTOBER 17, 2005) (DASHED WHERE INFERRED) (SHALLOW MONITORING WELLS)
- INTERPRETED GROUNDWATER FLOW DIRECTION
- 6.45 — GROUNDWATER ELEVATION (FT.-MSL)
- QUANTA PROPERTY BOUNDARY (SEE REFERENCE 3)
- RAILROAD
- FENCE LINE
- 20 — 5 FOOT CONTOUR LINE (FT.-MSL)
- 1 FOOT CONTOUR LINE (FT.-MSL)

NOTES

1.) FIGURE SHOWS GROUNDWATER QUALITY EXCEEDANCES (RED) BASED ON COMPARISON OF REPORTED ANALYTICAL RESULTS FROM SAMPLING EVENTS CONDUCTED IN JANUARY 2004 (GAGW-01, GAGW-02, GAGW-03, AND GAGW-05), AUGUST 2004 (GAGW-04D, GAGW-06I, GAGW-07 AND GAGW-08) AND OCTOBER 2005 (GAGW-09S AND GAGW-09D) TO THE NEW YORK STATE TOGS 1.1.1 CLASS GA GROUNDWATER CRITERIA (OCTOBER 1993, REVISED JUNE 1998 AND APRIL 2000 ADDENDUM). METAL CONCENTRATIONS THAT EXCEED THE TOGS GA CRITERIA AND ARE LESS THAN BACKGROUND GROUNDWATER CONCENTRATIONS (GAGW-04D) ARE IN BLUE.

2.) ALL RESULTS ARE SHOWN IN UG/L (PPB).

3.) THERE WERE NO DETECTIONS OF PCB'S.

4.) FT-MSL - FEET MEAN SEA LEVEL

5.) ND - NOT DETECTED

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 2148.dwg, ENTITLED TOPOGRAPHIC SURVEY OF QUANTA RESOURCES SUPERFUND SITE, LONG ISLAND CITY, NY, PROVIDED BY GEOD CORPORATION, DATED JANUARY 11, 2004.

2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILES Quanta Samples and Wells.xls, 2148A 8-23-04.xls, 2148A 4-11-05.xls, AND 2340 MONITORING WELLS.XLS, PROVIDED BY GEOD CORP.

3.) PROPERTY BOUNDARY TAKEN FROM DIGITAL FILE 2148 Boundary.dwg, TITLED "MAP SHOWING BOUNDARY OF BLOCK 312 LOT 69", DATED APRIL 29, 2004, PROVIDED BY GEOD CORP.

4.) DEBRIS PILE BOUNDARY REVISED PER FIELD OBSERVATIONS MADE BY GOLDER ASSOCIATES PERSONNEL DURING SITE VISITS.

5.) LOCATION OF MW-9 DIGITIZED FROM HARDCOPY FIGURE TITLED "GROUNDWATER CONTOURS", PROVIDED BY HALEY & ALDRICH, DATED FEBRUARY 2004.

6.) LOCATION OF MW-7 DIGITIZED FROM HARDCOPY FIGURE TITLED "SITE PLAN WITH SITE INVESTIGATION BORING LOCATIONS", PROVIDED BY ENVIRON, DATED SEPTEMBER 2000.

25 0 25 50
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

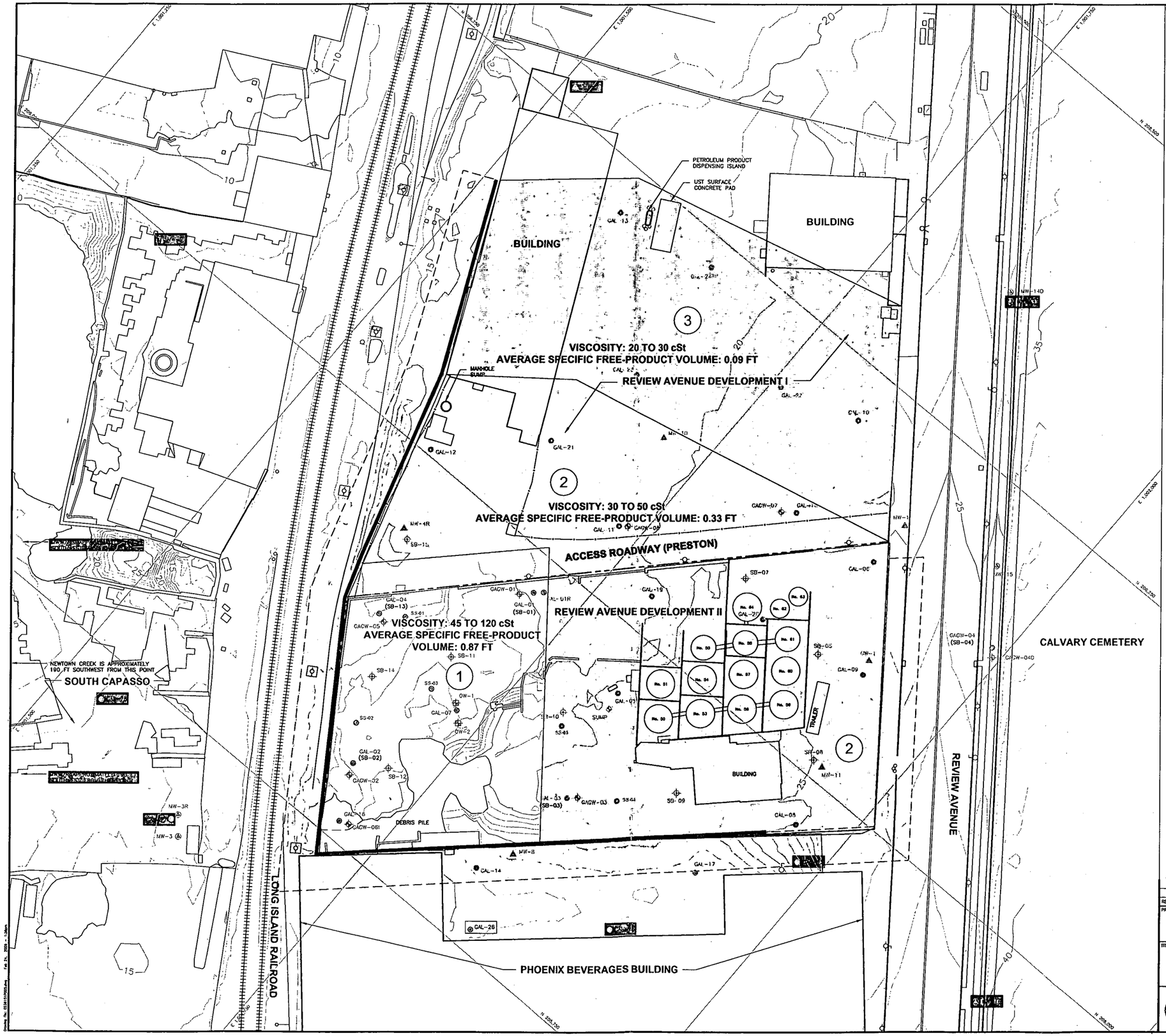
PROJECT
QUANTA RESOURCES
REVIEW AVENUE DEVELOPMENT II
SITE NUMBER 2-41-005
QUEENS COUNTY, NEW YORK

TITLE
SUMMARY OF GROUNDWATER EXCEEDANCES OF THE NEW YORK STATE TOGS 1.1.1 CLASS GA GROUNDWATER CRITERIA

Golder Associates
Philadelphia USA

PROJECT No.	023-6151	FILE No.	0236151P004
DESIGN	SDW 11/03/05	SCALE	AS SHOWN REV. 0
CADD	AM 02/24/06		
CHECK	SDW 02/24/06		
REVIEW	RSW 02/24/06		

FIGURE 4



LEGEND

- SURFICIAL SOIL SAMPLE LOCATIONS
- LNAPL MONITORING WELL (GOLDER ASSOCIATES 2003/2004/2005) (SEE REFERENCE 2)
- SHALLOW GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2004) (SEE REFERENCE 2)
- DEEP GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
- SOIL BORING (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
- ROEHR CHEMICAL INVESTIGATION WELL LOCATION (NOVEMBER 2000) (SEE REFERENCE 2)
- EXISTING ON-PROPERTY AND OFF-PROPERTY MONITORING WELL LOCATION (SEE REFERENCE 2)
- EXISTING OFF-PROPERTY MONITORING WELL LOCATION (LOCATION APPROXIMATE)
- SUMP (SEE REFERENCE 2)
- LNAPL PILOT TEST STUDY OBSERVATION WELL (SEE REFERENCE 2)
- EXISTING OFF-PROPERTY MONITORING WELL LOCATIONS (SEE REFERENCES 5 AND 6)
- EXISTING ABOVE GROUND TANK (REPORTED TO BE EMPTY AND DECONTAMINATED)
- QUANTA PROPERTY BOUNDARY (SEE REFERENCE 3)
- RAILROAD
- FENCE LINE
- 5 FOOT CONTOUR LINE (FT.-MSL)
- 1 FOOT CONTOUR LINE (FT.-MSL)
- APPROXIMATE OUTLINE OF CONTAINMENT BOUNDARY
- LNAPL NOT PRESENT (SEE NOTE 1)
- MEASURED LNAPL THICKNESS ONLY 0.3 FEET AS MEASURED ON APRIL 17, 2005. SPECIFIC FREE-PRODUCT VOLUME ONLY 0.019 FEET
- CONCEPTUAL LNAPL RECOVERY ZONE 1 (SEE NOTE 2)
- CONCEPTUAL LNAPL RECOVERY ZONE 2 (SEE NOTE 2)
- CONCEPTUAL LNAPL RECOVERY ZONE 2 (SEE NOTE 2)
- APPROXIMATE AREA WITHIN AN ESTIMATED 25 FOOT RADIUS OF INFLUENCE FOR A SINGLE VACUUM ENHANCED RECOVERY WELL

NOTES

1.) DURING THE RI, LNAPL WAS NOT OBSERVED IN WELLS MW-2, MW-7R, MW-14S, MW-16S, GAL-15, GAL-27 AND GAL-28. PRIOR TO THE RI, LNAPL HAD NOT BEEN OBSERVED IN WELLS MW-7 AND MW-9. THE LAST MEASUREMENT COLLECTED AT MW-7 WAS ON OCTOBER 3, 2000 AND FEBRUARY 11, 2003 AT MW-9. GOLDER WAS NOT ABLE TO LOCATE MW-7 AND WAS NOT PROVIDED ACCESS TO THE PROPERTY WHERE MW-9 IS LOCATED.

2.) CONCEPTUAL LNAPL RECOVERY ZONES ARE DISCUSSED IN SECTION 8.4.3 OF THE FEASIBILITY STUDY REPORT.

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 2148.dwg, ENTITLED TOPOGRAPHIC SURVEY OF QUANTA RESOURCES SUPERFUND SITE, LONG ISLAND CITY, NY, PROVIDED BY GEOD CORPORATION, DATED JANUARY 11, 2004.

2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILE Quanta Samples and Wells.xls, 2148A 8-23-04.xls AND 2148A 4-11-05.xls, PROVIDED BY GEOD CORP.

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SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT
QUANTA RESOURCES
REVIEW AVENUE DEVELOPMENT II
SITE NUMBER 2-41-005
QUEENS COUNTY, NEW YORK

TITLE
CONCEPTUAL RECOVERY ZONES

Golder Associates
Philadelphia USA

PROJECT No.	023-8151		FILE No.	0238151P005	
DESIGN	SDM	06/02/06	SCALE	AS SHOWN	REV. 0
CADD	AM	02/24/06			
CHECK	SDM	02/24/06			
REVIEW	RSW	02/24/06			

FIGURE 5

END

OF

DOCUMENT