PROPOSED REMEDIAL ACTION PLAN

Columbia Cement Company, Inc. Site

Operable Unit No. 1

Freeport, Town of Hempstead, Nassau County, New York

Site No. 1-30-052

February 2008

Prepared by:

Division of Environmental Remediation
New York State Department of Environmental Conservation

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SECTION 1: SUMMARY AND PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), is proposing a remedy for the Columbia Cement Company (CCC), Inc. Site Operable Unit No. 1. Operable Unit No.1 consists of the on-site project area owned by Illinois Tool Works (ITW), which is approximately 2 acres. Operable Unit No. 2 includes the off-site area immediately surrounding the 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, a spill of 3,500 gallons of 1,1,1-Trichloroethane (1,1,1-TCA) has resulted in the disposal of hazardous wastes, including contaminants such as volatile organic compounds (VOCs). These wastes have contaminated the soils, groundwater and soil vapor at the site, and have resulted in:

- a significant threat to human health associated with potential exposure to contaminated soils, groundwater and soil vapor; and
- a significant environmental threat associated with the current impacts of contaminants to the groundwater of underlying sole source aquifer.

To eliminate or mitigate these threats, the Department proposes *in situ* chemical oxidation (ISCO) for the contaminated soils in the source area, *in situ* bioremediation for the contaminated groundwater, a sub-slab depressurization system (SSDS) for the existing building and an environmental easement with periodic certification.

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 Department will select a final remedy for the site only after careful consideration of all comments received during the public comment period.

The Department 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 December 2006 Supplemental Remedial Investigation (RI) Report, the December 2003 RI Report, the February 2008 Feasibility Study (FS) Report, and other relevant documents. The public is encouraged to review the project documents, which are available at the following repositories:

Freeport Memorial Library-Reference Section
144 West Merrick Road
Freeport, New York 11520
Phone: (516) 379- 3274
Hours: Mon, Tues, Thurs, & Fri: 9 a.m. - 9 p.m.
Wednesday: 10 a.m. - 9 p.m.
Saturday
Sept-June : 9 a.m. - 5 p.m.
July-August: 9 a.m. -1 p.m.
Sun (Sept - May): 1 p.m. - 5 p.m.

NYSDEC Region One Headquarters
Division of Environmental Remediation
SUNY @ Stony Brook
50 Circle Road
Stony Brook, NY 11790-3409
Attention: Girish Desai
Phone: (631) 444- 0243
Mon - Fri: 8:30 a.m. - 4:45 p.m.

The Department seeks input from the community on all PRAPs. A public comment period has been set from February 13, 2008 to March 14, 2008 to provide an opportunity for public participation in the remedy selection process. A public meeting is scheduled for February 28, 2008, at the Freeport Memorial Library located at 144 West Merrick Road in Freeport, New York, beginning at 7 p.m.

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. Desai, project manager at the above address through March 14, 2008.

The Department 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 Department's final selection of the remedy for this site.

SECTION 2: SITE LOCATION AND DESCRIPTION

Operable Unit (OU) No. 1, which is the subject of this document, consists of the on-site project area which is 2 acres. An operable unit represents a portion of the site remedy that for technical or administrative reasons can be addressed separately to eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination. The remaining Operable Unit 2 for this site is the off-site area immediately surrounding the site.

The Columbia Cement Company site is located at 159 Hanse Avenue in Freeport, Nassau County, New York. The site is approximately 2 acres in size and located in an industrial/commercial area of Freeport. For the site location, please see Figure 1. The site is bordered by a former CCC warehouse and parking spaces to the north. Rohm & Haas Electronic Components borders the property to the east. The Knickerbocker building, with multiple tenants, is located to the south of the property. The property is bordered by Hanse Avenue to the West. Farber Plastics and Love & Quiches Bakery is located on the opposite (west) side of Hanse Avenue. A site plan is presented as Figure 2. The site building covers approximately 65,000 square feet, and consists of former offices, material storage, production rooms, and warehousing. Freeport Creek is located 500 feet (ft) west of the site and Stadium Park Canal is 1,000 ft east of the site. Stadium Park Canal merges with Freeport Creek approximately 1,500 ft southeast of the site. From this point, surface water flows south through tidal marshes to the Atlantic Ocean, approximately 5 miles south of the site. The site is very flat, ranging from 5 to 10 ft above Mean Sea Level. Surface water at the site drains to the west toward Freeport Creek. Storm drains located on site also drain to Freeport Creek.

The site is currently vacant. Current land use of the site is industrial. CCC was the first occupant of the site building since 1969. Prior to 1969, the Village of Freeport operated a municipal landfill within this area of Freeport before its development for commercial/industrial use.

The site geology consists of five stratigraphic units beneath the site. In order of increasing depth, these units are: fill material; tidal marsh deposits; gravelly sand; gray clay and silt; and gray sand. The fill material is encountered across the entire site and consists of reworked native soil and various debris related to previous site use as a municipal landfill. The fill material is present with an average thickness of about 11 ft. The tidal marsh deposits are encountered beneath the fill material over most of the site. The tidal marsh deposits are encountered at an average depth of 9.5 ft and has an average thickness of 4 ft. The gravelly sand unit is encountered beneath the tidal marsh deposits, and beneath the fill material where the tidal marsh deposits are absent. The gravelly sand thickness ranges from 15 to 30 ft. The gray clay and silt underlie the gravelly sand. This unit ranges in thickness from 20 to 30 ft beneath the site. The shallow water-bearing units beneath the site are not utilized as a drinking water source. Deeper confined units include the Jameco, Magothy and Lloyd aquifers, which are used for drinking water in some areas of Long Island. Due to saltwater encroachment near the southern shore of Long Island, these units are not a source of drinking water near the site. Groundwater beneath the site is classified as Class GA. Groundwater at the Site is encountered between 5.5 and 8.0 ft below ground surface (bgs). Deep monitoring wells are screened at the base of the gravelly sand. The shallow unconfined groundwater discharges to Freeport Creek. The gray clay and silt unit acts as a lower confining layer or aquitard, separating the water table aquifer from the underlying gray sand. The gray sand is a separate confined water-bearing unit.

Groundwater flows primarily to the west, however, due to the site's location, groundwater levels exhibit tidal influences, as described below. The tidal range is greatest to the west, suggesting a greater hydraulic connection to Freeport Creek than to Stadium Park Canal. The mean tide flow direction is east to west. See Figure 3.

During a high tide, flow was generally to the west with a very shallow hydraulic gradient. During low tide, a groundwater divide forms in the north-central portion of the site. Groundwater east of this divides flows to the east and groundwater west of the divide flows to the west. Based on this observation, the gradient in the spill area alternates from east to west with a very minimal gradient in both directions. This alternating flow direction should serve to minimize contaminant transport from the site.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

Columbia Cement Company manufactured various grades of contact cement and other industrial/commercial adhesives at the site since 1969. The southeastern portion of the site was served as an unloading and storage area for process chemicals. Between 1969 and 1988, there were twenty-two 1,000 gallon underground storage tanks (USTs) located in the southeastern part (southern tank farm) of the site to store chemicals such as toluene, hexane, acetone and Laktane. On April 28, 1988, during delivery of approximately 3,500 gallons of 1,1,1-TCA to an above ground tank in the building on the site, the truck became over pressurized causing the tanker end to buckle, resulting in the loss of the entire load. The Department responded to the spill. Approximately1,740 gallons of the spilled material was recovered, with the remaining 1,760 gallons of spilled material entering into a storm drain. An undetermined amount of spilled material also entered into the drainage system which leads to Freeport Creek. The 22 USTs and piping were removed on September 1989. Four additional 6,000 gallon USTs were located to the east of the 22 USTs. These tanks were reportedly used to store acetone, hexane, Laktane and toluene between 1969 and 1989. These tanks and associated lines were removed in January1989. A 6,000 gallon UST was also located in the southern tank farm that collected floor drain runoff from the manufacturing areas of the building. This UST was removed in 1994. Ten 8,000-gallon USTs were installed in the southern tank farm area. Five of these USTs (the southern tank farm) were installed in the Spring of 1988 (prior to the 1,1,1-TCA spill) and the remaining five (the northern tank farm) were installed after the spill. These 10 USTs were closed and removed by current site owner in September 2004.

3.2: Remedial History

In 1992, the Department listed the site as a Class 2 site in the Registry of Inactive Hazardous Waste Disposal Sites in New York. 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.

In 1988, approximately 1,760 gallons of 1,1,1-TCA was released to a storm drain. Emergency response to the spill was provided by the Department's Region 1 Spill Response Unit. An emergency cleanup of the spill included the removal of liquid material from the storm drainage system; solids, semi-solids, and liquids from the affected leaching basin; and the drilling of three soil borings, including split spoon sampling; and the installation of one observation well. Split samples taken from two of the borings revealed 1,1,1-TCA at concentrations ranging from 66 parts per million (ppm) to 42,649 ppm. Analytical results from the May 1989 sampling of the well (installed during the emergency response) showed levels of 1,1,1-TCA at 5,800 parts per billion (ppb). A split sample taken by the Department from the same well contained 200,000 ppb of 1,1,1-TCA. According to the Nassau County Department of Health, the drainage system which discharges to Freeport Creek was purged until sampling results showed 1,1,1-TCA below 50 ppb. A Focused subsurface investigation was conducted at the CCC site during May and June of 1997.

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 Department and the Burmah Castrol Holdings, Inc. entered into a Consent Order on May 29, 1998. The Order obligates the responsible parties to implement a full remedial program. Burmah Castrol Holdings, Inc. (Burmah Castrol) was the parent corporation of Columbia Cement Company, Inc. In 2001, BP purchased all Burmah Castrol holdings and assumed liability for the 1,1,1-TCA spill. I n 1996, the property was sold to TACC, International Corporation (TACC). TACC was subsequently acquired by Illinois Tool Works (ITW). ITW currently owns the property.

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. The RI was conducted between December 1998 and December 2006. The field activities and findings of the investigation are described in the RI report and included.

- Installation of 22 soil borings and 15 monitoring wells for analysis of soils and groundwater as well as physical properties of soil and hydrogeologic conditions;
- Hydraulic conductivity testing;
- Sampling of new and existing monitoring wells;
- Tidal influence on groundwater flow direction;
- Collection of soil samples and groundwater samples for analysis;
- Confirmed storm drain discharge (i.e., are the storm drains interconnected) and storm water discharge points;
- Collection of soil samples from on-site storm drains for analysis;
- Multiple rounds of groundwater sampling of all site monitoring wells, including collection of biofeasibility parameters;
- Collection of post-excavation soil samples during UST closure;
- Collection of soil samples in the UST/spill area after UST removal;
- Performance of bench-scale testing of potential remedial alternatives;

- Collection of soil vapor, sub-slab vapor, ambient air samples and indoor air sampling to evaluate the vapor intrusion pathway; and
- Slug testing of selected monitoring wells.

5.1.1: Standards, Criteria, and Guidance (SCGs)

To determine whether the soil, groundwater, and soil vapor contain contamination at levels of concern, data from the investigation were compared to the following SCGs:

- Groundwater, drinking water, and surface water SCGs are based on the Department's "Ambient Water Quality Standards and Guidance Values" and Part 5 of the New York State Sanitary Code.
- Soil SCGs are based on the Department's Cleanup Objectives ("Technical and Administrative Guidance Memorandum [TAGM] 4046; Determination of Soil Cleanup Objectives and Cleanup Levels.") and 6 NYCRR Subpart 375-6 - Remedial Program Soil Cleanup Objectives.
- Concentrations of VOCs in air were evaluated using the air guidelines provided in the NYSDOH guidance document titled "Guidance for Evaluating Soil Vapor Intrusion in the State of New York," dated October 2006.

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 in Section 5.1.2. More complete information can be found in the RI report.

5.1.2: Nature and Extent of Contamination

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

As described in the RI report, many soil, groundwater, soil vapor, indoor air, and ambient air samples were collected to characterize the nature and extent of contamination. As seen in Figures 4, 6, 7 and summarized in Table 1, the main categories of contaminants that exceed their SCGs are volatile organic compounds (VOCs). For comparison purposes, where applicable, SCGs are provided for each medium.

Chemical concentrations are reported in parts per billion (ppb) for water and parts per million (ppm) for waste, soil, and sediment. Air samples are reported in micrograms per cubic meter ($\mu g/m^3$).

Figures 4,6,7 and Table 1 summarize the degree of contamination for the contaminants of concern in soils, groundwater and sub-slab soil vapor and compare the data with the SCGs for the site. The following are the media which were investigated and a summary of the findings of the investigation.

Subsurface Soil

The main source of contamination was the spill of 1,1,1-TCA. Compounds detected at concentrations exceeding the SCGs include 1,1,1-TCA, 1,1-Dichloroethane (1,1-DCA), chloroethane (CA), toluene and xylenes. Most of the SCGs exceedences were spill-related compounds, although acetone was also widespread. Most of the highest concentrations were detected in samples collected from depths ranging from 10 to 20 ft bgs. The highest 1,1,1-TCA concentration (7,000 ppm) was detected in boring SB-98-2 at 10.0 to 13.7 ft bgs. In the immediate vicinity of the spill, 1,1,1-TCA was detected at 2,600 ppm in boring MW-00-11A from 16 to 18 ft bgs. A summary of soil sampling results is presented in Figure 4 and Table 1. Cross-sections presented in the Figure 5 show the vertical extent of soil impacts exceeding SCGs. No exceedences of SCGs were detected at depths greater than 22 ft.

Soil samples were collected from each of eight on-site storm drains. 1,1,1-TCA, methylene chloride and xylenes were detected from SD-1, SD-5 and SD-8 at levels above the SCGs. Impacted soil at levels significantly exceeding the SCGs is present in definable pockets. These areas are shown on Figure 5. Figure 5 summarizes the vertical extent of each of the laterally delineated impacted areas. The table on Figure 5 also shows the volume of each of the impacted areas and the volume of overlying non-impacted soil. Only one SVOC compound -bis(2-Ethylehexyl) phthalate was detected at concentrations exceeding the SCGs as shown in Table 1.

Subsurface soil contamination identified during the RI/FS will be addressed in the remedy selection process.

Groundwater

The nature and extent of groundwater VOC contamination changed between the January 1999 and the 2006 sampling events. Specifically, the levels of 1,1,1-TCA decreased significantly while the concentrations and extent of daughter product chloroethane (CA) has increased. The most recent data (June 2006) indicate that CA was detected at the downgradient site boundary at levels above the Department's Ambient Water Quality Standards and Guidance Values of 5 ppb.

Currently, 1,1,1-TCA is not present in any on-site wells at a concentration exceeding the Department's Ambient Water Quality Standards and Guidance Values. Its degradation products, 1,1-DCA and CA are the primary groundwater contaminants of concern from the June 2006 data. The highest CA concentration of 1,900 ppb was found in well MW-1S, immediately adjacent to the spill location. Along the northern boundary of the site, only chlorobenzene is present above the Department's Ambient Water Quality Standards and Guidance Values, and only in the northwest corner of the Site. Along the southern site boundary, 1,1-DCA and CA are present in and immediately downgradient from the spill area at concentrations over the Department's Ambient Water Quality Standards and Guidance Values. A CA plume extends from the source area west along the southern site boundary and extends off-site to wells MW-05-14S and MW-05-15D. In the spill area, only CA was detected at 1,900 ppb in well MW-1S in 2006 sample data which represents a significant decrease from the 49,000 ppb detected in 1997. No other compounds were detected in 2006 in the spill area shallow wells. Away from the immediate vicinity of the spill, the number of compounds detected in shallow wells and their concentrations decrease dramatically. 1,1,1-TCA and its immediate daughter product, 1,1-DCA were not detected in any shallow wells. In June 2006, CA concentrations decreased from 1,900 ppb in MW-1S to 120 ppb in MW-97-1S at the southwest site boundary. The fact that CA is more prevalent than 1,1,1-TCA or 1,1-DCA suggests that natural attenuation processes are occurring in the shallow gravelly sand aquifer. CA was not detected along the northern site boundary. A total of six off-site groundwater monitoring wells has been installed and groundwater samples were collected. Surface water and sediment samples were collected from the Freeport Creek. A groundwater plume extends from the source area toward Freeport Creek. The recent groundwater results indicated presence of site related VOCs in the groundwater close to the Freeport Creek. Samples would be collected from the Freeport Creek.

At monitoring well MW-00-12D, in the southeast corner of the site, CA (1,300 ppb), 1,1-DCA (11 ppb) and 1,1-DCE (5.8 ppb) were detected at concentrations exceeding the Department's Ambient Water Quality Standards and Guidance Values. At monitoring well MW-97-9D, in the southwest corner of the site, CA (730 ppb) and chlorobenzene (12 ppb) were the only compounds present at a concentration over the Department's Ambient Water Quality Standards and Guidance Values since June 2006. The presence of 1,1-DCA and CA are strong indicators that natural degradation of these compounds is occurring. Under typical groundwater conditions, 1,1,1-TCA will break down sequentially to 1,1-DCA, CA, then to ethane, and eventually carbon dioxide. Groundwater data suggest that in both the shallow and deep wells in the gravelly sand, 1,1,1-TCA degrades quickly to 1,1-DCA, which, in turn, degrades quickly to CA. 1,1-DCA is limited to deep wells in the vicinity of the spill area (MW-1D-97 and MW-00-12D). CA, however, does not degrade as quickly to ethane, but rather migrates with the groundwater west beyond the site toward Hanse Avenue, and Freeport Creek in both the shallow and deep wells in the gravelly sand. A summary of groundwater sampling results is presented in Table 1 and Figure 6.

Groundwater contamination identified during the RI/FS will be addressed in the remedy selection process.

Soil Vapor/Sub-Slab Vapor/Air

In September 2005, soil gas samples were collected from 11 soil vapor monitoring points around the UST/Spill area and the site perimeter. Soil gas sampling results are presented on Figure 10. The sampling results identified several VOCs. The most prevalently identified VOCs include 1,1,1-TCA, 1,1-DCA, CA, acetone, and several petroleum (benzene, toluene, ethylbenzene, xylene - BTEX) compounds. As observed in the 2005 sampling, soil gas concentrations were highest in the spill/UST area. 1,1,1-TCA concentrations ranged from non-detect to 50,600 $\mu g/m^3$; 1,1-DCA concentrations ranged from non-detect to 56,700 $\mu g/m^3$; and chloroethane concentrations ranged from 8.7 $\mu g/m^3$ to 17,500 $\mu g/m^3$. In August 2006, three soil gas samples were collected from the spill/UST area (SG-05-01, SG-05-04 and SG-05-11) and three samples were collected from the site perimeter (SG-05-05, SG-05-08 and SG-05-10). Please see Figure 7. Three sub-slab vapor samples were collected in the former CCC building. Sample SS-06-01 was collected in the room directly north of the spill area; sample SS-06-02 was collected in the room directly west of the spill area; and sample SS-06-03 was collected northwest of the spill area. As was the case for the soil vapor samples, highest concentrations were detected in closest proximity to the spill area, and concentrations of compounds attenuated rapidly with distance. In sample SS-06-02, 1,1,1-TCA, 1,1-DCA and chloroethane were detected at 86,200 $\mu g/m^3$, 30,600 $\mu g/m^3$ and 10,500 $\mu g/m^3$, respectively. Other compounds detected at elevated concentrations include tetrachloroethene (PCE) (2,140 $\mu g/m^3$), trichloroethene (TCE) (534 $\mu g/m^3$), 1,1-DCE (308 $\mu g/m^3$) and methylene chloride (251 $\mu g/m^3$). In sample SS-06-03, 1,1,1-TCA and 1,1-DCA were detected at 14 $\mu g/m^3$ and 8.9 $\mu g/m^3$, respectively. The results indicate that sub-slab vapor has been impacted in the southwest portion of the site building, but the concentrations in other areas of the building are significantly lower. Two indoor air samples were collected within the CCC building. The indoor air sampling results indicate the presence of low levels of VOCs. These VOCs consist primarily of BTEX compounds, hexane and acetone, with trace levels of the chlorinated VOCs detected. This suggests that the slab may be acting as a barrier against vapor intrusion. In addition, the presence of some of these same compounds in outdoor ambient air samples suggests that their presence may not be related to sub-slab conditions, but rather to the industrial setting of the site. Soil gas sampling indicated that VOCs are present in shallow soil throughout the Site. Concentrations of spill-related compounds were greatest in samples in and around the spill area, but are detected throughout Operable Unit 1. Several other VOCs were detected in multiple soil gas samples, including BTEX, PCE, TCE, methylene chloride and several other compounds. Several of these compounds were also detected in ambient air samples collected outdoors at the Site.

Sample results were compared to Matrix 1 and Matrix 2 in the NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*. Indoor air quality indicates only traces of site contaminants.

Soil vapor contamination identified during the RI/FS will be addressed in the remedy selection process.

5.2: Interim Remedial Measures

There were no IRMs performed at this site during the RI/FS.

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 site. A more detailed discussion of the human exposure pathways can be found in Section 6.0 of the RI 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.

Pathways that are known to, or may, exist include;

- Inhalation
- Ingestion
- Direct Contact

Inhalation is considered to be a potential exposure pathway at the current time. Shallow groundwater at the site is contaminated above New York State Standards, Criteria and Guidance levels for chlorinated volatile organic compounds [VOCs]. Chlorinated VOCs can vaporize into soil gas and present an inhalation exposure route. Indoor air quality data does not present a health concern based on 2006 data results. The facility is not occupied so there are no current public health exposure concerns.

There is no known, or potential, ingestion route for this site as there is no known use of groundwater on-site. The facility receives public water which is required to be routinely sampled for volatile organic compounds and meet Safe Drinking Water standards prior to distribution to the public. Groundwater is the source for drinking water in this commercial area, and site use of groundwater is not occurring. Thus, the groundwater is not expected to present a completed pathway.

There are no expected direct contact exposure pathways for this site based on the remedial action selected. A potential exposure pathway could exist for utility workers conducting subsurface work on the property as water, sewer, storm sewer and gas lines exist in the rear of the facility where the contaminated soil would be treated.

5.4: Summary of Environmental Assessment

This section summarizes the assessment of 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 Fish and Wildlife Impact Analysis, which is included in the RI report, presents a detailed discussion of the existing and potential impacts from the site to fish and wildlife receptors. In 2000, sediment and surface water samples were collected from the Freeport Creek. The site has not had a significant impact on nearby Freeport Creek. However, since groundwater contamination from the site has been recently detected in close proximity of the Freeport Creek, additional surface water and sediment samples would be collected from the Freeport Creek as part of the Operable Unit 2 and the Fish and Wildlife Impact Analysis would be revised based on the results of additional sampling.

Site contamination has impacted the groundwater resource in the Upper Glacial aquifer, which is a sole source aquifer that is a source of drinking water in the Nassau County. However, the hydrogeology of the area around the site and the site's location next to a creek indicates that impacted groundwater would not be a viable source for potential future drinking water due to saltwater intrusion.

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. 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:

- exposures of persons at or around the site to VOCs in soils;
- exposures of persons at or around the site to VOCs in groundwater;
- off-site migration of contaminants in groundwater;
- the discharge of contaminated groundwater to the Freeport Creek;
- the release of contaminants from soil into groundwater that may create exceedances of groundwater quality standards; and
- the release of contaminants from subsurface soil and groundwater into indoor air through soil vapor.

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

- ambient groundwater quality standards;
- soil cleanup goals in TAGM-4046 (Determination of Soil Cleanup Objectives and Cleanup Levels) and 6 NYCRR Subpart 375-6 (Remedial Program Soil Cleanup Objectives);
- October 2006 NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York; and
- surface water quality standards.

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 CCC Site were identified, screened and evaluated in the FS report which is available at the document repositories established for this site.

A summary of the remedial alternatives that were considered for this site is 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 are not achieved.

7.1: Description of Remedial Alternatives

The following potential remedies were considered to address the contaminated soils, groundwater and soil vapor at the site.

Alternative 1: No Action

Present Worth: *$0*
Capital Cost: *$0*
Annual Costs:
(Years 1-5): *$0*
(Years 5-30): *$0*

The No Action Alternative is evaluated as a procedural requirement and as a basis for comparison. It would allow the site to remain in an unremediated state. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

Alternative 2: Soil Excavation and Off-Site Disposal

Present Worth: *$550,000*
Capital Cost: *$550,000*
Annual Costs:
(Years 1-5): *$0*
(Years 5-30): *$0*

This alternative would involve the excavation and off-site disposal of contaminated subsurface soils in the source area. The excavation area would consist of four impacted areas (Residual Source Area 1, 2, 3 and 4) as shown in Figure 5. The total area of the four residual zones represents approximately 1,100 cubic yards of soil of which 610 cubic yards is estimated to be contaminated. The contaminated material would be treated and disposed using low-temperature thermal desorption process at the nearest permitted facility.

Excavation of contaminated soils at the site would address two main complicating factors: shallow groundwater level and the proximity to the building foundation. The contaminated soils lie below the groundwater water table, which is approximately 6 ft bgs in the source area. See Figure 5. Soil excavation would be conducted to the entire depth of soil contamination (up to 22 ft bgs). The excavation would require dewatering of the excavation pit. Because of the depth of excavation and the shallow groundwater table, sheet piling would be required to avoid excessive amounts of clean soil excavation adjacent to the contaminated areas that would otherwise be required to achieve stable side slopes within the excavation zone. These additional areas of excavation would also increase the amount of dewatering that would be required. The sheet pile wall could also be designed to serve as the retaining wall to protect the building foundation and features.

Alternative 3: *In Situ* Chemical Oxidation (ISCO) of Soils

Present Worth: *$480,000*
Capital Cost: *$480,000*
Annual Costs:
(Years 1-5): *$0*
(Years 5-30): *$0*

This alternative involves the *in-situ* chemical oxidation (ISCO) of contaminated subsurface soils. ISCO is based on the delivery of chemical oxidants to contaminated media in order to achieve destruction or breakdown of contaminants into non-toxic products. Treatment time with ISCO technologies is very rapid. Liquid oxidants are injected through injection wells or injection points. The type of oxidant to use depends on the mixture of contaminants and their concentrations. Typically used oxidants include activated hydrogen peroxide (for petroleum hydrocarbons), potassium permanganate (for chlorinated solvents) and most recently, activated sodium persulfate (for both petroleum hydrocarbons and chlorinated solvents). Sodium persulfate is relatively safe to handle when compared to hydrogen peroxide. The results of the bench scale testing indicated sodium persulfate activated with hydrogen peroxide can treat the site-specific contaminants effectively. The oxidants would be injected in the areas of residual soil contamination via several injection points. The ISCO injections would be conducted to the entire depth of soil contamination (up to 22 ft bgs) in the source areas. See Figure 8.

The soils from drains SD-1, SD-5 and SD-8 would be removed using a vac-truck, so that confined space entry would not be necessary. Soil would be removed from the base of the drain to the groundwater interface. The soil, liquid and debris collected would be disposed at a permitted treatment/disposal facility. The storm drains would be backfilled with clean sand fill to the pre-existing drain base grade.

An active mitigation system would be required if the building would be occupied in the future to prevent soil vapor intrusion. The engineering controls would include an active sub-slab depressurization system (SSDS). Imposition of an institutional control in the form of an environmental easement that would require (a) limiting the use and development of the property to commercial use, which would also permit industrial use; (b) compliance with the approved site management plan; (c) restricting the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by NYSDOH; and (d) the property owner to complete and submit to the Department a periodic certification of institutional and engineering controls.

Development of a site management plan would include the following institutional and engineering controls: (a) continued evaluation of the potential for vapor intrusion for any buildings developed on the site, including provision for mitigation of any impacts identified; (b) monitoring of indoor air; (c) identification of any use restrictions on the site; and (d) provisions for the continued proper operation and maintenance of the soil vapor mitigation system.

Alternative 4: Monitored Natural Attenuation (MNA) of Groundwater

Present Worth: *$380,000*
Capital Cost: *$180,000*
Annual Costs:
(Years 1-5): *$50,000*
(Years 6-22): *$20,000*

Residual groundwater contamination beneath the source area and impacted groundwater downgradient of the source would be treated through MNA. MNA takes advantage of naturally occurring processes in the subsurface to degrade contamination. Data collected during the RI, during the Supplemental Investigation sampling in 2004/2005, and during the 2006 groundwater sampling events provides evidence that natural attenuation is occurring at this site. The above suggests that MNA is an active process at the site. To implement MNA in accordance with USEPA Guidance provided in "Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater" (EPA 1998), additional ongoing monitoring and modeling would be required during implementation of this alternative. The cost estimate assumes that 15 existing and new wells would be sampled semiannually for five years, and then a subset (10 wells) would be sampled annually for an additional seventeen years. The samples would be analyzed for VOCs and the MNA parameters. This involves collecting information on dissolved oxygen, oxidation-reduction potential, nitrate, nitrite, iron, sulfate, methane, ethane, chloride, TOC, and alkalinity.

Because the groundwater plume would remain (but because of source removal, not grow but eventually shrink due to MNA), institutional controls in the form of an environmental easement would be placed on the property where the plume is present to prevent use of the groundwater during the MNA program.

Alternative 5: Groundwater Extraction and Treatment

Present Worth: *$1,780,000*
Capital Cost: *$1,010,000*
Annual Costs:
(Years 1-7): *$180,000*
(Years 8-12): *$30,000*

Residual groundwater contamination beneath the source area and impacted groundwater downgradient of the source would be treated through groundwater extraction and treatment. Three extraction wells would pump a total of 60 gallons per minute (gpm) of groundwater from the plume. The extraction wells would be installed with screen intervals in the gravelly sand unit. Data indicates no further contamination below the confining gray clay and silt geological unit. The contaminated water would be collected into an equalization tank, from which it would be pumped through a pre-treatment system to remove iron and then to an air stripper and liquid phase granular activated carbon for VOC removal. The components would be housed in a treatment building located in the immediate vicinity of the former spill area. In the air stripper, the chlorinated and hydrocarbon VOCs would transfer from the extracted groundwater to the air stream. A Division of Air (DAR-1) (Air Guide-1) analysis would need to be performed to determine if treatment of the air stripper vapor effluent is required. DAR-1 provides guidance for the control of toxic ambient air contaminants in New York State. For cost estimating purposes, it is anticipated that the air stream would require treatment. A vapor-phase granular activated carbon unit would treat the VOC contaminated air stream through adsorption. Treated air would be discharged to the atmosphere. Groundwater treated through the air stripper would be discharged to a nearby storm sewer. Discharge water would be monitored according to the requirements of a SPDES permit. Operation and maintenance of the system would include inspection and maintenance of system components and process groundwater and air sampling to verify system efficiency and the schedule for carbon change out. Groundwater sampling of monitoring wells would be conducted quarterly during the first year and semiannually during the remaining years of the seven-year treatment period. The treatment period was estimated based on the time estimated to achieve a 90% removal of CA in the aquifer. Following the treatment period, residual groundwater contamination above chemical-specific groundwater standards would be monitored. For costing purposes, it is assumed that groundwater monitoring would be required for an additional 5 years after active groundwater treatment.

Alternative 6: *In Situ* Bioremediation of Groundwater

Present Worth: *$280,000*
Capital Cost: *$180,000*
Annual Costs:
(Years 1-3): *$27,000*
(Years 4-7): *$13,000*

In situ bioremediation involves injecting slow-release oxygen compounds into the contaminated portion of the aquifer. Please see Figure 9. Bench-scale studies have shown that chloroethane will degrade under aerobic conditions, but aquifer conditions at the site are anaerobic. Injection of an oxygen release compound would counter these conditions and provide a source of oxygen that could be utilized by aerobic microbes to use as an electron acceptor during respiration and consumption of chloroethane.

The oxygen release compounds would be injected through a series of borings along the southern boundary of the Site (alley way) and along the western (Hanse Avenue) boundary of the Site. This treatment would effectively treat chloroethane and would prevent continued off-site migration of chloroethane.

Effectiveness would be monitored using existing monitoring wells. Reduced or eliminated levels of chloroethane would be the most obvious indicator of successful aerobic degradation. The longevity of the oxygen release compounds would be monitored through dissolved oxygen levels in monitoring wells. If dissolved oxygen levels decline while some chloroethane remains, the oxygen release compounds would be injected as necessary through additional borings.

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. 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.

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 Department 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. <u>Short-term Effectiveness</u>. 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.

4. <u>Long-term Effectiveness and Permanence</u>. 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.

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

6. <u>Implementability</u>. 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.

7. <u>Cost-Effectivness</u>. Capital costs and annual 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. <u>Community Acceptance</u>. 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 Department 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: <u>SUMMARY OF THE PROPOSED REMEDY</u>

The Department is proposing Alternative 3 *In Situ* Chemical Oxidation of Soils and Alternative 6 *In Situ* Bioremediation of Groundwater as the remedy for this site. The elements of this remedy are described at the end of this section.

The proposed remedy is based on the results of the RI and the evaluation of alternatives presented in the FS. Alternatives 3 and 6 are being proposed because, as described below, this satisfies the threshold criteria and provides the best balance of the primary balancing criteria described in Section 7.2. This would achieve the remediation goals for the site by actively remediating the contaminated soil and groundwater. The active remediation would also restore soil and groundwater quality to soil cleanup guidance values and ambient water quality standards, respectively, to the extent practicable, which would comply with SCGs and protect human health and the environment. The active remediation would eliminate off-site migration of contaminated groundwater by treating on-site soils that create the most significant threat to public health and the environment, it would greatly reduce the source of contamination to groundwater, and it would create the conditions needed to restore groundwater quality to the extent practicable. Soil excavation, *In Situ* chemical oxidation, groundwater extraction and treatment and *In Situ* bioremediation are presumptive remedies that have been used successfully at similar sites with VOC contamination.

Alternative 1 was removed from consideration because it would not remediate contaminated soil and groundwater and therefore would not satisfy the "threshold criteria" for evaluating potential alternatives, which are "protection of public health and the environment" and "compliance with SCGs".

Alternatives 2, 3, 4, 5 and 6 would comply with SCGs and protect human health and the environment by either treating contaminated soil or groundwater, and by evaluating and addressing the potential for vapor intrusion.

Because Alternatives 2, 3, 4, 5 and 6 would satisfy the threshold criteria, the five balancing criteria are particularly important in selecting a final remedy for the site.

Alternatives 3 and 6 would have short-term impacts which can easily be controlled. The time needed to achieve the remediation goals would be longest for Alternatives 4 and 5.

Achieving long-term effectiveness is best accomplished by excavation of all contaminated soils below the water table (Alternative 2). Alternative 3 is favorable because it would address all contaminated saturated soils. Structural analysis would be required to ensure the stability of the adjacent building during soil excavation activities.

Alternative 3 is favorable in that it would be readily implementable. Alternatives 2, 4 and 5 would also be implementable.

Alternative 2, excavation and off-site disposal, would reduce the volume of waste on-site. The overwhelming majority of contamination is below the water table. Approximately 1,100 cubic yards of soil would be removed of which 610 cubic yards is estimated to be contaminated and 500 cubic yards of soil mainly fill material which is not contaminated.

Alternative 2 would greatly reduce the mobility of contaminants. Only Alternative 3 would reduce the toxicity of contaminants by chemical/physical treatment.

The cost of the alternatives varies significantly for groundwater alternatives. Alternative 3 is very favorable because it is a permanent remedy that would eliminate most of the continuing sources of groundwater contamination at the site. Groundwater extraction and treatment (Alternative 5) is the most costly remedy and would require an additional 5 years to clean up the groundwater than Alternative 6. Alternative 6 would be very cost effective and would remediate groundwater 5 years sooner than Alternative 5 and 15 years sooner than Alternative 4. The costs of Alternative 2 are higher than Alternative 3. Designing the remedy, mobilizing the equipment, preparing the site, and construction management are substantial costs associated with each of these remedies and do not change appreciably with the increase in soil to be excavated.

The estimated present worth cost to implement the Alternatives 3 and 6 are $760,000. The cost to construct the remedy is estimated to be $660,000 and the estimated average annual cost for 1 to 3 years is $27,000 and 4 to 7 years is $13,000.

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. *In situ* chemical oxidation (ISCO) of contaminated subsurface soils in the source area. ISCO is based on the delivery of chemical oxidants to contaminated media in order to achieve destruction or breakdown of contaminants into non-toxic products.

3. *In situ* bioremediation of contaminated groundwater at the site. *In situ* bioremediation involves injecting slow-release oxygen compounds into the contaminated portion of the aquifer to treat chloroethane.

4. Imposition of an institutional control in the form of an environmental easement that would require (a) limiting the use and development of the property to commercial use, which would also permit industrial use; (b) compliance with the approved site management plan; (c) restricting the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by NYSDOH; and (d) the property owner to complete and submit to the Department a periodic certification of institutional and engineering controls.

5. Development of a site management plan which would include the following institutional and engineering controls: (a) continued evaluation of the potential for vapor intrusion for any buildings developed on the site, including provision for mitigation of any impacts identified; (b) monitoring of soil, soil vapor, groundwater and indoor air; (c) identification of any use restrictions on the site; (d) vapor intrusion management, including but not limited to, an active SSDS in the existing building to prevent soil vapor intrusion inside the building; and (e) provisions for the performance monitoring and continued proper operation and maintenance of the sub-slab depressurization system, including any required post-installation indoor air quality sampling.

6. The property owner would provide a periodic certification of institutional and engineering controls, prepared and submitted by a professional engineer or such other expert acceptable to the Department, until the Department notifies the property owner in writing that this certification is no longer needed. This submittal would: (a) contain certification that the institutional controls and engineering controls put in place are still in place and are either unchanged from the previous certification or are compliant with Department-approved modifications; (b) allow the Department access to the site; and (c) state 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 unless otherwise approved by the Department.

7. The operation of the components of the remedy would continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible.

Since the remedy results in untreated hazardous waste remaining at the site, a long-term monitoring program would be instituted. This program would allow the effectiveness of the ISCO and bioremediation to be monitored and would be a component of the long-term management for the site.

TABLE 1
Nature and Extent of Contamination
Subsurface Soils, Groundwater and Soil vapor
December 1998 to October 2006

SUBSURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	1,1,1-Trichloroethane	ND to 7,000	0.68	19 of 155
	1,1-Dichloroethane	ND to 390	0.27	15 of 155
	Chloroethane	ND to 16	1.9	6 of 155
	Toluene	ND to 660	0.7	4 of 155
	1,1-Dichloroethene	ND to 18	0.33	4 of 155
	1,2-Dichloroethane	ND to 0.9	0.02	2 of 155
	Acetone	ND to 170	0.05	31 of 155
	Benzene	ND to 1.2	0.06	2 of 155
	Ethylbenzene	ND to 250	11	2 of 155
	Methylene Chloride	ND to 1.0	0.05	10 of 155
	Trichloroethene	ND to 1.2	0.47	2 of 155
	Xylene(s)	ND to 1,500	1.6	2 of 155
Semivolatile Organic Compounds (SVOCs)	Phenol	ND to 0.34	0.33	1 of 8
	Chrysene	ND to 2.2	1	1 of 8
	bis(2-Ethylhexyl) phthalate	0.18 to 96	50	3 of 8

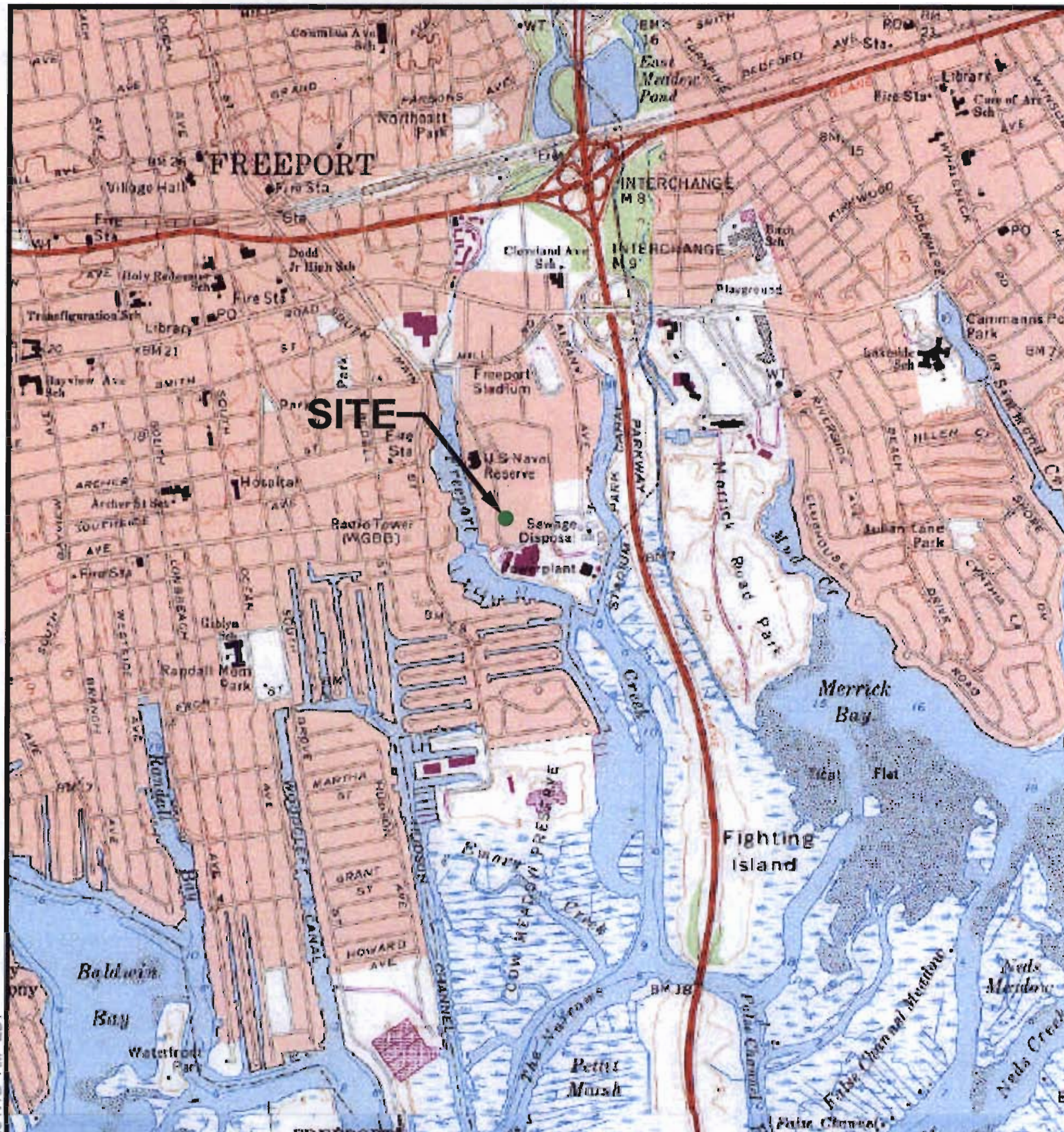
TABLE 1
Nature and Extent of Contamination
Subsurface Soils, Groundwater and Soil vapor
December 1998 to October 2006

GROUNDWATER	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	1,1,1-Trichloroethene	ND to 5,100	5	6 of 70
	1,1-Dichloroethane	ND to 4,300	5	11 of 70
	1,1-Dichloroethene	ND to 23	5	3 of 70
	Acetone	ND to 300	50	3 of 70
	Benzene	ND to 23	1	5 of 70
	Chlorobenzene	ND to 32	5	21 of 70
	Chloroethane	ND to 13,000	5	45 of 70
	Ethylbenzene	ND to 5,100	5	1of 70
	Methylene Chloride	ND to 840	5	10 of 70
	Toluene	ND to 76	5	2 of 70
	Trichlorobenzene	ND to 9	5	1 of 70
	Vinyl chloride	ND to 30	2	3 of 70
Sub-slab soil vapor	**Contaminants of Concern**	**Concentration Range Detected ($\mu g/m^3$)[a]**	**SCG[bc] ($\mu g/m^3$)[a]**	**Frequency of Exceeding SCG**
Volatile Organic Compounds (VOCs)	1,1,1-Trichloroethane	14 to 86,200	NA	NA
	Tetrachloroethene	43 to 2,140	NA	NA
	Tricholroethene	5.9 to 534	NA	NA
	Methylene Chloride	ND to 251	NA	NA
	1,1-Dichloroethane	8.9 to 30,600	NA	NA
	Chloroethane	ND to 10, 500	NA	NA

[a] ppb = parts per billion, which is equivalent to micrograms per liter, ug/L, in water;
ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
ug/m^3 = micrograms per cubic meter;
ND = Not Detected
NA = Not Applicable
[b] SCG = standards, criteria, and guidance values; Soil SCGs are based on the Department's Cleanup Objectives (Technical and Administrative Guidance Memorandum [TAGM] 4046; Determination of Soil Cleanup Objectives and Cleanup Levels, and 6 NYCRR Subpart 375-6 Remedial Program Soil Cleanup Objectives); Groundwater SCGs are based on the Department's "Ambient Water Quality Standards and Guidance Values" and Part 5 of the New York State Sanitary Code

Table 2
Remedial Alternative Costs

Remedial Alternative	Capital Cost ($)	Annual Costs ($)	Total Present Worth ($)
1. No Action	$0	$0	$0
2. Soil excavation and off-site disposal	$550,000	$0	$550,000
3. *In Situ* Chemical Oxidation of Soils	$480,000	$0	$480,000
4. Monitored Natural Attenuation	$180,000	$610,000	$380,000
5. Groundwater extraction and treatment	$1,010,000	$1,424,000	$1,780,000
6. *In Situ* Bioremediation	$180,000	$135,000	$280,000



QUADRANGLE LOCATION

0 2000 4000

SCALE IN FEET

N

FORMER COLUMBIA CEMENT COMPANY, INC.

159 HANSE AVENUE
FREEPORT, NEW YORK

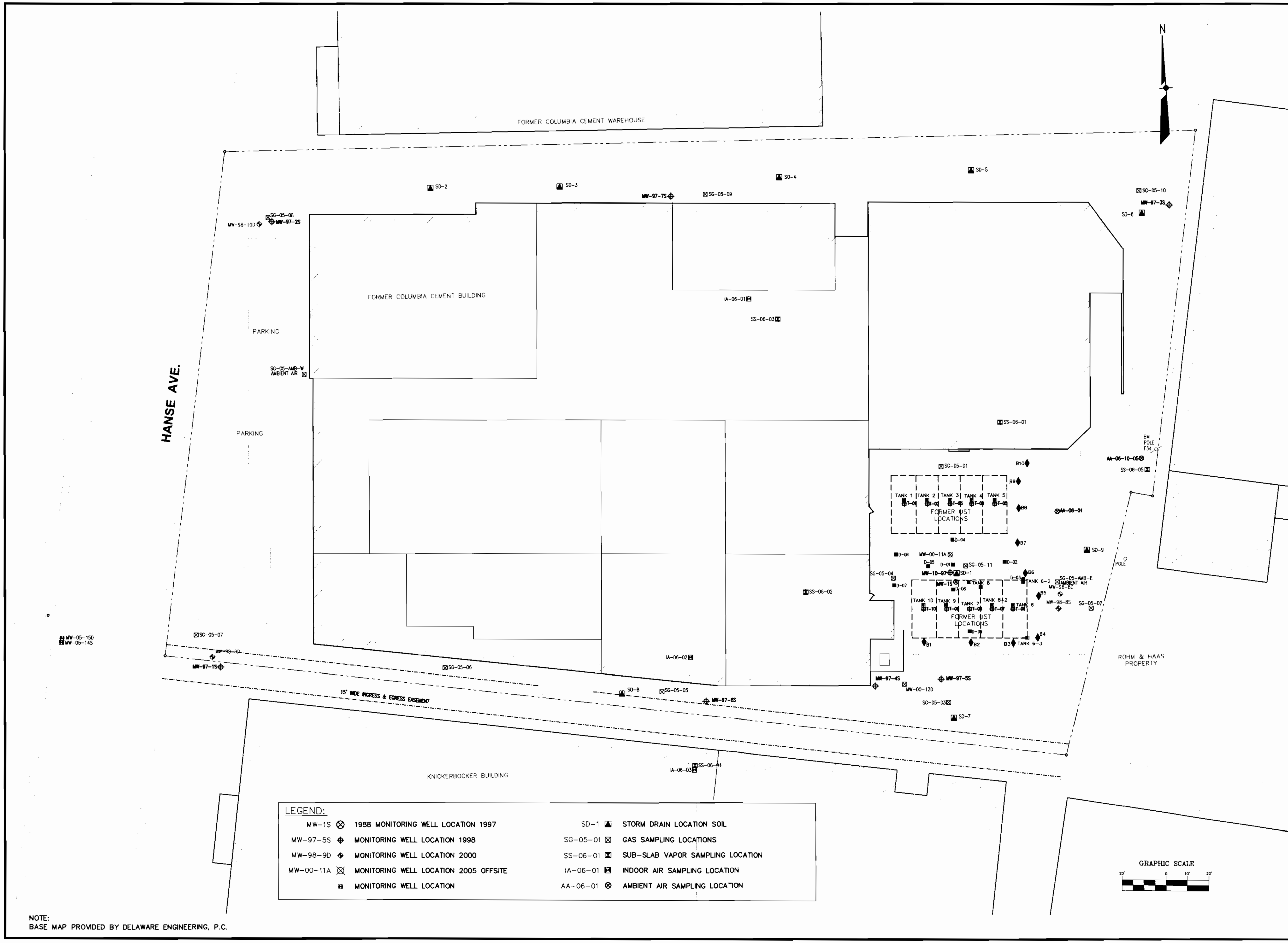
SITE LOCATION MAP

REFERENCE:
U.S.G.S. 7.5 MINUTE QUADRANGLE:
FREEPORT, N.Y., 1994

URS
12 COMMERCE DRIVE
CRANFORD, NJ, 07016
PHONE: (908) 272-8300
FAX: (908) 272-3940

DATE: 11/08/03	
JOB: 18564-060-175	
FIGURE 1	

S:\18564\060\PLOT\060-001.dwg 04/05/2004 11:31:12 AM EDT



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12 COMMERCE DRIVE
CRANFORD, NJ. 07016
PHONE: (908) 272-8300
FAX: (908) 272-3940

Issue Date: 04/20/05

Revisions		
No.	Date	Description

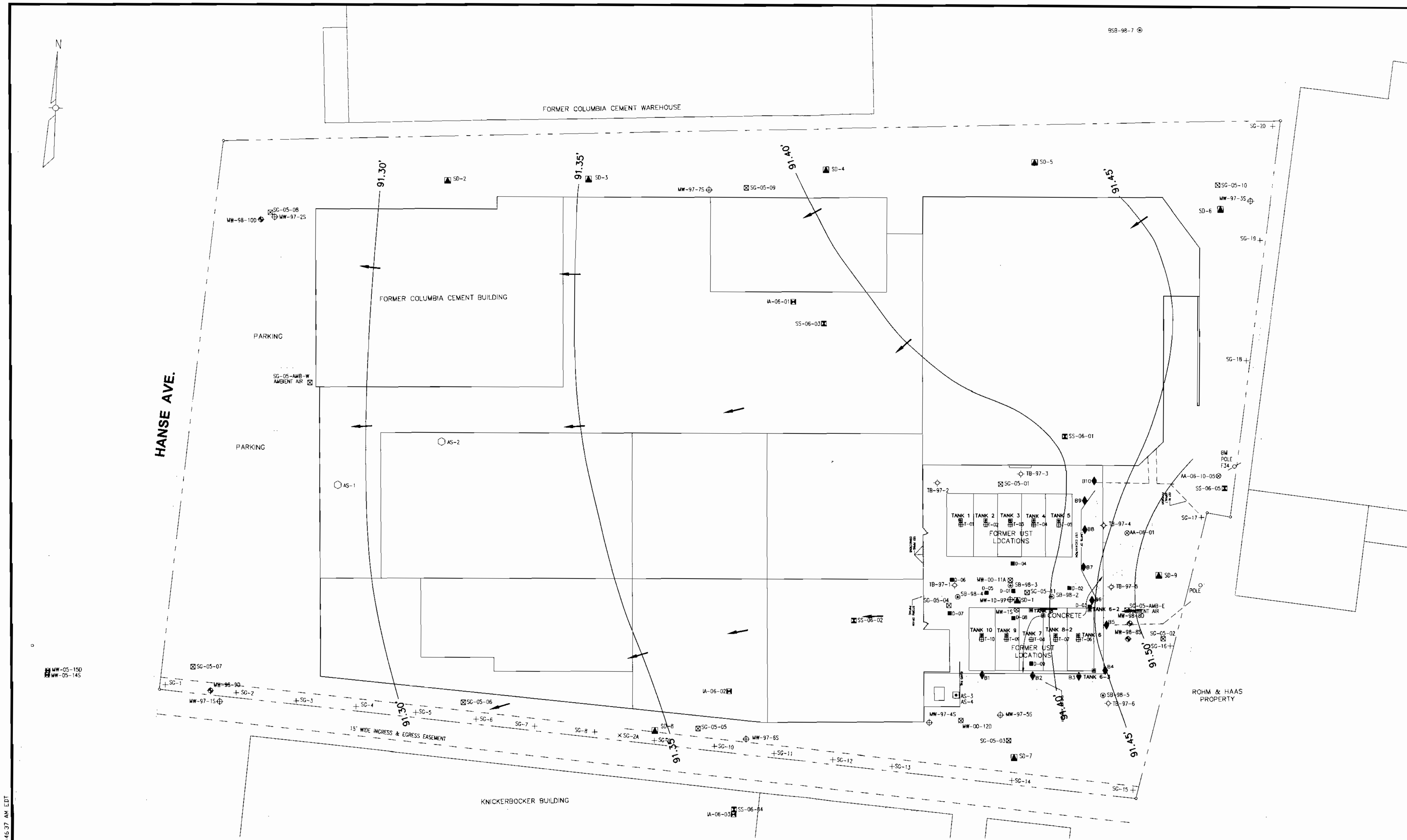
Project Description

Former Columbia Cement Company. Inc. 159 Hanse Avenue Freeport, New York

Sheet Title:

SITE PLAN WITH SAMPLE LOCATIONS

Drawn By:	J.T.	12/18/06
Checked By:	M.B.	12/18/06
Scale:	AS SHOWN	
Project Number:	38546433	
Sheet Number:	FIGURE 2	



REFERENCE:
REMEDIAL INVESTIGATION REPORT
COLUMBIA CEMENT COMPANY, INC.
159 HANSE AVENUE
FREEPORT, NEW YORK 11520
SITE # 1-30-052
JULY 2003
PREPARED BY DELAWARE
ENGINEERING, P.C.

LEGEND:

MW-1S ⊗	1988 MONITORING WELL LOCATION 1997	SD-1	STORM DRAIN LOCATION SOIL
MW-97-5S	MONITORING WELL LOCATION 1998	SG-05-01	GAS SAMPLING LOCATIONS
MW-98-9D	MONITORING WELL LOCATION 2000	SS-06-01	SUB-SLAB VAPOR SAMPLING LOCATION
MW-00-11A	MONITORING WELL LOCATION 2005 OFFSITE	IA-06-01	INDOOR AIR SAMPLING LOCATION
	MONITORING WELL LOCATION	AA-06-01 ⊗	AMBIENT AIR SAMPLING LOCATION

BENCHMARK ESTABLISHED BY
RUST E & I AT
UTILITY POLE F34
ASSUMED DATUM = 100.00 FT.

NOTE:
BASE MAP PROVIDED BY DELAWARE ENGINEERING, P.C.

S:\18564\060\PLOT\060-18(Fig5).dwg 04/05/2004 11:46:37 AM EDT

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CRANFORD, NJ 07016
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FAX: (908) 272-3940

Issue Date: 01/18/08

Revisions

No.	Date	Description

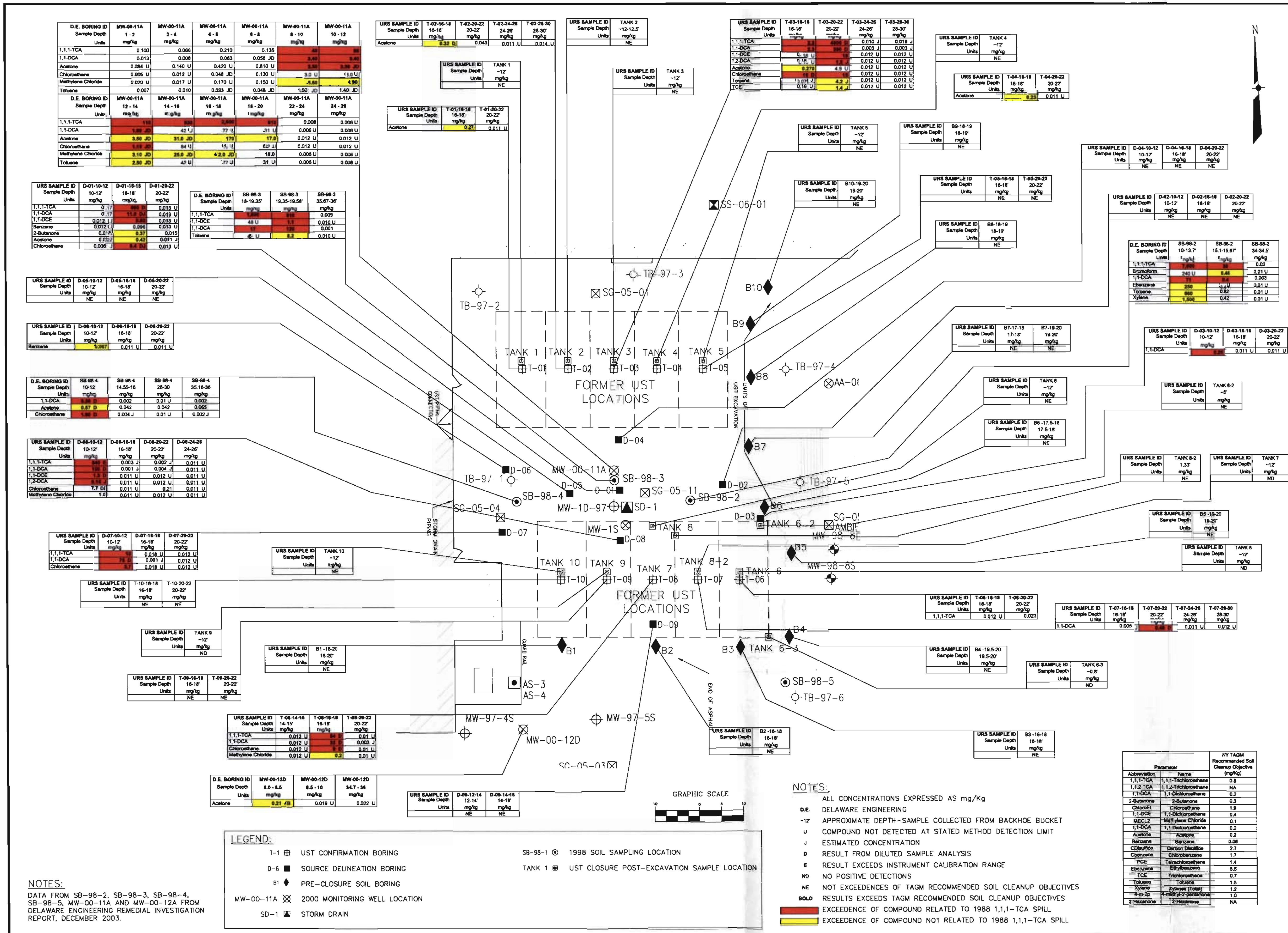
Project Description

Former Columbia Cement Company. Inc.
159 Hanse Avenue
Freeport, New York

Sheet Title:

GROUNDWATER ELEVATION CONTOUR MAP
(MEAN TIDE-MAY 3, 2000)

Drawn By:	J.T.	11/05/03
Checked By:	M.B.	11/07/03
Scale:	AS SHOWN	
Project Number:	38546433	
Sheet Number:	FIGURE 3	



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(A BP Affiliated Company)

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12 COMMERCE DRIVE
CRANFORD, NJ 07016
PHONE: (908) 272-8300
FAX: (908) 272-3940

Issue Date: 01/18/08

Revisions

No.	Date	Description

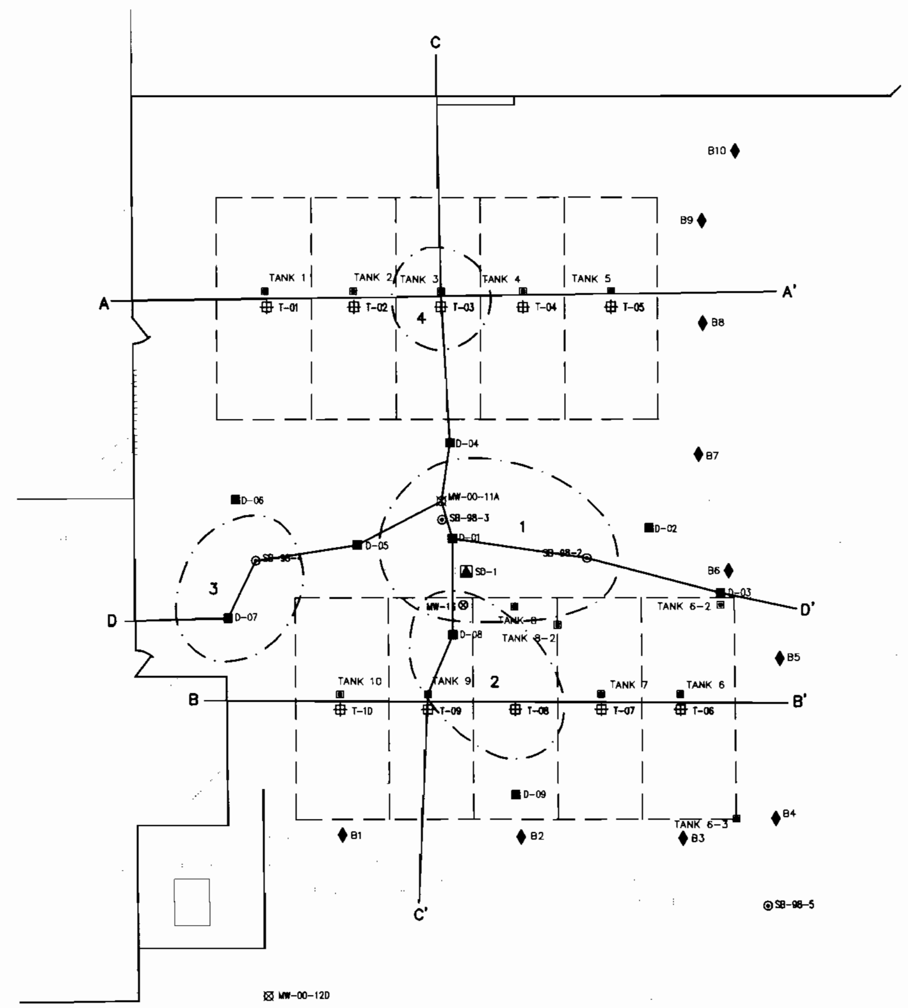
Project Description

Former Columbia Cement Company. Inc. 159 Hanse Avenue Freeport, New York

Sheet Title:

SOIL BORING VOLATILE ORGANIC DATA

Drawn By:	J.T.	12/18/06
Checked By:	M.B.	12/18/06
Scale:	AS SHOWN	
Project Number:	38546433	
Sheet Number:	FIGURE 4	



RESIDUAL SOURCE AREA	IMPACTED INTERVAL (AT BELOW GRADE)	AREA (SQ FT)	IMPACTED SOIL VOLUME (CU YD)	OVERBURDEN VOLUME (CU YD)
1	8-20	1140	510	340
2	12-18			
3	10-15	255	50	95
4	12-22	156	60	100*
TOTAL			620	535

* ASSUMES EXPANDED AREA FOR UPPER 12 FEET OF EXCAVATION.

LEGEND:

- SB-98-1 ⊙ 1998 SOIL SAMPLING LOCATION
- TANK 1 ▣ UST CLOSURE POST-EXCAVATION SAMPLE LOCATION
- T-1 ⊕ UST CONFIRMATION BORING
- MW-00-11A ⊠ 2000 MONITORING WELL LOCATION
- SD-1 ◩ STORM DRAIN
- D-6 ■ SOURCE DELINEATION BORING
- B1 ◆ PRE-CLOSURE SOIL BORING
- ▭ FORMER UST LOCATION
- ◯ RESIDUAL SOURCE AREA
- A——A' CROSS-SECCTION LINE

GRAPHIC SCALE

10 0 5 10

NOTE:
BASE MAP PROVIDED BY DELAWARE ENGINEERING, P.C.

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12 COMMERCE DRIVE
CRANFORD, NJ, 07016
PHONE: (908) 272-8300
FAX: (908) 272-3940

Issue Date: 01/18/08

Revisions		
No.	Date	Description

Project Description

Former Columbia Cement Company. Inc.
159 Hanse Avenue
Freeport, New York

Sheet Title:

RESIDUAL SOIL SOURCE AREAS

Drawn By:	J.T.	12/18/06
Checked By:	M.B.	1218/06
Scale:	AS SHOWN	
Project Number:	38546433	
Sheet Number:	FIGURE 5	

LEGEND:

MW-1S ⊗	1988 MONITORING WELL LOCATION
MW-97-5S ⊕	1997 MONITORING WELL LOCATION
MW-98-9D	1998 MONITORING WELL LOCATION
MW-00-11A ⊠	2000 MONITORING WELL LOCATION
SD-1	STORM DRAIN
MW-05-15D	2005 OFFSITE MONITORING WELL LOCATION

NOTES:

	ALL CONCENTRATIONS [redacted]SED AS µg/Kg
<	COMPOUND NOT DETEC[redacted] STATED METHOD DETECTION LIMIT
NA	NOT ANALYZED
BOLD	RESULT EXCEEDS NYS [redacted]DWATER STANDARD
(red)	EXCEEDENCE OF COMP[redacted]ELATED TO 1988 1,1,1-TCA SPILL
(yellow)	EXCEEDENCE OF COMPOUND NOT RELATED TO 1988 1,1,1-TCA SPILL
J	RESULT IS A QUANTITATIVELY ESTIMATED VALUE

NOTE:
SAMPLING DATA PRIOR TO JUNE 2004 FROM DELAWARE ENGINEERING'S REMEDIAL INVESTIGATION REPORT DECEMBER 2003.

Atlantic Richfield Company
(A BP Affiliated Company)

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12 COMMERCE DRIVE
CRANFORD, NJ, 07016
PHONE: (908) 272-8300
FAX: (908) 272-3940

Issue Date: 01/18/08

Revisions

No.	Date	Description

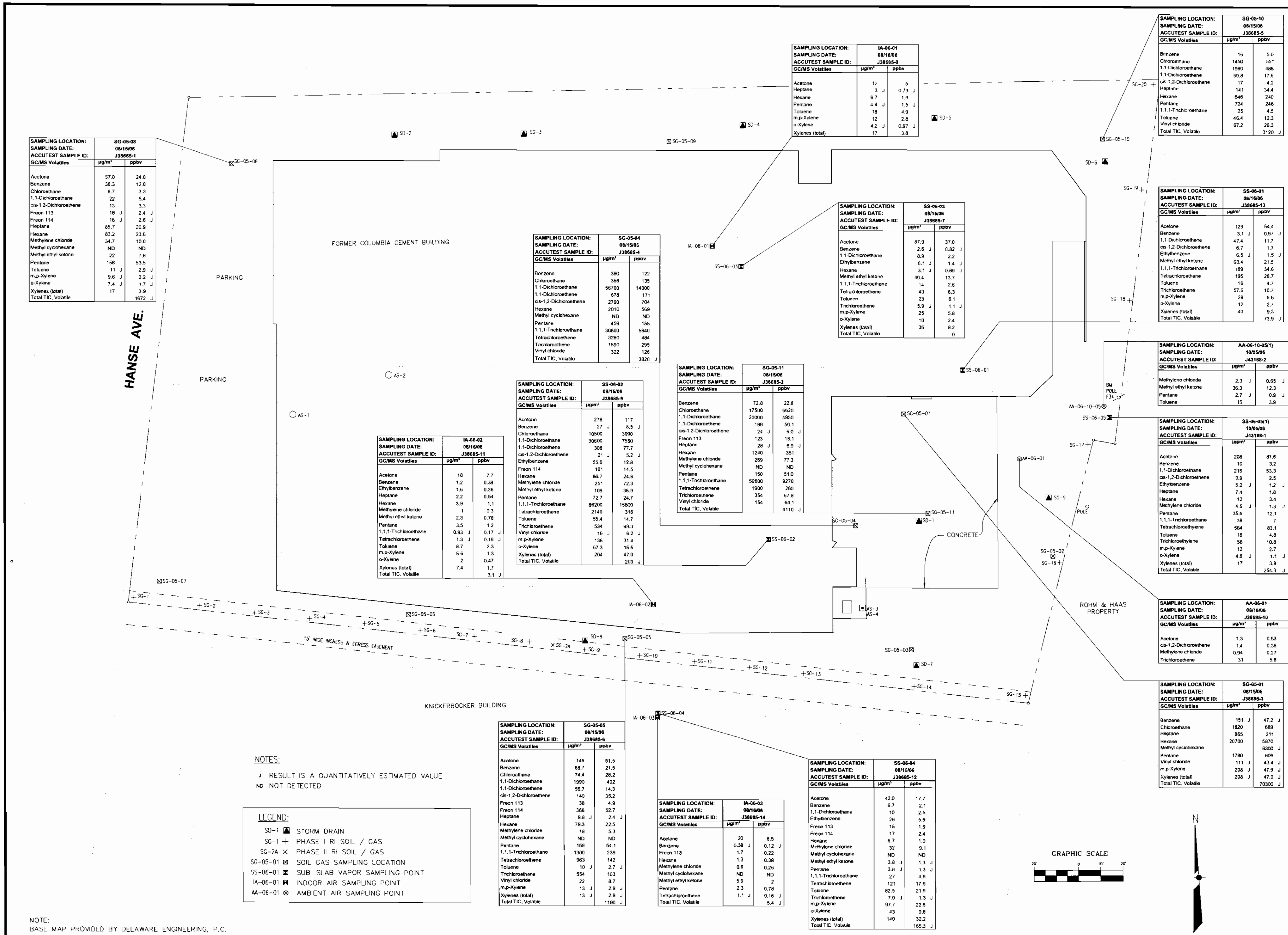
Project Description

Former Columbia Cement Company, Inc.
159 Hanse Avenue
Freeport, New York

Sheet Title:

GROUNDWATER VOC SAMPLING LOCATIONS AND RESULTS

Drawn By:	J.T.	12/18/06
Checked By:	M.B.	12/18/06
Scale:	AS SHOWN	
Project Number:	38546433	
Sheet Number:	FIGURE 6	



NOTES:

J RESULT IS A QUANTITATIVELY ESTIMATED VALUE
ND NOT DETECTED

LEGEND:

- SD-1 STORM DRAIN
- SG-1 + PHASE I RI SOIL / GAS
- SG-2A × PHASE II RI SOIL / GAS
- SG-05-01 SOIL GAS SAMPLING LOCATION
- SS-06-01 SUB-SLAB VAPOR SAMPLING POINT
- IA-06-01 INDOOR AIR SAMPLING POINT
- AA-06-01 AMBIENT AIR SAMPLING POINT

NOTE:
BASE MAP PROVIDED BY DELAWARE ENGINEERING, P.C.

SAMPLING LOCATION:	SG-05-08	
SAMPLING DATE:	08/15/06	
ACCUTEST SAMPLE ID:	J38685-1	
GC/MS Volatiles	µg/m³	ppbv
Acetone	57.0	24.0
Benzene	38.3	12.0
Chloroethane	8.7	3.3
1,1-Dichloroethane	22	5.4
cis-1,2-Dichloroethene	13	3.3
Freon 113	18 J	2.4 J
Freon 114	18 J	2.6 J
Heptane	85.7	20.9
Hexane	83.2	23.6
Methylene chloride	34.7	10.0
Methyl cyclohexane	ND	ND
Methyl ethyl ketone	22	7.6
Pentane	158	53.5
Toluene	11 J	2.9 J
m,p-Xylene	9.6 J	2.2 J
o-Xylene	7.4 J	1.7 J
Xylenes (total)	17	3.9
Total TIC, Volatile		1672 J

SAMPLING LOCATION:	IA-06-01	
SAMPLING DATE:	08/16/06	
ACCUTEST SAMPLE ID:	J38685-8	
GC/MS Volatiles	µg/m³	ppbv
Acetone	12	5
Heptane	3 J	0.73 J
Hexane	6 7	1.9
Pentane	4.4 J	1.5 J
Toluene	18	4.9
m,p-Xylene	12	2.8
o-Xylene	4.2 J	0.97 J
Xylenes (total)	17	3.8

SAMPLING LOCATION:	SG-05-04	
SAMPLING DATE:	08/15/06	
ACCUTEST SAMPLE ID:	J38685-4	
GC/MS Volatiles	µg/m³	ppbv
Benzene	390	122
Chloroethane	356	135
1,1-Dichloroethane	56700	14000
1,1-Dichloroethene	678	171
cis-1,2-Dichloroethene	2790	704
Hexane	2010	569
Methyl cyclohexane	ND	ND
Pentane	456	155
1,1,1-Trichloroethane	30800	5640
Tetrachloroethene	3280	484
Trichloroethene	1590	295
Vinyl chloride	322	126
Total TIC, Volatile		3820 J

SAMPLING LOCATION:	SS-06-03	
SAMPLING DATE:	08/16/06	
ACCUTEST SAMPLE ID:	J38685-7	
GC/MS Volatiles	µg/m³	ppbv
Acetone	87.9	37.0
Benzene	2.6 J	0.82 J
1 1-Dichloroethane	8.9	2.2
Ethylbenzene	6.1 J	1.4 J
Hexane	3.1 J	0.69 J
Methyl ethyl ketone	40.4	13.7
1,1,1-Trichloroethane	14	2.6
Tetrachloroethene	43	6.3
Toluene	23	6.1
Trichloroethene	5.9 J	1.1 J
m,p-Xylene	25	5.8
o-Xylene	10	2.4
Xylenes (total)	36	8.2
Total TIC, Volatile		0

SAMPLING LOCATION:	SS-06-02	
SAMPLING DATE:	08/16/06	
ACCUTEST SAMPLE ID:	J38685-9	
GC/MS Volatiles	µg/m³	ppbv
Acetone	278	117
Benzene	27 J	8.5 J
Chloroethane	10500	3990
1,1-Dichloroethane	30600	7550
1,1-Dichloroethene	308	77.7
cis-1,2-Dichloroethene	21 J	5.2 J
Ethylbenzene	55.6	12.8
Freon 114	101	14.5
Hexane	86.7	24.6
Methylene chloride	251	72.3
Methyl ethyl ketone	109	36.9
Pentane	72.7	24.7
1,1,1-Trichloroethane	86200	15800
Tetrachloroethene	2140	316
Toluene	55.4	14.7
Trichloroethene	534	99.3
Vinyl chloride	16 J	6.2 J
m,p-Xylene	136	31.4
o-Xylene	67.3	15.5
Xylenes (total)	204	47.0
Total TIC, Volatile		203 J

SAMPLING LOCATION:	SG-05-11	
SAMPLING DATE:	08/15/06	
ACCUTEST SAMPLE ID:	J38685-2	
GC/MS Volatiles	µg/m³	ppbv
Benzene	72.8	22.8
Chloroethane	17500	6620
1,1-Dichloroethane	20000	4950
1,1-Dichloroethene	199	50.1
cis-1,2-Dichloroethene	24 J	6.0 J
Freon 113	123	16.1
Heptane	28 J	6.9 J
Hexane	1240	351
Methylene chloride	269	77.3
Methyl cyclohexane	ND	ND
Pentane	150	51.0
1,1,1-Trichloroethane	50600	9270
Tetrachloroethene	1900	280
Trichloroethene	354	67.8
Vinyl chloride	154	64.1
Total TIC, Volatile		4110 J

SAMPLING LOCATION:	IA-06-02	
SAMPLING DATE:	08/16/06	
ACCUTEST SAMPLE ID:	J38685-11	
GC/MS Volatiles	µg/m³	ppbv
Acetone	18	7.7
Benzene	1.2	0.38
Ethylbenzene	1.6	0.36
Heptane	2.2	0.54
Hexane	3.9	1.1
Methylene chloride	1	0 3
Methyl ethyl ketone	2.3	0.78
Pentane	3.5	1.2
1,1,1-Trichloroethane	0.93 J	0.17 J
Tetrachloroethene	1.3 J	0.19 J
Toluene	8.7	2.3
m,p-Xylene	5 6	1.3
o-Xylene	2	0.47
Xylenes (total)	7.4	1.7
Total TIC, Volatile		3.1 J

SAMPLING LOCATION:	SG-05-10	
SAMPLING DATE:	08/15/06	
ACCUTEST SAMPLE ID:	J38685-5	
GC/MS Volatiles	µg/m³	ppbv
Benzene	16	5.0
Chloroethane	1450	551
1,1-Dichloroethane	1960	488
1,1-Dichloroethene	69.8	17.6
cis-1,2-Dichloroethene	17	4.2
Heptane	141	34.4
Hexane	646	240
Pentane	724	246
1,1,1-Trichloroethane	25	4.5
Toluene	46.4	12.3
Vinyl chloride	67.2	26.3
Total TIC, Volatile		3120 J

SAMPLING LOCATION:	SS-06-01	
SAMPLING DATE:	08/16/06	
ACCUTEST SAMPLE ID:	J38685-13	
GC/MS Volatiles	µg/m³	ppbv
Acetone	129	54.4
Benzene	3.1 J	0.97 J
1,1-Dichloroethane	47.4	11.7
cis-1,2-Dichloroethene	6.7	1.7
Ethylbenzene	6.5 J	1.5 J
Methyl ethyl ketone	63.4	21.5
1,1,1-Trichloroethane	189	34.6
Tetrachloroethene	195	28.7
Toluene	16	4.7
Trichloroethene	57.5	10.7
m,p-Xylene	29	6.6
o-Xylene	12	2.7
Xylenes (total)	40	9.3
Total TIC, Volatile		73.9 J

SAMPLING LOCATION:	AA-06-10-05(1)	
SAMPLING DATE:	10/05/06	
ACCUTEST SAMPLE ID:	J43168-2	
GC/MS Volatiles	µg/m³	ppbv
Methylene chloride	2.3 J	0.65 J
Methyl ethyl ketone	36.3	12.3
Pentane	2.7 J	0.9 J
Toluene	15	3.9

SAMPLING LOCATION:	SS-06-05(1)	
SAMPLING DATE:	10/05/06	
ACCUTEST SAMPLE ID:	J43168-1	
GC/MS Volatiles	µg/m³	ppbv
Acetone	208	87.6
Benzene	10	3.2
1,1-Dichloroethane	216	53.3
cis-1,2-Dichloroethene	9.9	2.5
Ethylbenzene	5.2 J	1.2 J
Heptane	7.4	1.8
Hexane	12	3.4
Methylene chloride	4.5 J	1.3 J
Pentane	35.6	12.1
1,1,1-Trichloroethane	38	7
Tetrachloroethylene	564	83.1
Toluene	18	4.8
Trichloroethylene	58	10.8
m,p-Xylene	12	2.7
o-Xylene	4.8 J	1.1 J
Xylenes (total)	17	3.8
Total TIC, Volatile		254.3 J

SAMPLING LOCATION:	AA-06-01	
SAMPLING DATE:	08/16/06	
ACCUTEST SAMPLE ID:	J38685-10	
GC/MS Volatiles	µg/m³	ppbv
Acetone	1.3	0.53
cis-1,2-Dichloroethene	1.4	0.36
Methylene chloride	0.94	0.27
Trichloroethene	31	5.8

SAMPLING LOCATION:	SG-05-01	
SAMPLING DATE:	08/15/06	
ACCUTEST SAMPLE ID:	J38685-3	
GC/MS Volatiles	µg/m³	ppbv
Benzene	151 J	47.2 J
Chloroethane	1820	689
Heptane	865	211
Hexane	20700	5870
Methyl cyclohexane		6300 J
Pentane	1780	606
Vinyl chloride	111 J	43.4 J
m,p-Xylene	208 J	47.9 J
Xylenes (total)	208 J	47.9 J
Total TIC, Volatile		70300 J

SAMPLING LOCATION:	SG-05-05	
SAMPLING DATE:	08/15/06	
ACCUTEST SAMPLE ID:	J38685-6	
GC/MS Volatiles	µg/m³	ppbv
Acetone	146	61.5
Benzene	68.7	21.5
Chloroethane	74.4	28.2
1,1-Dichloroethane	1990	492
1,1-Dichloroethene	56.7	14.3
cis-1,2-Dichloroethene	140	35.2
Freon 113	38	4.9
Freon 114	368	52.7
Heptane	9.8 J	2.4 J
Hexane	79.3	22.5
Methylene chloride	18	5.3
Methyl cyclohexane	ND	ND
Pentane	159	54.1
1,1,1-Trichloroethane	1300	239
Tetrachloroethene	963	142
Toluene	10 J	2.7 J
Trichloroethene	554	103
Vinyl chloride	22	8.7
m,p-Xylene	13 J	2.9 J
Xylenes (total)	13 J	2.9 J
Total TIC, Volatile		1190 J

SAMPLING LOCATION:	IA-06-03	
SAMPLING DATE:	08/16/06	
ACCUTEST SAMPLE ID:	J38685-14	
GC/MS Volatiles	µg/m³	ppbv
Acetone	20	8.5
Benzene	0.38 J	0.12 J
Freon 113	1.7	0.22
Hexane	1.3	0.38
Methylene chloride	0.9	0.26
Methyl cyclohexane	ND	ND
Methyl ethyl ketone	5.9	2
Pentane	2.3	0.78
Tetrachloroethene	1.1 J	0.16 J
Total TIC, Volatile		5.4 J

SAMPLING LOCATION:	SS-06-04	
SAMPLING DATE:	08/16/06	
ACCUTEST SAMPLE ID:	J38685-12	
GC/MS Volatiles	µg/m³	ppbv
Acetone	42.0	17.7
Benzene	6.7	2.1
1,1-Dichloroethane	10	2.5
Ethylbenzene	26	5.9
Freon 113	15	1.9
Freon 114	17	2.4
Hexane	6.7	1.9
Methylene chloride	32	9.1
Methyl cyclohexane	ND	ND
Methyl ethyl ketone	3.8 J	1.3 J
Pentane	3.8 J	1.3 J
1,1,1-Trichloroethane	27	4.9
Tetrachloroethene	121	17.9
Toluene	82.5	21.9
Trichloroethene	7.0 J	1.3 J
m,p-Xylene	97.7	22.6
o-Xylene	43	9.8
Xylenes (total)	140	32.2
Total TIC, Volatile		165.3 J

Atlantic Richfield Company
(A BP Affiliated Company)

URS
12 COMMERCE DRIVE
CRANFORD, NJ, 07016
PHONE: (908) 272-8300
FAX: (908) 272-3940

Issue Date: 01/18/08

Revisions

No.	Date	Description

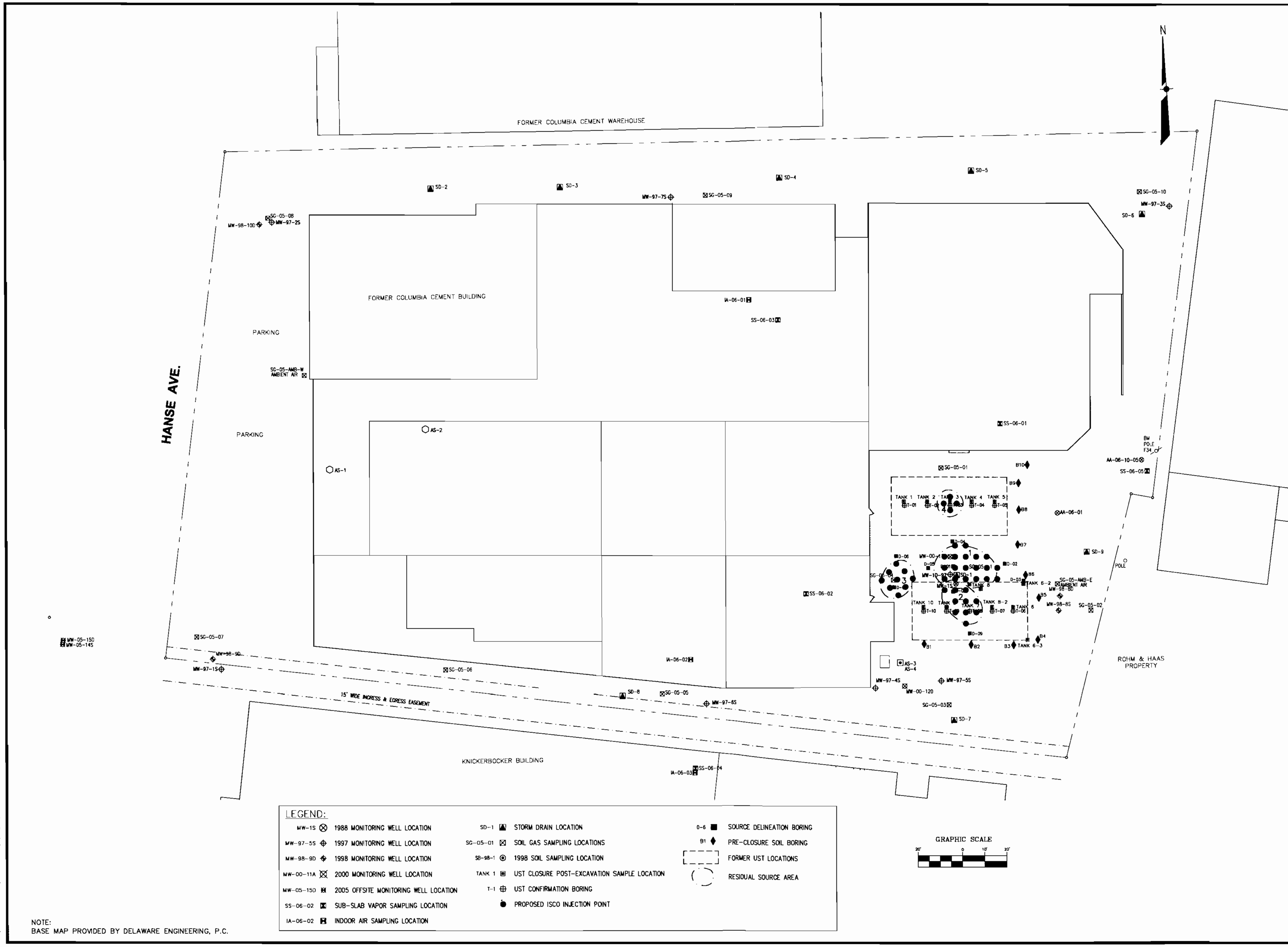
Project Description

Former Columbia Cement Company. Inc.
159 Hanse Avenue
Freeport, New York

Sheet Title:

2006 SOIL SOIL VAPOR INTRUSION SAMPLING LOCATIONS AND RESULTS

Drawn By:	J.T.	12/18/06
Checked By:	M.B.	12/18/06
Scale:	AS SHOWN	
Project Number:	38546433	
Sheet Number:	FIGURE 7	



Atlantic Richfield Company
(A BP Affiliated Company)

URS
12 COMMERCE DRIVE
CRANFORD, NJ, 07016
PHONE: (908) 272-8300
FAX: (908) 272-3940

Issue Date: 01/18/08

Revisions

No.	Date	Description

Project Description

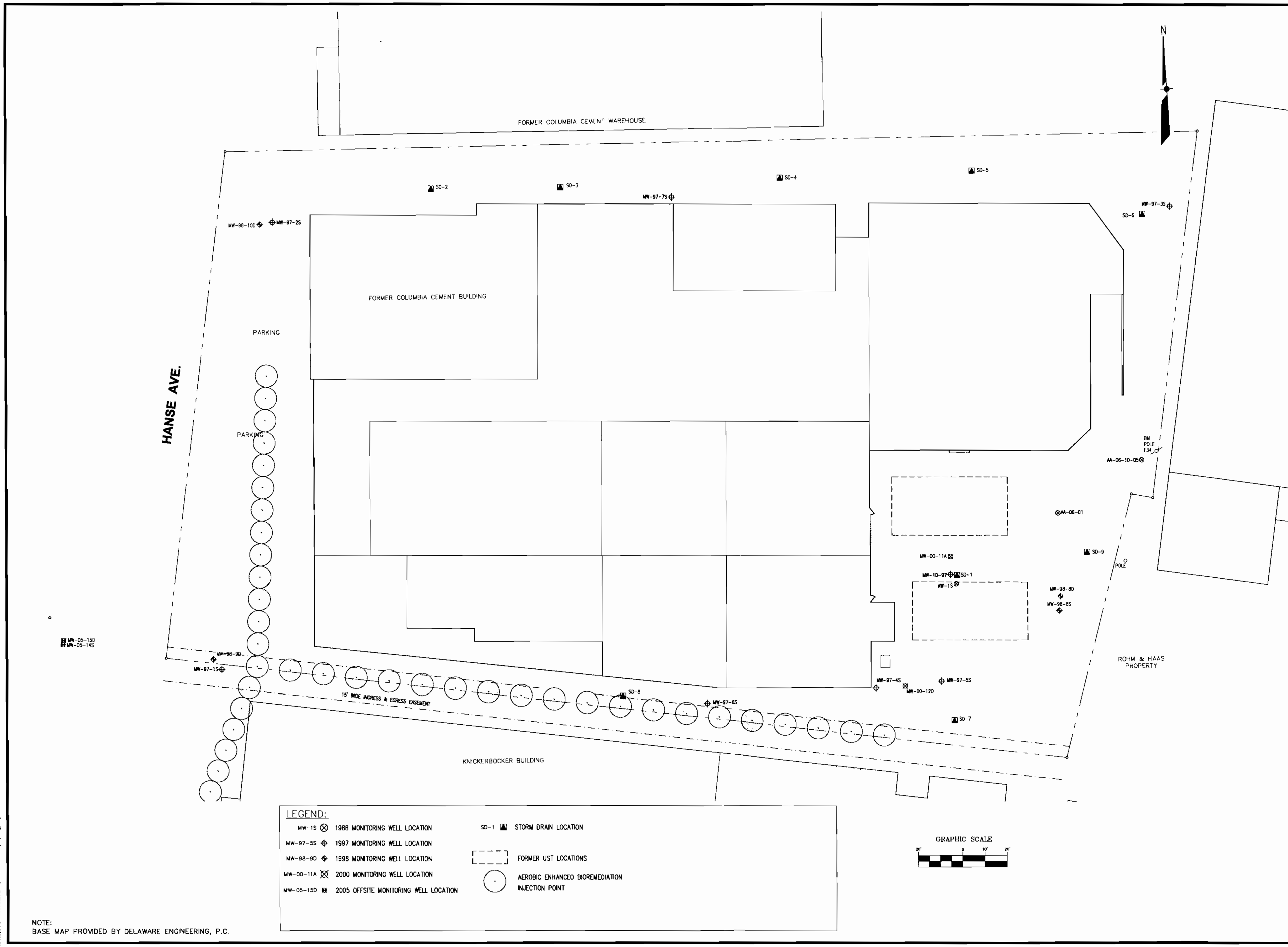
Former Columbia Cement Company. Inc.
159 Hanse Avenue
Freeport, New York

Sheet Title:

ALTERNATIVE 3: IN-SITU CHEMICAL OXIDATION OF SOILS

Drawn By:	J.T.	12/07/05
Checked By:	M.B.	12/08/05
Scale:	AS SHOWN	
Project Number:	38646433	
Sheet Number:	FIGURE 8	

K:\Cadd\38646433\COLUMBIA CEMENT\FS\FIGURE-16(F8).dwg, Layout1, 2/11/2008 3:46:03 PM



Atlantic Richfield Company
(A BP Affiliated Company)

URS
12 COMMERCE DRIVE
CRANFORD, NJ, 07016
PHONE: (908) 272-8300
FAX: (908) 272-3940

Issue Date: 04/20/05

Revisions		
No.	Date	Description

Project Description

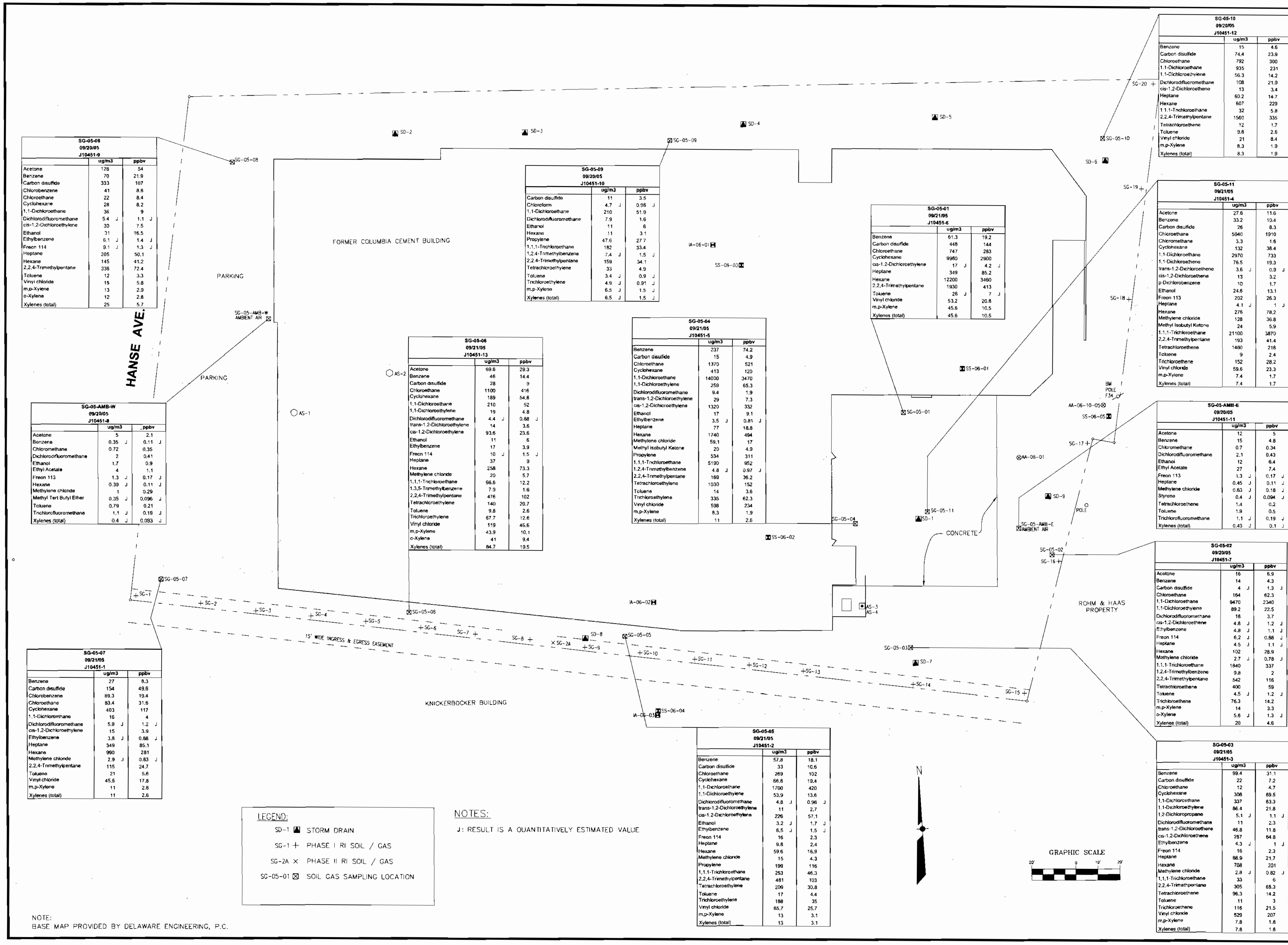
Former Columbia Cement Company, Inc.
159 Hanse Avenue
Freeport, New York

Sheet Title:

ALTERNATIVE 6: IN-SITU BIOREMEDIATION OF GROUNDWATER

Drawn By:	L.H.	12/19/07
Checked By:	M.B.	12/19/07
Scale:	AS SHOWN	
Project Number:	38646433	
Sheet Number:	FIGURE 9	

K:\Cadd\38646433\COLUMBIA CEMENT\FS\FIGURE-19(F9).dwg, Layout1, 2/11/2008 2:45:51 PM



SG-05-08 — 09/20/05 — J10451-9

	ug/m3	ppbv
Acetone	128	54
Benzene	70	21.9
Carbon disulfide	333	107
Chlorobenzene	41	8.8
Chloroethane	22	8.4
Cyclohexane	28	8.2
1,1-Dichloroethane	36	9
Dichlorodifluoromethane	5.4 J	1.1 J
cis-1,2-Dichloroethylene	30	7.5
Ethanol	31	16.5
Ethylbenzene	6.1 J	1.4 J
Freon 114	9.1 J	1.3 J
Heptane	205	50.1
Hexane	145	41.2
2,2,4-Trimethylpentane	338	72.4
Toluene	12	3.3
Vinyl chloride	15	5.8
m,p-Xylene	13	2.9
o-Xylene	12	2.8
Xylenes (total)	25	5.7

SG-05-AMB-W — 09/20/05 — J10451-8

	ug/m3	ppbv
Acetone	5	2.1
Benzene	0.35 J	0.11 J
Chloromethane	0.72	0.35
Dichlorodifluoromethane	2	0.41
Ethanol	1.7	0.9
Ethyl Acetate	4	1.1
Freon 113	1.3 J	0.17 J
Hexane	0.39 J	0.11 J
Methylene chloride	1	0.29
Methyl Tert Butyl Ether	0.35 J	0.096 J
Toluene	0.79	0.21
Trichlorofluoromethane	1.1 J	0.19 J
Xylenes (total)	0.4 J	0.093 J

SG-05-07 — 09/21/05 — J10451-1

	ug/m3	ppbv
Benzene	27	8.3
Carbon disulfide	154	49.6
Chlorobenzene	89.3	19.4
Chloroethane	83.4	31.6
Cyclohexane	403	117
1,1-Dichloroethane	16	4
Dichlorodifluoromethane	5.9 J	1.2 J
cis-1,2-Dichloroethylene	15	3.9
Ethylbenzene	3.8 J	0.88 J
Heptane	349	85.1
Hexane	990	281
Methylene chloride	2.9 J	0.83 J
2,2,4-Trimethylpentane	115	24.7
Toluene	21	5.6
Vinyl chloride	45.5	17.8
m,p-Xylene	11	2.6
Xylenes (total)	11	2.6

SG-05-09 — 09/20/05 — J10451-10

	ug/m3	ppbv
Carbon disulfide	11	3.5
Chloroform	4.7 J	0.96 J
1,1-Dichloroethane	210	51.9
Dichlorodifluoromethane	7.9	1.6
Ethanol	11	6
Hexane	11	3 1
Propylene	47.6	27 7
1,1,1-Trichloroethane	182	33.4
1,2,4-Trimethylbenzene	7.4 J	1.5 J
2,2,4-Trimethylpentane	159	34.1
Tetrachloroethylene	33	4.9
Toluene	3.4 J	0.9 J
Trichloroethylene	4.9 J	0.91 J
m,p-Xylene	6.5 J	1.5 J
Xylenes (total)	6.5 J	1.5 J

SG-05-06 — 09/21/05 — J10451-13

	ug/m3	ppbv
Acetone	69.6	29.3
Benzene	46	14.4
Carbon disulfide	28	9
Chloroethane	1100	416
Cyclohexane	189	54.8
1,1-Dichloroethane	210	52
1,1-Dichloroethylene	19	4.8
Dichlorodifluoromethane	4.4 J	0.88 J
trans-1,2-Dichloroethylene	14	3.6
cis-1,2-Dichloroethylene	93.6	23.6
Ethanol	11	6
Ethylbenzene	17	3.9
Freon 114	10 J	1.5 J
Heptane	37	9
Hexane	258	73.3
Methylene chloride	20	5.7
1,1,1-Trichloroethane	66.6	12.2
1,3,5-Trimethylbenzene	7.9	1.6
2,2,4-Trimethylpentane	476	102
Tetrachloroethylene	140	20.7
Toluene	9.8	2.6
Trichloroethylene	67.7	12.6
Vinyl chloride	119	46.6
m,p-Xylene	43.9	10.1
o-Xylene	41	9.4
Xylenes (total)	84.7	19.5

SG-05-04 — 09/21/05 — J10451-5

	ug/m3	ppbv
Benzene	237	74.2
Carbon disulfide	15	4.9
Chloroethane	1370	521
Cyclohexane	413	120
1,1-Dichloroethane	14000	3470
1,1-Dichloroethylene	259	65.3
Dichlorodifluoromethane	9.4	1.9
trans-1,2-Dichloroethylene	29	7.3
cis-1,2-Dichloroethylene	1320	332
Ethanol	17	9.1
Ethylbenzene	3.5 J	0.81 J
Heptane	77	18.8
Hexane	1740	494
Methylene chloride	59.1	17
Methyl Isobutyl Ketone	20	4.9
Propylene	534	311
1,1,1-Trichloroethane	5190	952
1,2,4-Trimethylbenzene	4.8 J	0.97 J
2,2,4-Trimethylpentane	169	36.2
Tetrachloroethylene	1030	152
Toluene	14	3.6
Trichloroethylene	335	62.3
Vinyl chloride	598	234
m,p-Xylene	8.3	1.9
Xylenes (total)	11	2.6

SG-05-01 — 09/21/05 — J10451-6

	ug/m3	ppbv
Benzene	61.3	19.2
Carbon disulfide	448	144
Chloroethane	747	283
Cyclohexane	9980	2900
cis-1,2-Dichloroethylene	17 J	4.2 J
Heptane	349	85.2
Hexane	12200	3460
2,2,4-Trimethylpentane	1930	413
Toluene	26 J	7 J
Vinyl chloride	53.2	20.8
m,p-Xylene	45.6	10.5
Xylenes (total)	45.6	10.5

SG-05-05 — 09/21/05 — J10451-2

	ug/m3	ppbv
Benzene	57.8	18.1
Carbon disulfide	33	10.6
Chloroethane	269	102
Cyclohexane	66.8	19.4
1,1-Dichloroethane	1700	420
1,1-Dichloroethylene	53.9	13.6
Dichlorodifluoromethane	4.8 J	0.98 J
trans-1,2-Dichloroethylene	11	2.7
cis-1,2-Dichloroethylene	226	57.1
Ethanol	3.2 J	1.7 J
Ethylbenzene	6.5 J	1.5 J
Freon 114	16	2.3
Heptane	9.8	2.4
Hexane	59.6	16.9
Methylene chloride	15	4.3
Propylene	199	116
1,1,1-Trichloroethane	253	46.3
2,2,4-Trimethylpentane	481	103
Tetrachloroethylene	209	30.8
Toluene	17	4.4
Trichloroethylene	188	35
Vinyl chloride	65.7	25.7
m,p-Xylene	13	3.1
Xylenes (total)	13	3.1

SG-05-10 — 09/20/05 — J10451-12

	ug/m3	ppbv
Benzene	15	4.6
Carbon disulfide	74.4	23.9
Chloroethane	792	300
1,1-Dichloroethane	935	231
1,1-Dichloroethylene	56.3	14.2
Dichlorodifluoromethane	108	21.9
cis-1,2-Dichloroethene	13	3.4
Heptane	60.2	14.7
Hexane	607	229
1 1,1-Trichloroethane	32	5.8
2,2,4-Trimethylpentane	1560	335
Tetrachloroethene	12	1.7
Toluene	9.8	2.6
Vinyl chloride	21	8.4
m,p-Xylene	8.3	1.9
Xylenes (total)	8.3	1.9

SG-05-11 — 09/21/05 — J10451-4

	ug/m3	ppbv
Acetone	27.6	11.6
Benzene	33.2	10.4
Carbon disulfide	26	8.3
Chloroethane	5040	1910
Chloromethane	3.3	1.6
Cyclohexane	132	38.4
1,1-Dichloroethane	2970	733
1,1-Dichloroethene	76.5	19.3
trans-1,2-Dichloroethene	3.6 J	0.9 J
cis-1,2-Dichloroethene	13	3.2
p-Dichlorobenzene	10	1.7
Ethanol	24.6	13.1
Freon 113	202	26.3
Heptane	4.1 J	1 J
Hexane	276	78.2
Methylene chloride	128	36.8
Methyl Isobutyl Ketone	24	5.9
1,1,1-Trichloroethane	21100	3870
2,2,4-Trimethylpentane	193	41.4
Tetrachloroethene	1480	218
Toluene	9	2.4
Trichloroethene	152	28.2
Vinyl chloride	59.6	23.3
m,p-Xylene	7.4	1.7
Xylenes (total)	7.4	1.7

SG-05-AMB-E — 09/20/05 — J10451-11

	ug/m3	ppbv
Acetone	12	5
Benzene	15	4.8
Chloromethane	0.7	0.34
Dichlorodifluoromethane	2.1	0.43
Ethanol	12	6.4
Ethyl Acetate	27	7.4
Freon 113	1.3 J	0.17 J
Heptane	0.45 J	0.11 J
Methylene chloride	0.63 J	0.18 J
Styrene	0.4 J	0.094 J
Tetrachloroethene	1.4	0.2
Toluene	1.9	0.5
Trichlorofluoromethane	1.1 J	0.19 J
Xylenes (total)	0.43 J	0.1 J

SG-05-02 — 09/20/05 — J10451-7

	ug/m3	ppbv
Acetone	16	6.9
Benzene	14	4.3
Carbon disulfide	4 J	1.3 J
Chloroethane	164	62.3
1,1-Dichloroethane	9470	2340
1,1-Dichloroethylene	89.2	22.5
Dichlorodifluoromethane	18	3.7
cis-1,2-Dichloroethene	4.8 J	1.2 J
Ethylbenzene	4.8 J	1.1 J
Freon 114	6.2 J	0.88 J
Heptane	4.5 J	1.1 J
Hexane	102	28.9
Methylene chloride	2.7 J	0.78 J
1,1,1-Trichloroethane	1840	337
1,2,4-Trimethylbenzene	9.8	2
2,2,4-Trimethylpentane	542	116
Tetrachloroethene	400	59
Toluene	4.5 J	1.2 J
Trichloroethene	76.3	14.2
m,p-Xylene	14	3.3
o-Xylene	5.6 J	1.3 J
Xylenes (total)	20	4.6

SG-05-03 — 09/21/05 — J10451-3

	ug/m3	ppbv
Benzene	99.4	31.1
Carbon disulfide	22	7.2
Chloroethane	12	4.7
Cyclohexane	308	89.5
1,1-Dichloroethane	337	83.3
1,1-Dichloroethylene	86.4	21.8
1,2-Dichloropropane	5.1 J	1.1 J
Dichlorodifluoromethane	11	2.3
trans-1,2-Dichloroethene	46.8	11.8
cis-1,2-Dichloroethene	257	64.8
Ethylbenzene	4.3 J	1 J
Freon 114	16	2.3
Heptane	88.9	21.7
Hexane	708	201
Methylene chloride	2.8 J	0.82 J
1,1,1-Trichloroethane	33	6
2,2,4-Trimethpentane	305	65.3
Tetrachloroethene	96.3	14.2
Toluene	11	3
Trichloroethene	116	21.5
Vinyl chloride	529	207
m,p-Xylene	7.8	1.8
Xylenes (total)	7.8	1.8

Atlantic Richfield Company
(A BP Affiliated Company)

URS
12 COMMERCE DRIVE
CRANFORD, NJ, 07016
PHONE: (908) 272-8300
FAX: (908) 272-3940

Issue Date: 01/18/08

Revisions		
No	Date	Description

Project Description

Former Columbia Cement Company, Inc.
159 Hanse Avenue
Freeport, New York

Sheet Title:

2005 SOIL VAPOR INTRUSION SAMPLING LOCATIONS AND RESULTS

Drawn By:	J.T.	12/18/06
Checked By:	M.B.	12/18/06
Scale:	AS SHOWN	
Project Number:	38546433	
Sheet Number:	FIGURE10	