New York State Department of Environmental Conservation Brownfield Cleanup Program

REMEDIAL INVESTIGATION WORK PLAN

Bethpage Community Park Ice Rink Area

Stewart Avenue
Bethpage
Nassau, New York

NYSDEC Site No. C130212

January 2014

Prepared for:

Town of Oyster Bay
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TOWN OF OYSTER BAY
BETHPAGE, NASSAU COUNTY, NEW YORK
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JANUARY 2014

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1.0 INTRODUCTION

On behalf of the Town of Oyster Bay (TOB) Office of the Town Attorney (OTA), Holzmacher, McLendon & Murrell, P.C. (H2M) has prepared this Remedial Investigation Work Plan (RIWP) for the Bethpage Community Park Ice Rink Area in the Hamlet of Bethpage, TOB, Nassau County, New York (Site). The approximately 0.4-acre Site is situated within the northeast portion of the approximately 18-acre Bethpage Community Park (Park) and encompasses the footprint of two former ice skating rinks, now demolished and replaced by the current indoor ice skating center. United States Geological Survey (USGS) 7.5-minute topographic quadrangles including the Site and the surrounding area (within a minimum radius of 0.5 miles) are provided as Figure 1. A map showing the Park features and Site outline is provided as Figure 2.

1.1. SITE BACKGROUND

To date, a number of environmental investigations have been conducted at the Site and general area by various entities including the United States Navy (U.S. Navy), USGS, New York State Department of Environmental Conservation (NYSDEC), New York State Department of Health (NYSDOH), Grumman Aircraft Engineering Corporation (Grumman), Northrop Grumman Corporation (NGC), Rogers, Golden & Halpern of Philadelphia, Pennsylvania (RGH), Geraghty & Miller, Inc. of Plainview, New York (G & M), Halliburton NUS Environmental Corporation of Wayne, Pennsylvania (Halliburton), Dvirka and Bartilucci Consulting Engineers of Woodbury, New York (D & B), ARCADIS, Inc. of Melville, New York (ARCADIS), EA Engineering P.C. and its Affiliate EA Science and Technology (EAE & ST), and H2M. A Freon™ compound identified as chlorodifluoromethane (Freon-22™) was detected in the groundwater down-gradient of the Site. Based on an NYSDEC letter dated September 17, 2008, “NYSDEC has concluded that the former ice rinks” at the Bethpage Community Park “were the source of the dichlodifluoromethane (Freon-22)”. In a NYSDEC letter to ARCADIS, dated May 26, 2010, the NYSDEC indicates that a “review of groundwater analytical data shows that Freon-22 groundwater contamination has been identified as a sub-plume within the overall OU3 Grumman groundwater contamination plume.”

In the BCP application prepared by the TOB (also known as the Participant) and submitted to the NYSDEC on July 26, 2011, the TOB proposed to investigate the extent of Freon-22™ impacts from the Site to the groundwater and, if necessary, develop and implement mitigating measures (Project). The NYSDEC accepted the Site into the Brownfield Cleanup Program (BCP) in a letter dated January 19, 2012 and executed / entered into a Brownfield

Cleanup Agreement (BCA) with the TOB on March 16, 2012. In the NYSDEC letter dated April 10, 2013 (April 2013 NYSDEC Comment Letter), the TOB was additionally tasked with "investigating volatile organic compounds (VOCs) that include Freon 12, Freon 22 and any other VOC impacts from the Brownfield site to groundwater and soil vapor". The April 2013 NYSDEC Comment Letter further clarified that the RIWP must include sampling and analysis for "all VOCs and tentatively identified compounds (TICs)".

According to the Remedial Investigation Report (Site Area) prepared by ARCADIS for Operable Unit 3 (OU3) and dated February 1, 2008 (February 2008 ARCADIS RIR [Site Area]), the southwest portion of the Park ("Areas 'B', 'C', 'D', and 'I'", as defined by ARCADIS) "appear to be continuing sources of VOCs to groundwater." Based on the Record of Decision (ROD) for Northrop Grumman Bethpage Facility – Operable Unit Number: 03 – State Superfund Project – Bethpage, Nassau County- Site No. 130003A, dated March 2013 and issued by the NYSDEC (March 2013 NYSDEC OU3 ROD), the "approximately one-acre VOC rag pit area" is the source area(s) for VOCs.

Considering the above, this RIWP has been prepared to include groundwater and soil vapor sampling for VOCs, Freon-12™, Freon-22™, plus VOC TICs analysis. It is understood that the contaminant of concern associated with the subject Site is limited to Freon™, and that non-Freon™ VOC analytical data, that may be generated as part of the Remedial Investigation, will be utilized for information purposes regarding the Site setting and not for consideration as contaminants of concern associated with the Site.

1.2. PROJECT OBJECTIVES

The objective of the Project is to investigate the extent of contaminant impacts from the Site to groundwater and to soil vapor. Based on the findings of the Remedial Investigation (RI), a determination will be made as to whether there are any potential threats to human health and/or the environment due to the above-listed compounds of concern. Specific project objectives are defined further in Section 4.1.

2.0 SITE AND AREA DESCRIPTION

2.1. LOCATION AND USE

Site

The Site is located on Stewart Avenue in the Hamlet of Bethpage, TOB, Nassau County, New York. The Site location map is provided as Figures 1 and 2. The approximately 0.4-acre Site is situated within the northeast portion of the Park. The Site encompasses the footprint of two former ice skating rinks, now demolished and replaced by the current indoor ice skating center. The Site is currently utilized for recreational purposes.

Bethpage Community Park

Surrounding the Site is the approximately 18-acre Park containing additional recreational facilities. The Park is bordered by Cherry Avenue Extension to the north; Stewart Avenue to the east; Former NGC Plant 24 Access Road to the south; and the former NGC Plant 24

building and other NGC properties to the west. Bethpage High School (BHS) is located east of the Park, across Stewart Avenue and residential properties are located south of the Park, across the Former NGC Plant 24 Access Road. A portion of the Park and the Former NGC Plant 24 Access Road are collectively referred to by NYSDEC as OU3. The Park is currently owned and operated by the TOB and contains a swimming pool, basketball court, baseball field, tennis courts, playgrounds, picnic areas, a parking lot, and an indoor ice skating center. A site plan depicting the Park features and Former NGC Plant 24 Access Road is provided in Figure 2 of the 2010 Annual Summary Operation, Maintenance, and Monitoring (OM&M) Report for the Groundwater Interim Remedial Measure (IRM) prepared by ARCADIS for OU3 and dated April 7, 2011 (April 2011 ARCADIS Annual Summary OM&M Report for 2010). The area hydraulically down-gradient of the Park and Sycamore Avenue is defined by ARCADIS as the "Study Area".

Construction Area

Surrounding the Site and within the Park is an approximately 7-acre area identified in the Investigation Report and Remedial Action Plan prepared by H2M and dated November 2005 (November 2005 H2M IR and RAP) as the Construction Area. The Construction Area extends from the north border of the Park, in a southerly direction to the approximate center of the Park. A site plan depicting the Construction Area is provided in Figure 2 of the Final Engineering Report (FER) prepared by H2M for the Construction Area IRM and dated March 2008 (March 2008 H2M FER).

Former Grumman Property

The former Grumman Property (Grumman Property) was approximately 500 acres in size and was located to the north, west and south of the Site. The Grumman Property was owned and operated by Grumman, now known as NGC. A site plan depicting the Grumman Property is provided as Figure 1 of the Remedial Investigation Report (Study Area Groundwater) prepared by ARCADIS for OU3 and revision dated February 7, 2011 (February 2011 ARCADIS RIR [Study Area]).

Former United States Naval Weapons Industrial Reserve Plant

The former United States Naval Weapons Industrial Reserve Plant (NWIRP) occupied approximately 105 acres of the north-central portion of the Grumman Property. A site plan depicting the former NWIRP is provided as Figure 1 of the February 2011 ARCADIS RIR (Study Area).

Former Occidental Chemical Corporation / RUCO Polymer Corporation

The former Occidental Chemical Corporation (formerly the Hooker Chemical Corporation) / RUCO Polymer Corporation (OCC / RUCO) was approximately 17 acres in area and located on New South Road, adjacent to and west of the Grumman Property. A site plan depicting the OCC / RUCO is provided as Figure 1 of the February 2011 ARCADIS RIR (Study Area).

Surrounding Area

The surrounding area, outside the boundaries of the Park, consists of mixed land uses including residential, commercial and school properties. Located south of the Park and the Former NGC Plant 24 Access Road are Sycamore Avenue (TOB-owned roadway) and residential properties. Stewart Avenue is a Nassau County-owned roadway that adjoins the Park to the east, beyond which is a school. Located north of the Park are Cherry Avenue / Aerospace Boulevard (Grumman-owned roadway) and commercial properties. Site and Area Physical Setting

2.1.1. Topography

The Site is located in an area that is approximately 125 feet above mean sea level (msl) and is generally flat. The surrounding area land surface ranges from approximately 85 to 120 feet above msl and is generally flat.

2.1.2. Geology

The Site subsurface consists primarily of fill material underlain by native soils (fine to medium sands). The low permeability zones of unsaturated soils consist of silts, silty clay and clay with interbedded sand lenses. The subsurface from land surface downward includes the Upper Glacial Pleistocene-age outwash deposits followed by the Cretaceous-age Magothy Formation. The Upper Glacial deposits are coarser compared to the Magothy Formation deposits which become finer with depth. The Site and the general area of the Site are underlain by four major unconsolidated units, which from land surface downward include the Pleistocene Series, the Magothy Formation, the Raritan Clay Member of the Raritan Formation, and the Lloyd Sand Member of the Raritan Formation. The estimated elevation of the top of the Raritan Confining Unit is -550 feet msl. The bedrock surface in the general area of the Site is sloping in a southeasterly direction.

2.1.3. Hydrogeology

The Site is located on Long Island glacial sand deposits which have been designated as a sole source aquifer. The depth to groundwater at the Site varies seasonally from approximately 50 to 55 feet below land surface (bls). The depth to groundwater within the general area of the Site varies between 50 and 74 feet msl. Groundwater flow at the Site and in the general area of the Site is in the south-southeasterly direction.

The groundwater reservoir at the Site and in the general area of the Site is divided into three main aquifers: the Upper Glacial aquifer; the Magothy aquifer; and the Lloyd Sand aquifer. The Upper Glacial aquifer is underlain by the Magothy aquifer, which is a primary source of drinking water in Nassau County. The Raritan Clay confines the underlying Lloyd Sand aquifer. The average hydraulic conductivity of the Upper Glacial aquifer is approximately 270 feet per day and the average horizontal hydraulic conductivity of the Magothy aquifer is approximately 50 feet per day.

The Upper Glacial and Magothy aquifers were segregated into the following hydrogeologic zones during the evaluation of groundwater flow and quality presented in the Operable Unit 2 (OU2) Groundwater Remedial System Hydraulic Effectiveness Evaluation prepared by

ARCADIS for the Site Area and dated May 6, 2003 (May 2003 ARCADIS OU2 GW Remedial System Evaluation):

- Shallow Zone – Extends from the water table (50 feet msl) to 40 feet msl.
- Intermediate Zone – Extends from 40 to -50 feet msl.
- Deep Zone – Extends from -50 to -365 feet msl.
- Deep2 Zone – Extends from -365 to -530 feet msl.
- D3 Zone – Extends from -530 to -550 feet msl.

Based on the Groundwater IRM Work Plan (WP) prepared by ARCADIS for OU3 and dated November 14, 2007, with a revision date of December 12, 2007 (December 2007 ARCADIS Groundwater IRM WP), the groundwater was segregated into the following two hydrogeologic zones for remediation:

- Groundwater in the upper 20 feet of the surficial aquifer (70 to 50 feet msl).
- Groundwater below the upper 20 feet of the surficial aquifer (50 feet msl and below).

There are no water supply wells located on the Site or in the Park. Public / private drinking water supply and irrigation wells located within a radial distance of 0.5 miles from the approximate center of the Site are listed below (adapted from the RIR [Site Area] prepared by ARCADIS for OU3 and dated February 1, 2008 [February 2008 ARCADIS RIR (Site Area)]):

- Approximately 975 feet to the northeast of the eastern Site boundary is irrigation well, N-4175. The irrigation well is screened from 54 to 69 feet bls.
- Approximately 1,600 feet to the northeast of the eastern Site boundary is the Bethpage Water District (BWD) Adams Avenue Wellfield (AAW). The BWD AAW consists the following:
    - Supply well N-4063 (approximately 1,600 feet northeast) is screened from 139 to 233 feet bls;
    - Supply well N-8767 / Well #7 (approximately 1,750 feet northeast) is screened from 579 to 640 feet bls;
    - Supply well N-4146 (approximately 2,000 feet northeast) is screened from 153 to 235 feet bls; and
    - Supply well N-8768 / Well #8 (approximately 2,100 feet northeast) is screened from 608 to 678 feet bls.

Local residents receive the water supply from municipal wells owned / operated by the BWD. The closest BWD supply wells south-southeast (down-gradient) of the southern Site boundary are located within the BWD Plant 4 on Sophia Street (BWD 6915 / Well #4-1 [approximately 8,400 feet] and BWD 6916 / Well #4-2 [approximately 8,600 feet]).

Massapequa Lake is located approximately 7 miles southeast of the Site and the South Oyster Bay is located approximately 8 miles south of the Site.

3.0 RECORDS SEARCH

A records search was conducted for the Site, Park and general area and included a review of the Site, Park and general area environmental history, assessments, investigations, remediations, work plans, action plans, remediation measures, environmental findings, etc., as available. The records search was conducted in general accordance with Appendix 3A – Records Search Requirements and Section 3.12 – Records Search Report of NYSDEC Division of Environmental Remediation (DER)-10 / Technical Guidance for Site Investigation and Remediation.

3.1. DOCUMENT REVIEW

Available environmental documents pertaining to Site, Park and general area were obtained from TOB, the document repository at the Bethpage Park Library in Bethpage, New York (Library), the NYSDEC, the NYSDEC Online Region 1 – Environmental Remediation Project Information Database, and/or the Naval Facilities Engineering Command (NAVFAC) Online Admin Record Files Search. The environmental documents were reviewed for environmental information relative to groundwater and soil vapor and more specifically to Freon-22™ in groundwater and soil vapor at the Site, Park and general area. Additionally, as required by the NYSDEC in the April 2013 NYSDEC Comment Letter, select documents (where noted below) were reviewed for environmental information relative to Freon-12™, in groundwater and soil vapor at the Site, Park and general area and additional details regarding Freon-12™ in groundwater and soil vapor are provided in Section 3.2 of this RIWP. Historical information obtained from and findings of the records search are provided throughout this RIWP and summarized below.

Initial Assessment Study of NWIRP Bethpage, NY and NWIRP Calverton, NY prepared by RGH and dated December 1986 (December 1986 RGH IAS)

Tabulated groundwater analytical data obtained from the Bethpage and Hicksville Water Districts in 1986 did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the December 1986 RGH IAS. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TIC) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (method detection limit [MDL], contract required detection limit [CRDL], instrument detection limit [IDL], reporting limit [RL], etc.). Soil vapor was not addressed in the study.

RI / Feasibility Study (FS) WP prepared by G & M for the Grumman Property and dated March 1990 (March 1990 G & M RI / FS WP)

G & M conducted an RI / FS to identify and define "potential contamination attributable" to the Grumman Property and provide sufficient data to design a remedial action alternative (RAA). In preparing the RI / FS, G & M reviewed "all existing data" for the Grumman Property, NWIRP and OCC / RUCO, including history; waste generation, storage, disposal, and treatment processes; and water quality data. Tabulated groundwater analytical data

obtained between 1982 and 1989 and utilized for mass balance reporting under the State Pollutant Discharge Elimination System (SPDES) did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the March 1990 G & M RI / FS WP. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

RI/FS Fourth Monthly Progress Report prepared by G & M for the Grumman Property and dated May 24, 1991 (May 1991 G & M Fourth MPR)

Laboratory analytical data did not include Freon-22™. It is unknown if the groundwater samples were analyzed for VOC TICs and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.). Report references soil-gas survey methodology and survey.

RI/FS Seventh Monthly Progress Report prepared by G & M for the Grumman Property and dated September 23, 1991 (September 1991 G & M Seventh MPR)

Tabulated groundwater analytical data did not include Freon-22™. Laboratory analytical data report(s) was/were not included in the September 1991 G & M Seventh MPR. It is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

RI/FS Eleventh Monthly Progress Report prepared by G & M for the Grumman Property and dated January 15, 1992 (January 1992 G & M Eleventh MPR)

Tabulated groundwater analytical data did not include Freon-22™. Laboratory analytical data report(s) was/were not included in the January 1992 G & M Eleventh MPR. It is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

Data Report Phase I RI prepared by G & M for the Grumman Property and dated January 1992 (January 1992 G & M RI Data Report)

G & M collected groundwater samples from various monitoring wells (former Grumman Property, former OCC / RUCO and USGS monitoring wells) in October 1991 for Target Compound List (TCL) VOC analysis. Although various TICs were identified in the groundwater samples, the tabulated groundwater analytical data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the January 1992 G & M RI Data Report. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

New York State Site Registry Delisting Petition prepared by D & B for 789 South Broadway (Grumman Property) and dated March 1992 (March 1992 D & B 789 South Broadway SRDP)

Tabulated groundwater analytical data did not include Freon-22™. Laboratory analytical data report(s) was/were not included in the March 1992 D & B 789 South Broadway SRDP. It is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

New York State Site Registry Delisting Petition prepared by D & B for the Ballfield Site (Grumman Property) and dated March 1992 (March 1992 D & B Ballfield Site SRDP)

Tabulated groundwater analytical data did not include Freon-22™. Laboratory analytical data report(s) was/were not included in the March 1992 D & B Ballfield Site SRDP. It is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

New York State Site Registry Delisting Petition prepared by D & B for the Parking Lot Adjacent to Bethpage Fire Department and dated March 1992 (March 1992 D & B BFD SRDP)

Tabulated groundwater analytical data did not include Freon-22™. Laboratory analytical data report(s) was/were not included in the March 1992 D & B BFD SRDP. It is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

Final Remedial Investigation Report (RIR) prepared by Halliburton for the NWIRP and dated May 1992 (May 1992 Halliburton RIR)

Halliburton conducted an RI that included collection of groundwater samples from various monitoring wells across the NWIRP and submittal to a laboratory for “organic analyses”. Although various TICs were identified in the groundwater samples, the tabulated groundwater analytical data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the May 1992 Halliburton RIR. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

New York State Site Registry Delisting Petition prepared by D & B for 801 and 805 South Broadway and dated March 1992 (November 1992 D & B 801 and 805 South Broadway SRDP)

Tabulated groundwater analytical data did not include Freon-22™. Laboratory analytical data report(s) was/were not included in the November 1992 D & B 801 and 805 South Broadway SRDP. It is unknown if the groundwater samples were analyzed for Freon-22™

(and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

RI/FS Nineteenth Monthly Progress Report prepared by G & M for the Grumman Property and dated November 5, 1992 (November 1992 G & M Nineteenth MPR)

Tabulated groundwater analytical data did not include Freon-22™. Laboratory analytical data report(s) was/were not included in the November 1992 G & M Nineteenth MPR. It is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.). Report references soil gas survey results for SG-13.

New York State Site Registry Delisting Petition prepared by D & B for Site 6 (Runway) and dated February 1993 (February 1993 D & B Site 6 SRDP)

Tabulated groundwater analytical data did not include Freon-22™. Laboratory analytical data report(s) was/were not included in the February 1993 D & B Site 6 SRDP. It is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

New York State Site Registry Delisting Petition prepared by D & B for Site 9 (Plant 18) and dated February 1993 (February 1993 D & B Site 9 SRDP)

Tabulated and groundwater analytical data and VOC analysis data sheets did not include Freon-22™. It is unknown if the groundwater samples were analyzed for VOC TICs and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

New York State Site Registry Delisting Petition prepared by D & B for Hangar 7 and dated April 1993 (April 1993 D & B Hangar 7 SRDP)

Tabulated and groundwater analytical data and VOC analysis data sheets did not include Freon-22™. It is unknown if the groundwater samples were analyzed for VOC TICs and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

Phase 2 RIR prepared by Halliburton for the NWIRP and dated October 1993 (October 1993 Halliburton Phase 2 RIR)

Halliburton conducted an RI at the NWIRP to further delineate the extent of VOC-impacted groundwater. The RI included collection of groundwater samples from various monitoring wells (temporary and permanent) at the NWIRP and submittal to a laboratory for “volatile organic analyses”. Although various TICs were identified in the groundwater samples, the tabulated groundwater analytical data did not include Freon-22™. Based on the volatile organics analysis data sheets for TICs, it was indeterminable if Freon-22™ was identified in the groundwater samples.

FS Report prepared by Halliburton for the NWIRP and dated March 1994 (March 1994 Halliburton FS Report)

Freon-22™ was not identified as a potential groundwater contaminant of concern at the NWIRP.

New York State Site Registry Delisting Petition prepared by D & B for Central Avenue (Grumman Property) and dated June 1994 (June 1994 D & B Central Avenue SRDP)

Tabulated groundwater analytical data did not include Freon-22™. Laboratory analytical data report(s) was/were not included in the June 1994 D & B Central Avenue SRDP. It is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

RIR prepared by G & M for the Grumman Aerospace Property and dated September 1994 (September 1994 G & M RIR)

G & M conducted an RI within the Site Area (as defined by G & M) that included collection of groundwater samples from various monitoring wells and submittal to a laboratory for VOCs by United States Environmental Protection Agency (EPA) Method 8240. The tabulated groundwater analytical data and the raw analytical data report did not include Freon-22™. It should be noted that the September 1994 G & M RIR and laboratory analytical data report(s) did not include information relative to TICs. Therefore, it is unknown if Freon-22™ was detected as a TIC at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.). Report indicates VOCs detected in soil-gas survey in several locations.

New York State Site Registry Delisting Petition prepared by D & B for Building 24 and dated October 1995 (October 1995 D & B Building 24 SRDP)

Tabulated and groundwater analytical data and VOC analysis data sheets did not include Freon-22™. It is unknown if the groundwater samples were analyzed for VOC TICs and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

Quarterly Groundwater Sampling Data prepared by ARCADIS G & M for the Site Area and dated January 7, 1998 (January 1998 ARCADIS G & M QGWS Data)

Tabulated groundwater analytical data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the January 1998 ARCADIS G & M QGWS Data. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

Annual Water Supply Statement and Supplemental Data Package for 1997 prepared by H2M for the BWD and dated March 1998 (March 1998 H2M AWS Statement)

Tabulated groundwater analytical data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the March 1998 H2M AWS Statement. Therefore, it is unknown if the groundwater samples were analyzed for Freon-

22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

First Quarter 1999 Hydraulic and Groundwater Quality Monitoring Report prepared by ARCADIS G & M for the Site Area and dated 1999 (1999 ARCADIS G & M First Quarter GWMR);

Tabulated groundwater analytical data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the 1999 ARCADIS G & M First Quarter GWMR. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

Second Quarter 1999 Groundwater Monitoring Report prepared by ARCADIS G & M for the Site Area and dated 1999 (1999 ARCADIS G & M Second Quarter GWMR)

Although various TICs were identified in the groundwater samples, the tabulated groundwater analytical data did not include Freon-22™. Based on the data usability summary reports (DUSR), it was indeterminable if Freon-22™ was identified in the groundwater samples. It should be noted that the laboratory analytical data report(s) was/were not included in the Second Quarter GWMR. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

Third Quarter 1999 Groundwater Monitoring Report prepared by ARCADIS G & M for the Site Area and dated 1999 (1999 ARCADIS G & M Third Quarter GWMR)

Tabulated groundwater analytical data (including TICs) did not include / identify Freon-22™.

First Quarter 2000 Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated 2000 (2000 ARCADIS First Quarter GWMR)

Tabulated groundwater analytical data (including TICs) did not include / identify Freon-22™.

Second Quarter 2000 Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated 2000 (2000 ARCADIS Second Quarter GWMR)

Tabulated groundwater analytical data (including TICs) did not include / identify Freon-22™.

Groundwater FS prepared by ARCADIS for the Site Area and dated October 16, 2000 (October 2000 ARCADIS Groundwater FS)

Freon-22™ was not identified as a groundwater contaminant of concern at the Site Area (as defined by ARCADIS).

2000 Annual Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated 2000 (2000 ARCADIS Annual GWMR)

Tabulated groundwater analytical data (including TICs) did not include / identify Freon-22™.

2001 Annual Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated 2001 (2001 ARCADIS Annual GWMR)

Based on a tabulation of TICs detected in groundwater samples collected during the fourth quarter of 2001, Freon-22™ was identified in monitoring well, GM-21I at a concentration greater than the NYSDEC Division of Water Technical and Operational Guidance Series (1.1.1) Class GA drinking water ambient standards and guidance values (SGV) for Freon-22™. Monitoring well GM-21I is located in the southern portion of the Grumman Property, at a distance greater than 4,500 feet southwest of the Site (cross-gradient of the OU3 / Study Area VOC-Plume).

First Quarter 2002 Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated 2002 (2002 ARCADIS First Quarter GWMR)

Tabulated groundwater analytical data (including TICs) did not include / identify Freon-22™.

Third Quarter 2002 Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated 2002 (2002 ARCADIS Third Quarter GWMR)

Tabulated groundwater analytical data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the 2002 ARCADIS Third Quarter GWMR. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

2002 Annual Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated 2002 (2002 ARCADIS Annual GWMR)

Tabulated groundwater analytical data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the 2002 ARCADIS Annual GWMR. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

May 2003 ARCADIS OU2 GW Remedial System Evaluation

Tabulated groundwater analytical data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the May 2003 ARCADIS OU2 GW Remedial System Evaluation. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

Investigation Sampling Program Analytical Results of Soil and Groundwater Samples prepared by D & B for the Site Area and dated August 2003 (August 2003 D & B ISP Analytical Results)

On June 19, 2003, D & B collected one groundwater sample each from three monitoring wells (BCPMW-1, BCPMW-2 and BCPMW-3) located within the southwest portion of the Park for VOC analysis. The tabulated data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the August 2003 D & B ISP

Analytical Results. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

Quarterly Groundwater Monitoring Report for Quarters 1 to 3 of 2003 prepared by ARCADIS for the Site Area

Tabulated groundwater analytical data (including TICs) did not include / identify Freon-22™.

2003 Annual Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated 2003 (2003 ARCADIS Annual GWMR)

Tabulated groundwater analytical data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the 2003 ARCADIS Annual GWMR. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

First Quarter 2004 Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated 2004 (2004 ARCADIS First Quarter GWMR)

Tabulated groundwater analytical data (including TICs) did not include / identify Freon-22™.

Second Quarter 2004 Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated 2004 (2004 ARCADIS Second Quarter GWMR)

Tabulated groundwater analytical data (including TICs) did not include / identify Freon-22™.

Third Quarter 2004 Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated 2004 (2004 ARCADIS Third Quarter GWMR)

Tabulated groundwater analytical data (including TICs) did not include / identify Freon-22™.

Fourth Quarter 2004 Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated May 19, 2005 (2004 ARCADIS Fourth Quarter GWMR)

Tabulated groundwater analytical data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the 2004 ARCADIS Fourth Quarter GWMR. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

2004 Annual Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated 2004 (2004 ARCADIS Annual GWMR)

Tabulated groundwater analytical data (including TICs) did not include / identify Freon-22™.

Data Report for Phase I Groundwater RI prepared by ARCADIS for the Site Area and dated December 1, 2004 (December 2004 ARCADIS Phase I Data Report)

ARCADIS drilled 12 vertical profile borings (VPB) in the Park and Park Area between July and September 2004. The final depths of the VPBs ranged between 110 and 300 feet bls.

Groundwater samples were collected from the 12 VPBs (VP-1 through VP-12) at depths ranging between 65 and 301 feet bls. A total of 60 groundwater samples were submitted "to the laboratory for analysis of the full TCL VOCs using NYSDEC Analytical Services Protocol (ASP) Method 2000." The VOC analytical results were compared to "NYSDEC standards, criteria, and guidance values (SCGs)." June, September and November 2003 analytical data obtained for groundwater samples from three monitoring wells in the southwestern portion of the Park (BCPMW-1 through BCPMW-3) were also tabulated in the December 2004 ARCADIS Data Report and compared by ARCADIS to the NYSDEC SCGs.

The following is a summary of the findings, as reported by ARCADIS:

- The subsurface lithology consists of sand with discontinuous lenses of clay and silt.
- The depth to groundwater is approximately 60 feet bls.
- The direction of groundwater flow is towards the southeast.
- VOCs were detected at concentrations greater than the NYSDEC SCGs. The VOC-impacted groundwater plume extends horizontally approximately 1,000 feet in width (along the Former NGC Plant 24 Access Road) and extends to a depth greater than 200 feet bls.
- The VOC-impacted groundwater plume appears to migrate towards the east-southeast.

The tabulated data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the December 2004 ARCADIS Phase I Data Report. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

First Quarter 2005 Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated 2005 (2005 ARCADIS First Quarter GWMR)

Tabulated groundwater analytical data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the 2005 ARCADIS First Quarter GWMR. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

Second Quarter 2005 Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated 2005 (2005 ARCADIS Second Quarter GWMR)

Tabulated groundwater analytical data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the 2005 ARCADIS Second Quarter GWMR. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

Third Quarter 2005 Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated 2005 (2005 ARCADIS Third Quarter GWMR)

Tabulated groundwater analytical data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the 2005 ARCADIS Third Quarter GWMR. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

Fourth Quarter 2005 Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated April 5, 2006 (2005 ARCADIS Fourth Quarter GWMR)

Tabulated groundwater analytical data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the 2005 ARCADIS Fourth Quarter GWMR. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

November 2005 H2M IR and RAP

H2M conducted an IRM field investigation in May and June 2005 to characterize the nature and extent of contamination in shallow groundwater within the approximately 7-acre Construction Area to support the construction of new Park facilities, including an indoor ice skating center (replacing two former ice skating rinks) at the Site. The Site and other portions of the Construction Area were further evaluated during a supplemental investigation to the IRM (details are provided in the applicable subsection of this RIWP).

The IRM field investigation for the Construction Area included installation of four monitoring wells (CAMW-1 through CAMW-4) to depths ranging between approximately 61 and 63 feet below ground surface (bgs) and collection of one groundwater sample each from three monitoring wells for various analytical parameters, including VOCs plus TICs. The VOC analytical results were compared to the NYSDEC Class GA SGVs.

The following is a summary of the findings, as reported by H2M:

- The direction of shallow groundwater flow is towards the south-southeast.
- VOCs were detected at concentrations greater than the NYSDEC Class GA SGVs.
- Freon-22™ was detected at a concentration greater than the NYSDEC Class GA SGV for Freon-22™ in the groundwater sample collected from monitoring well CAMW-4 (south of the Site).
- Freon-12™ was not detected in any of the monitoring well locations.

The monitoring wells were abandoned subsequent to the investigation and prior to the commencement of the remedial action program. A supplemental IRM investigation was implemented to obtain additional data at and in the vicinity of the Site. The details of the supplemental IRM investigation are provided in the applicable subsection of this RIWP.

The remedial action objective for the Construction Area was to identify a remedial strategy that is protective of human health considering the intended future use and potential future use of the Construction Area (continued use as a recreational park), as well as protective of the environment. The proposed RAP, as it related to groundwater and soil vapor, was to remediate impacted soils that were affecting or having the potential to negatively affect groundwater or soil vapor quality to NYSDEC recommended soil cleanup objective concentrations for subsurface soils.

- Soil vapor samples were collected from 14 boring locations at a depth of 10 feet below grade and soil vapor samples were collected from 6 of the 14 boring locations at a depth of 52 or 58 to 60 feet bgs. An ambient sample was collected for each field day that soil vapor samples were collected. Each sample was analyzed for TCL VOCs via EPA Method TO-15. Because the State of New York has not promulgated specific standards, criteria or guidance values for concentrations of compounds in subsurface vapors, NYSDOH decision making matrices were considered when evaluating the soil vapor data collected. Soil vapor sampling results were also evaluated individually, compared with background outdoor air levels and reviewed "as a whole" to identify trends and special variations in the data. Freon-22™ was not detected in any of the soil vapor sampling locations.
- Freon-12™ was detected in the soil vapor sampling locations in the vicinity of the Site. Freon-12™ was not detected during soil sampling.

IRM Supplemental IR prepared by H2M for the Construction Area and dated December 2005 (December 2005 H2M IRM Supplemental IR)

In September 2005, H2M conducted a supplemental IRM investigation that included installation of one monitoring well (CAMW-5) north of the Site to enable an improved evaluation of hydraulically up-gradient groundwater conditions in the Construction Area. Monitoring well CAMW-5 was completed at a depth of approximately 73 feet bgs. One groundwater sample was collected and submitted for laboratory analysis of various parameters, including VOCs plus TICs. The VOC analytical results were compared to the NYSDEC Class GA SGVs.

The following is a summary of the findings, as reported by H2M:

- The direction of shallow groundwater flow is towards the south-southeast.
- No VOCs were detected in the groundwater sample collected from CAMW-5.

The monitoring well was abandoned subsequent to the investigation and prior to the commencement of the remedial action program.

Soil vapor samples were collected from three locations and at three depths to serve as vertical profiles within the boundary of the Site. The soil vapor sampling program also

included the collection and analysis of an ambient sample for each field day that soil vapor samples were collected. Each sample was analyzed for TCL VOCs via EPA Method TO-15. Because the State of New York has not promulgated specific standards, criteria or guidance values for concentrations of compounds in subsurface vapors, NYSDOH decision making matrices were considered when evaluating the soil vapor data collected. Soil vapor sampling results were also evaluated individually, compared with background outdoor air levels and reviewed "as a whole" to identify trends and special variations in the data.

- Freon-22™ was not detected in any soil vapor samples.
- Freon-12™ was detected in the soil vapor sampling locations at the Site. Freon-12™ was not detected during soil sampling.

First Quarter 2006 Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated 2006 (2006 ARCADIS First Quarter GWMR)

Tabulated groundwater analytical data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the 2006 ARCADIS First Quarter GWMR. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

IRM Addendum to the RAP prepared by H2M for the Construction Area and dated March 2006 (H2M IRM RAP Addendum)

H2M summarized and evaluated three additional remedial alternatives. The remedial action proposed in the November 2005 H2M IRM IR and RAP was unchanged (with regards to groundwater and soil vapor).

Second, Third and Fourth Quarter of 2006 Groundwater Monitoring Reports prepared by ARCADIS for the Site Area and dated 2006 (2006 ARCADIS First, Second and Third Quarters GWMRs)

Tabulated groundwater analytical data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the 2006 ARCADIS First, Second and Third Quarter GWMRs. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

2006 Annual Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated August 20, 2007 (2006 ARCADIS Annual GWMR)

ARCADIS collected groundwater samples from various monitoring wells within the Site Area (as described by ARCADIS) and submitted them for VOC analysis, including Freon-22™. Based on the tabulated analytical data tables, Freon-22™ was not identified in the groundwater samples at concentrations greater than the NYSDEC Class GA SGV for Freon-22™.

First and Second Quarters of 2007 Groundwater Monitoring Report prepared by ARCADIS for the Site Area and dated 2007 (2007 ARCADIS First and Second Quarters GWMRs)

Tabulated groundwater analytical data did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the 2007 ARCADIS First and Second Quarters GWMR. Therefore, it is unknown if the groundwater samples were analyzed for Freon-22™ (and/or VOC TICs) and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

December 2007 ARCADIS Groundwater IRM WP

Grumman implemented a groundwater treatment system IRM for the VOC-impacted plume at OU3. The groundwater IRM proposed to mitigate the off-site migration of VOCs through the implementation of a groundwater pump-and-treat system to provide a hydraulic barrier across the down-gradient OU3 Site boundary. The groundwater IRM process is described as follows: impacted groundwater is extracted from the subsurface via recovery wells that are located along the Former Plant 24 Access Road; the extracted groundwater is conveyed to the treatment area located on McKay Field; the groundwater treatment system consists of an air stripper, duct heater, and emission control system (ECS); and treated groundwater flows to the northeast NWIRP basin via gravity flow (the treated air stripper off-gas is discharged to the atmosphere).

Summary Report for an Immediate Soil Vapor Intrusion Investigation at Former Grumman Settling Ponds (1-30-003A) Bethpage, New York, prepared by EAE & ST and dated December 2007 (December 2007 EAE & ST SVI Investigation Summary Report)

The report documents a sub-slab soil vapor and indoor air quality investigation conducted at residential homes located south of the OU3 site, as well as soil vapor sampling activity conducted on the property of BHS. Freon-12™ was detected at low concentrations (greater than the laboratory MDL; maximum concentration was 6.08 micrograms per cubic meter [$\mu g/m^3$]) in 21 of the 22 sub-slab soil vapor, indoor air, outdoor air, and duplicate samples collected. Freon-22™ was not detected at a concentration greater than the laboratory MDL in any of the 22 sub-slab soil vapor, indoor air, outdoor air, and duplicate samples collected. Freon-12 was detected in the 8 soil vapor samples collected (includes 1 duplicate sample), at concentrations ranging between approximately 3.5 $\mu g/m^3$ and approximately 4,000 $\mu g/m^3$. Freon-22 was detected in the 8 soil vapor samples collected (includes 1 duplicate sample), at concentrations ranging between approximately 7 $\mu g/m^3$ and approximately 98,000 $\mu g/m^3$.

February 2008 ARCADIS RIR (Site Area)

ARCADIS conducted an RI for OU3 to define the geology and hydrogeology; fully develop the list of the contaminants of concern; determine the nature and extent of the contaminants of concern in groundwater; identify potential source areas; determine if additional data are required; identify and characterize contaminant of concern fate and transport; and obtain data to support design and implementation of an IRM(s). ARCADIS installed a total of 49 VPBs between 2004 and 2006. The final depths of the VPBs ranged between 70 and 300 feet bls. Seven permanent monitoring wells were installed between August 2006 and March

2007 (BCPMW4-1, BCPMW4-2, BCPMW4-3, BCPMW5-1, BCPMW6-1, BCPMW6-2, AND BCPMW7-1). The final depths of the monitoring wells ranged between 70 to 148 feet bls. Groundwater samples collected from the VPBs and monitoring wells were analyzed for TCL VOCs, including Freon-22™.

The following is a summary of the findings (related to groundwater, soil vapor, Freon-12™, Freon-22™, and VOCs (including Freon-12™, Freon-22™) in the groundwater and soil vapor), as reported by ARCADIS:

- The depth to groundwater varies seasonally and is approximately 50 to 55 feet bls.
- The direction of groundwater flow is towards the south-southeast.
- The hydraulic gradient across the Site was calculated to be 0.0016 ft / ft.
- The average horizontal groundwater velocity at the water table was calculated to be 1.4 to 2.8 feet / day.
- A groundwater plume containing VOCs is present beneath the Site Area (as defined by ARCADIS) and originated from Areas “B”, “C”, “D”, and “I” (as defined by ARCADIS).
- The VOC groundwater plume was delineated within the Site Area (as defined by ARCADIS) in the up- and cross-gradient directions (north and east-west, respectively) and vertical direction.
- Freon-12 was not detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.) in the groundwater samples.
- As reported by ARCADIS, “a sub-plume consisting of chlorodifluoromethane (Freon 22) has been identified originating from the Town former ice rink. Based on Town information, Freon 22 was used and released to the environment at the Park...”
- The Freon-22™ groundwater sub-plume was delineated within the OU3 boundary, but the down-gradient extent was not known (at the time of the RI).
- Freon-22™ was identified in the sub-plume at concentrations greater than 10 parts per billion (ppb).
- The Freon-22™ sub-plume extends over an average width of approximately 250 feet.
- The maximum concentration of Freon-22™ (290 ppb) was detected in VPB, VP-13, located approximately 250 south, southeast of the Site.
- Freon-22™ is a gas under ambient conditions and “volatilizes rapidly when released on land”.
- Based on the estimated organic carbon partitioning coefficient (log K_{OC}), Freon-22™ has a high potential for leaching in soil. Biodegradation is not expected in soils.
- Freon-22™ is not expected to adsorb to suspended solids or sediments in aquatic systems. Biodegradation is not expected (under aerobic or anaerobic conditions) in aquatic systems.

- Based on the estimated octanol-water portioning coefficient (log K_{OW}), the potential for bio-concentration in aquatic organisms is considered to be low.
- Freon-22™ has a half-life of 9.4 years.
- Freon-22™ is expected to exist in a gaseous phase with degradation occurring by reaction due to direct photolysis.
- Majority of VOC mass in soil vapor is limited to the Park area.
- As reported by ARCADIS, "Freons 12 and 22 were detected in soil gas beneath the Park former ice rink."
- Highest concentrations (defined by ARCADIS as concentrations greater than 1,000 µg/m^3) of Freon-12™ and Freon-22™ in soil vapor are located near the Town of Oyster Bay former ice rink.
- A soil gas mitigation IRM is describe along with a schedule for startup.

March 2008 H2M FER

The IRM RI included the installation of five groundwater monitoring wells at up-gradient and down-gradient locations within the Construction Area. Freon-22™ was identified as a TIC at a concentration greater than the NYSDEC Class GA SGV for Freon-22™ in the groundwater sample collected from CAMW-4, located south, southeast of the Site. No source areas for the VOC contaminants of concern were identified within the limits of the Construction Area during the soil investigation. The March 2008 H2M FER summarized the results of a remedial action program that included the excavation and off-site disposal of contaminated soil from designated portions of the Construction Area.

NYSDEC Approval Letter for the March 2008 H2M IRM FER dated September 17, 2008

The NYSDEC concluded that the former ice rinks were the source of Freon-22™.

WP for Off-Site Monitoring Well Sampling prepared by ARCADIS for OU3 and dated June 19, 2009 (June 2009 ARCADIS Off-Site MW Sampling WP)

ARCADIS prepared an off-site monitoring well sampling work plan to determine and document the off-site groundwater flow direction and the groundwater quality at locations off-site and down-gradient of the Park. The scope included collecting two rounds of groundwater samples from a total of 26 wells and submitting the groundwater samples (along with appropriate quality assurance / quality control [QA/QC] samples) for TCL VOC, including Freon-22™, analysis via "NYSDEC ASP 2000 Method OLM 4.2".

Third Quarter Operation, Maintenance and Monitoring Report prepared by ARCADIS for OU3 and dated January 2009 [sic] *(January 2010 ARCADIS Third Quarter [2009] OM&M Report)*

ARCADIS conducted groundwater monitoring activities in April 2009 to serve as a "'baseline' against which future groundwater quality data will be compared". Groundwater samples were collected from the influent and effluent Water Sampling Ports-5 and -7 (WSP-5 and

WSP-7, respectively), 4 groundwater IRM recovery wells (RW-1 through RW-4) and 17 monitoring wells (B24MW-2, M24MW-3, B30MW-1, BCPMW-1, BCPMW-2, BCPMW-3, BCPMW-4-1, BCPMW-4-2, BCPMW-4-3, BCPMW-5-1, BCPMW-6-1, BCPMW-6-2, BCPMW-7-1, MW-200-1, MW-201-1, MW-202-1, and MW-203-1) and submitted to a laboratory for TCL VOC plus Freon-22™ analysis via NYSDEC ASP 2000 Method OLM 4.2. The April 2009 ARCADIS Baseline Analysis Report was not available for review. Select analytical data from the April 2009 sampling event were provided in subsequent ARCADIS reports, the details of which are discussed in the appropriate sub-sections of this RIWP. The following is a summary of the results of the baseline groundwater quality monitoring event, as reported by ARCADIS in the January 2010 ARCADIS Third Quarter (2009) OM&M Report:

- The groundwater containment system was determined to be "operating as expected and the associated capture zone has developed".
- The VOC analytical results (assumed to also include Freon-22™) from the Baseline Sampling Event were "consistent with previous results".

Groundwater samples were collected from the influent and effluent water sampling ports (as detailed above) in July (22nd, 24th and 29th), August (5th, 12th, 19th) and September (1st and 10th) 2009. Groundwater samples were collected from the 4 groundwater IRM recovery wells and 17 monitoring wells (as detailed above) on July 29th, August 12th and on September 10, 2009. The following is a summary of the tabulated Freon-22™ analytical data provided in the January 2010 ARCADIS Third Quarter (2009) OM&M Report:

- Freon-22™ was detected at concentrations greater than the NYSDEC Class GA SGV for Freon-22™ in the groundwater samples collected from the groundwater IRM influent Water Sampling Port-5 (WSP-5).
- The discharge limit for Freon-22™ (as per the interim SPDES equivalency program or "NYSDEC TOGS 1.1.1 Quality Standards and Guidance Values and Groundwater Effluent Limitations") is 5 ppb.
- Freon-22™ was not detected at or above the laboratory quantification limit for Freon-22™ in the groundwater samples collected from the groundwater IRM effluent Water Sampling Port-7 (WSP-7).
- Freon-22™ was detected at a concentration greater than the NYSDEC Class GA SGV for Freon-22™ in the groundwater sample collected from recovery well RW-4 in July, August and September 2009.
- Freon-22™ was detected at a concentration greater than the NYSDEC Class GA SGV for Freon-22™ in the groundwater sample collected from recovery well RW-3 in August and September 2009.

Fourth Quarter Operation, Maintenance and Monitoring Report prepared by ARCADIS for OU3 and dated February 2010 (February 2010 ARCADIS Fourth Quarter [2009] OM&M Report)

Groundwater samples were collected from the influent and effluent water sampling ports, the 4 groundwater IRM recovery wells and 17 monitoring wells (as detailed above) in October, November and December 2009. The following is a summary of the tabulated Freon-22™ analytical data provided in the February 2010 ARCADIS Fourth Quarter (2009) OM&M Report:

- Freon-22™ was detected at concentrations greater than the NYSDEC Class GA SGV for Freon-22™ in the groundwater samples collected from the groundwater IRM influent Water Sampling Port-5 (WSP-5).
- The discharge limit for Freon-22™ (as per the interim SPDES equivalency program or "NYSDEC TOGS 1.1.1 Quality Standards and Guidance Values and Groundwater Effluent Limitations") is 5 ppb.
- Freon-22™ was not detected at or above the laboratory quantification limit for Freon-22™ in the groundwater samples collected from the groundwater IRM effluent Water Sampling Port-7 (WSP-7).
- Freon-22™ was detected at a concentration greater than the NYSDEC Class GA SGV for Freon-22™ in the groundwater sample collected from recovery well RW-4 in November and December 2009 (analytical data, if obtained, were not provided for the October 2009 sampling event).
- Freon-22™ was detected at a concentration greater than the NYSDEC Class GA SGV for Freon-22™ in the groundwater sample collected from recovery well RW-3 in November and December 2009 (analytical data, if obtained, were not provided for the October 2009 sampling event).
- Freon-22™ was detected at concentrations greater than the NYSDEC Class GA SGV for Freon-22™ in the groundwater samples collected from monitoring wells BCPMW-4-1, BCPMW-6-1 and MW-203-1 in December 2009 (analytical data, if obtained, were not provided for the October and November 2009 sampling events).

Freon-22™ analytical data obtained from the April 2009 sampling event (ARCADIS Baseline Analysis Report) was included in the tabulated data provided in the February 2010 ARCADIS Fourth Quarter (2009) OM&M Report and is summarized below:

- Freon-22™ was detected at concentrations greater than the NYSDEC Class GA SGV for Freon-22™ in the groundwater samples collected from monitoring wells BCPMW-4-1, BCPMW-6-1 and MW-203-1.
- Freon-22™ was not detected at concentrations greater than the NYSDEC Class GA SGV for Freon-22™ in the remaining monitoring wells sampled in April 2009.

Second Quarter 2010 Groundwater Monitoring Report prepared by ARCADIS for OU2 and dated August 13, 2010 (2010 ARCADIS Second Quarter GWMR)

Freon-22™ was not detected at concentrations greater than the NYSDEC Class GA SGV for Freon-22™.

Third Quarter 2010 Operation, Maintenance and Monitoring Report prepared by ARCADIS for OU3 and dated November 2010 (November 2010 ARCADIS Third Quarter (2010) OM&M Report)

Groundwater samples were collected from the influent and effluent water sampling ports and the 4 groundwater IRM recovery wells in July, August and September 2010. The following is a summary of the tabulated Freon-22™ analytical data provided in the November 2010 ARCADIS Third Quarter (2010) OM&M Report:

- Freon-22™ was detected at concentrations greater than the NYSDEC Class GA SGV for Freon-22™ in the groundwater samples collected from the groundwater IRM influent Water Sampling Port-5 (WSP-5).
- The discharge limit for Freon-22™ (as per the interim SPDES equivalency program or "NYSDEC TOGS 1.1.1 Quality Standards and Guidance Values and Groundwater Effluent Limitations") is 5 ppb.
- Freon-22™ was not detected at or above the laboratory quantification limit for Freon-22™ in the groundwater samples collected from the groundwater IRM effluent Water Sampling Port-7 (WSP-7).

First Quarter 2011 Groundwater Monitoring Report prepared by ARCADIS for OU2 and dated June 30, 2011 (June 2011 ARCADIS First Quarter [2011] GWMR)

Freon-22™ was not detected at concentrations greater than the NYSDEC Class GA SGV for Freon-22™ in the groundwater samples collected from OU2 monitoring wells. Tabulated groundwater analytical data for OU2 outpost wells sampled during the first quarter of 2011 did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the June 2011 ARCADIS First Quarter (2011) GWMR. Therefore, it is unknown if the OU2 outpost well groundwater samples were analyzed for Freon-22™ and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

Second Quarter 2011 Groundwater Monitoring Report prepared by ARCADIS for OU2 and dated August 12, 2011 and revision provided by ARCADIS in an electronic mail (e-mail) dated September 6, 2011 (August 2011 ARCADIS Second Quarter [2011] GWMR)

Freon-22™ was not detected at concentrations greater than the NYSDEC Class GA SGV for Freon-22™ in the groundwater samples collected from OU2 monitoring wells. Tabulated groundwater analytical data for OU2 outpost wells sampled during the second quarter of 2011 did not include Freon-22™. It should be noted that the laboratory analytical data report(s) was/were not included in the August 2011 ARCADIS Second Quarter (2011) GWMR. Therefore, it is unknown if the OU2 outpost well groundwater samples were analyzed for

Freon-22™ and / or if Freon-22™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.).

Site Area Focused Feasibility Study (FFS) prepared by ARCADIS for OU3 and dated May 12, 2010

A FFS was prepared to identify and evaluate remedial technologies and remedial alternatives for soil, soil gas and groundwater at the OU3 site area. The following remedy was selected in the FFS for OU3 groundwater and soil vapor:

Alternative GW-2 (Groundwater):

- Operation, maintenance and monitoring of OU3 groundwater IRM (implemented in July 2009) to prevent migration of groundwater in the upper 20 feet of the aquifer containing total VOCs at concentrations greater than 5 ppb;
- Transition to natural attenuation with monitoring (of residual potential contaminants of concern) after groundwater IRM system shutdown criteria are achieved; and
- Implement an environmental easement to control OU3 groundwater use.

Alternative SW-2 (Soil vapor):

- Operation, maintenance and monitoring of the existing soil gas IRM to prevent the off-site migration of onsite soil gas until IRM shutdown criteria are achieved.
- Implement an environmental easement to require future onsite structures to address potential vapor intrusion.

April 2011 ARCADIS Annual Summary OM&M Report for 2010

The groundwater IRM details are included in the April 2011 ARCADIS Annual Summary OM&M Report for 2010 and summarized below:

- The groundwater is extracted via recovery wells along the Former Plant 24 Access Road;
- The groundwater is conveyed to a treatment plant at McKay Field via four underground pipelines;
- The groundwater is treated via air stripper, reducing the concentration of VOCs (including Freon-22™) in the groundwater;
- The groundwater is filtered (to remove metals);
- The treated groundwater is returned to the aquifer via a discharge pipeline to a recharge basin on the former NWIRP;

- The concentration of VOCs (not including Freon-22™) in the air stripper off-gas is reduced via a vapor phase treatment system prior to discharge to the atmosphere; and
- The groundwater IRM effectiveness is periodically monitored via the Groundwater Monitoring Network (consists of 35 monitoring locations [17 groundwater monitoring wells, 4 remedial wells and 14 piezometers]).

- Freon-22™ has been detected in the OU3 groundwater and a sub-plume of Freon-22™ was determined to be "originating from the area of the Town of Oyster Bay's (Town's) former ice rink".

The following is a summary of the groundwater IRM OM&M activities between January 1 and December 31, 2010, as reported by ARCADIS:

- "Project VOCs" are defined as those VOCs that "may be related to former Grumman historical activities" and include the VOCs listed in the Interim SPEDES permit equivalency (1,1,1-trichloroethane, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, tetrachloroethene, trichloroethene, vinyl chloride, cis-1,2-dichloroethene, trans-1,2-dichloroethene, and trans-1,2-dichloroethene), toluene, benzene, and total xylenes.
- VOCs, including Freon-12™[1] and Freon-22™, that have been detected at OU3 and are "not related to former Grumman activities" are defined as "Non-Project VOCs". It should be noted that Non-Project VOCs represents the difference between the detected total VOCs and Project VOCs. Although ARCADIS generally refers to Non-Project VOCs as Freon-12™ and Freon-22™, Non-Project VOCs may include various additional VOCs that were detected in the groundwater samples.
- Between July 2009 and December 2010, approximately 525 pounds of Non-Project VOCs were recovered. It should be noted that the mass of Non-Project VOCs recovered represents the difference between the detected masses of total VOCs (1,018 pounds) and Project VOCs (493 pounds).
- In 2010, more than 99% of Non-Project VOCs were recovered by remedial wells RW-3 and RW-4.
- The rate of Non-Project VOCs recovery was 1.3 pounds per day.
- Non-project VOCs influent concentration (between July 2009 and December 2010) ranged between 30 ppb (July and August 2009) and 650 ppb (May 2010) and averaged 337 ppb.

[1] Freon-12™ and Freon-22™ concentrations are frequently combined in ARCADIS reports. Based on information obtained from the records search (Section 3.0 – Records Search of this RIWP), Freon-22™ was "released to the environment at the Park". In an NYSDEC letter dated September 17, 2008, the NYSDEC concluded that the former Town of Oyster Bay ice rinks were the source of the Freon-22™ groundwater and soil vapor impacts. Although details / information regarding a Freon-12™ release at the Site was not obtained during the records search, in the April 2013 NYSDEC Comment Letter, the NYSDEC states that "the site is a source of Freon 12".

- Although greater than during groundwater IRM start-up, "non-project VOCs (Freon22)" concentration in groundwater is "leveling off".
- During 2010, Non-Project VOCs[2] comprised approximately 93% of total VOCs detected in remedial well RW-3 and over 99% of total VOCs detected in remedial well RW-4.

The following is a summary of the tabulated Freon-22™ analytical data provided in the April 2011 ARCADIS Annual Summary OM&M Report for 2010:

- Non-project VOCs comprise approximately 1.7% of total VOCs detected in remedial well RW-1 and 0.2% of total VOCs in remedial well RW-2.
- Freon-22™ was detected at concentrations greater than the NYSDEC Class GA SGV for Freon-22™ in the groundwater samples collected from the groundwater IRM influent Water Sampling Port-5 (WSP-5).
- The discharge limit for Freon-22™ (as per the interim SPDES equivalency program or "NYSDEC TOGS 1.1.1 Quality Standards and Guidance Values and Groundwater Effluent Limitations") is 5 ppb.
- Freon-22™ was not detected at or above the laboratory quantification limit for Freon-22™ in the groundwater samples collected from the groundwater IRM effluent Water Sampling Port-7 (WSP-7).
- Freon-22™ was detected at concentrations greater than the NYSDEC Class GA SGV for Freon-22™ in the groundwater samples collected from remedial wells RW-3 and RW-4 in February, April, July, and October 2010.
- Freon-22™ was detected at concentrations greater than the NYSDEC Class GA SGV for Freon-22™ in the groundwater samples collected from monitoring wells BCPMW-6-1, BCPMW-7-1 and MW-203-1.
- Freon-22™ was not detected at concentrations greater than the NYSDEC Class GA SGV for Freon-22™ and/or the laboratory quantification limit for Freon-22™ in the groundwater samples collected from the remaining remedial wells and monitoring wells.

[2] Freon-12™ and Freon-22™ concentrations are frequently combined in ARCADIS reports. Based on information obtained from the records search (Section 3.0 – Records Search of this RIWP), Freon-22™ was "released to the environment at the Park". In an NYSDEC letter dated September 17, 2008, the NYSDEC concluded that the former Town of Oyster Bay ice rinks were the source of the Freon-22™ groundwater and soil vapor impacts. Although details / information regarding a Freon-12™ release at the Site was not obtained during the records search, in the April 2013 NYSDEC Comment Letter, the NYSDEC states that "the site is a source of Freon 12".

NYSDEC Letter to ARCADIS dated May 26, 2010 (May 2010 NYSDEC Letter)

The NYSDEC stated that a "Review of the groundwater analytical data shows that Freon 22 groundwater contamination has been identified as a sub-plume within the overall OU3 Grumman groundwater contamination plume."

February 2011 ARCADIS RIR (Study Area)

ARCADIS conducted an RI within the area hydraulically down-gradient of the Park and Sycamore Avenue (Study Area). A total of 20 VPBs were drilled within the Study Area between June 2006 and July 2009. The final depths of the VPBs ranged between 120 to 890 feet bls. A total of 15 monitoring wells were installed in the Study Area between March 2007 to May 2009 to depths ranging between 55 and 750 feet bls. Approximately 500 groundwater samples were collected from various depths within the VPBs (including QA / QC samples). Approximately 30 groundwater samples were collected at varying frequency and from various depths within the monitoring wells (including QA / QC samples). Groundwater samples obtained from the VPBs and monitoring wells were submitted for TCL VOC analysis (including Freon-12™ and Freon-22™).

The following is a summary of the findings, as reported by ARCADIS:

- Groundwater elevations within the Study Area vary between approximately 51 and 74 feet above msl.
- The direction of groundwater flow is towards the south-southeast and vertically, slightly downward.
- The horizontal hydraulic gradient in the northern portion of the Study Area is approximately 0.0017 ft / ft and the average horizontal groundwater velocity in the northern portion of the Study Area is approximately 0.85 ft / day.
- The horizontal hydraulic gradient in the southern portion of the Study Area is approximately 0.0032 ft / ft and the average horizontal groundwater velocity in the southern portion of the Study Area is approximately 2.56 ft / day.
- The maximum extent of the OU2 VOC-Plume is approximately 3.5 miles in length, 1.6 miles in width, 790 feet in depth, and 430 feet in thickness.
- The maximum extent of the Study Area VOC-Plume (south of OU3, within the eastern portion of the OU2 VOC-Plume) is approximately 8,300 feet in length and 2,100 feet in width.
- The VOC-impacted groundwater descends in the aquifer as it migrates south-southeast of OU3 (consistent with the direction of groundwater flow) and extends to a maximum depth of 670 feet bls with an approximate thickness of 430 feet.
- Based on cross-sections of the Study Area VOC-Plume, the VOC impacts are present at similar depths in the groundwater along the cross-sections. A segment of VOC-impacted groundwater was identified between VPBs VP-111 and VP-119 at depths of 100 and 330 feet bls. ARCADIS concluded this shallower segment of the VOC-impacted groundwater was "not consistent with the depth of the Study Area VOC-

impacted groundwater originating" from the Park (Study Area VOC-Plume reached depths greater than 330 feet bls in the area between VPBs VP-111 and VP-119) and therefore not related to the Park.

- Soil gas impacts related to OU3 are limited to the Park Area and do not extend off-site.
- The soil gas IRM effectively prevents off-site migration of VOCs in soil gas and that additional off-site soil gas investigation is not required. Report references NYSDOH concurrence with this conclusion.

The following is a summary of the tabulated Freon-12™ and Freon-22™ analytical data provided in the February 2011 ARCADIS RIR (Study Area):

- Freon-12™ was detected at concentrations greater than the NYSDEC Class GA SGV for Freon-12™ in the groundwater samples collected from the following groundwater sampling locations (the sample depths [reported in feet bls] are provided in parenthesis): VP-108 (115 to 120); VP-108 (125 to 130); and VP-116 (194).
- Freon-22™ was detected at concentrations greater than the NYSDEC Class GA SGV for Freon-22™ in the groundwater samples collected from the following groundwater sampling locations (the sample depths [reported in feet bls] are provided in parenthesis): VP-100 (75 to 85); VP-115 (242); VP-115 (402); VP-115 (442); VP-115 (482); and VP-116 (194). It should be noted that the groundwater sample collected from 194 feet bls at VP-116 is within the portion of the impacted groundwater that ARCADIS concluded is "not consistent" with the depth of and not related to the OU3-Plume
- Freon-12™ and Freon-22™ were not detected at concentrations greater than the NYSDEC Class GA SGVs for Freon-12™ and Freon-22™ and/or the laboratory quantification limits for Freon-12™ and Freon-22™ in the groundwater samples collected from the remaining VPBs and monitoring wells.

Supplement to the RIR (Study Area Groundwater) prepared by ARCADIS for OU3 and dated March 5, 2010 (March 2010 ARCADIS SRIR [Study Area])

ARCADIS collected groundwater samples from 15 monitoring wells within the Study Area between October and November 2009. The groundwater samples were analyzed for TCL VOCs (including Freon-12™ and Freon-22™). Based on the tabulated Freon-12™ and Freon-22™ analytical data provided in the March 2010 ARCADIS SRIR (Study Area), Freon 12™ and Freon-22™ were not detected at concentrations greater than the NYSDEC Class GA SGVs for Freon-12™ and Freon-22™ and/or the laboratory quantification limits for Freon-12™ and Freon-22™ in the groundwater samples collected from the monitoring wells.

Proposed Remedial Action Plan (Northrop Grumman Bethpage Facility – Operable Unit Number: 03 – State Superfund Project – Bethpage, Nassau County- Site No. 130003A) dated May 2012 prepared by NYSDEC (May 2012 NYSDEC PRAP)

Proposed Remedial Action Plan (PRAP) includes the following conclusions by NYSDEC:

- On site soil vapor and associated potential migration of soil vapor impacts to adjacent residences has already been addressed by Grumman through implementation of the soil vapor extraction IRM.
- The continued off-site migration of impacted groundwater has largely been addressed by the on-site groundwater pump and treatment system IRM.
- PRAP recommends that the groundwater IRM in place be utilized and upgraded as necessary to "assure the capture/containment of the full depth and area of contaminated groundwater leaving the Site."
- PRAP recommends that the existing soil vapor IRM continue operation to prevent migration of contaminated soil vapor.

NYSDEC Letter to Bethpage Union Free School District dated September 20, 2012 (September 2012 NYSDEC Letter)

The Department summarizes soil vapor and groundwater investigation findings associated with the OU3 site, as they relate to the BHS. BHS is located east of the Park property across Stewart Avenue. Reference is made to a September 18, 2008 letter (and a copy of same is attached) from NYSDOH to the School District. The NYSDOH letter summarizes indoor air sample results associated with an investigation on the BHS property. The NYSDOH indicates that Freon-12™ and -22™ were detected at low levels in crawl space and indoor air samples collected at BHS. Freon-22™ was detected in a sub-slab sample and an indoor air sample collected at the administration building. NYSDOH concludes that "these concentrations of Freon 22 are not levels that are expected to be an exposure concern." The DEC concludes that the soil vapor IRM located south of the Park "pulls contaminated vapor away from the school and toward the Grumman Access Road." DEC also concludes that "The remedial Investigation is complete for the OU3 groundwater contamination plume in the vicinity of Bethpage High school and no additional groundwater or soil vapor monitoring points are needed at the school property for this OU."

ROD for Northrop Grumman Bethpage Facility – Operable Unit Number: 03 – State Superfund Project – Bethpage, Nassau County- Site No. 130003A, dated March 2013 and issued by the NYSDEC (March 2013 NYSDEC OU3 ROD)

The ROD presents the NYSDEC-selected remedy to address source areas in OU3 and the capture and treatment of off-site groundwater hotspot in the OU3 plume. The ROD remedy components related to VOCs in groundwater and soil vapor are summarized below (as reported by the NYSDEC):

- “The existing groundwater extraction and treatment IRM will continue to be operated and upgraded as necessary…to assure the capture / containment of the full depth and area of contaminated groundwater”.
- The groundwater is impacted with chlorinated VOCs and total chromium.
- The impacted groundwater was identified at depths up to 150 feet bgs.
- The shallow and a majority of the deep impacted groundwater are being captured by the groundwater IRM.
- Additional groundwater extraction wells (along with the necessary treatment) may be installed. The extraction wells will be located downgradient of the “area(s) of elevated contaminant levels identified upgradient of Bethpage Water District Plant 4.” The system will be designed to capture and treat “90 percent of the mass of groundwater migrating from the elevated ‘hotspot area’.”
- Additional groundwater monitoring wells will be installed to create a three-dimensional (3-D) delineation of the leading edge of the OU3 plume and to assess the need for further evaluating the groundwater remediation.
- The Wellhead Treatment Contingency Plan outlined in the OU2 ROD will remain in effect.
- The treatment capacity of the groundwater IRM may be upgraded.
- A Site Management Plan (SMP) including, but not limited to the following:
    - Institutional controls / environmental easements will include, but not be limited to the following: Groundwater use restrictions (acceptable use as “source of potable or process water, without necessary water quality treatment…”); and evaluating potential for soil vapor intrusion).
    - Monitoring Plan including, but not limiting to the following: assessing the performance and effectiveness of the on- and off-site pump and treat systems and the Soil Vapor Extraction (SVE) system; monitoring plume migration beyond the “off-site treatment area that becomes part of the OU2 plume; monitoring the groundwater for polychlorinated biphenyls (PCB) and chromium; monitoring for vapor intrusion; and additional sampling and/or monitoring well installation “along the eastern boundary to better define the lateral extent of groundwater contamination.”
    - Operation and Maintenance Plan to ensure continued operation, maintenance, monitoring, inspecting, and reporting as applicable to, but not limited to the following: on- and off-site pump and treat systems; SVE system; and compliance monitoring of treatment systems.
- “…a source of dichlorofloromethane (Freon-22) and dichlorodifloromethane (Freon-12), not attributable to operations at the Northrop Grumman facility but resulting from the operation of the two former Town of Oyster Bay ice skating rinks located east of OU3, is contributing to the groundwater contamination at the site. The Freon plume emanating from the ice rinks is comingled with OU3 related VOCs.”

- The OU3 plume migrating beyond the Park boundaries becomes comingled with the OU2 plume. The OU3 plume extends to a depth of "at least 550 feet bgs" and extends approximately 5,400 feet downgradient of the Park boundary.
- "…the off-site groundwater is impacted by the Freon plume from the former Town of Oyster Bay ice skating rinks."
- The on- and off-site groundwater will be remediated for an inorganic and various VOCs, including Freon-12™ and Freon-22™.
- The existing soil vapor extraction and treatment IRM will continue to be operated to "prevent migration of contaminated soil vapor."
- "…no site-related soil vapor contamination of concern was identified in the off-site areas evaluated, and impacts to indoor air are not occurring. Therefore, no further action was necessary for off-site residential properties."
- "Soil vapor contamination on the site…was addressed during the IRM".
- The NYSDEC provided the following responses to comments from the public meeting, availability session and/or written comments:
    - The Park "groundwater containment system is intended to capture the contaminated groundwater leaving the OU3 area."
    - The groundwater IRM is "effective in capturing the shallow groundwater plume where concentrations exceed 5 µg/L [micrograms per liter]."
    - "The Department, along with the NYSDOH, is confident that the nature and extent of contamination at OU3 has been fully characterized to allow the selection of this remedy…The Department determined that sufficient investigation had been conducted for both the on and off-site components of OU3 to enable selection of a comprehensive remedy…The nature and extent of the OU3 plume has been defined by the OU3 RI sampling program sufficient to allow this remedy selection…The off-site remedial investigation generated the information necessary to quantify the overall extent of the OU3 groundwater plume."
    - Regarding off-site groundwater, "The full extent of this TOB off-site Freon migration has yet to be determined."
    - "The Freon 12 and Freon 22 in the soil gas, and Freon 22 in the groundwater have been linked to the two former Ice Rinks, since demolished, which were owned by the Town of Oyster Bay…Freon 12 and Freon 22 have both been detected in soil gas, however, to date, only Freon 22 has been detected in the groundwater."
    - "The Department completed soil vapor sampling at the Bethpage High School property and in areas adjacent to Stewart Avenue in 2007 and 2008. The Department and NYSDOH have determined…the levels detected are not likely to impact indoor air quality at levels that would pose a health concern. Hence,

there is no reason to regularly evaluate the Bethpage High School building for soil vapor intrusion."

- "SVI evaluations conducted near the OU3 site have shown that SVI is not occurring in buildings close to the site."
- The SVE IRM is "effectively preventing the off-site migration of all volatile vapors to adjacent residences regardless of the specific compound or its source."

It should be noted that Table 1 - On-Site Groundwater, within Exhibit A includes a reference to detections of "Chlorodifluoromethane (Freon-21)". However, dichlorofluoromethane is known to be synonymous with Freon-21™.

3.2. ENVIRONMENTAL HISTORY

3.2.1. Site and Park

The Site is owned and operated by TOB and is a part of the Park. Historically, the Park was first developed and utilized for farming activity. Grumman (predecessor to NGC) purchased the Park in 1941 and utilized the Park as sludge settling beds (settling ponds) and recharge basins for waste disposal purposes (including Grumman manufacturing processes and industrial wastes, industrial wastewater treatment sludge, spent paint booth rags, and potential used oil). The Park was also utilized for fire control training. Grumman transferred ownership of the Park to the TOB in 1962 for use as a public park. The TOB developed the Park with an ice skating rink (Site), a parking lot, basketball court, baseball field, stormwater recharge basin, paddleball, tennis and shuffleboard courts, picnic and playground areas, horseshoe pits, bicycle racks, swimming pools, and offices. The Park was partially redeveloped by the TOB in 2005. Redevelopment of the Site included demolition of the former ice skating rink and replacement with the current indoor ice skating center.

3.2.2. Operable Units 2 and 3

The NWIRP was established in 1933 and included four plants, two warehouse complexes, a salvage storage area, water recharge basins, an Industrial Wastewater Treatment Plant (ITWP), and several support buildings. Operations at the NWIRP included research prototyping, testing, design engineering, fabrication, and primary assembly of military aircraft. Freon™ was utilized at the NWIRP.

Beginning in the 1940's, operations at the Grumman Property included chemical milling, plating, and degreasing. Chromic acid wastes were disposed in open seepage basins or directly on the ground between 1940 and 1949. Chromium contamination was identified in a public water supply well south of the Grumman Property in 1949. Between 1949 and 1962 neutralized chromic acid wastes were dried in settling ponds and shipped off-site for disposal.

The approximately 17-acre OCC / RUCO site began operations in 1945 and included handling and storing natural rubber latex. Plasticizers and polyvinyl chloride were produced at the OCC / RUCO site in 1950 and between 1956 and 1976, respectively. Manufacturing

processes wastes (including glycols, alcohols, tetrachloroethene [PCE], methanol, and organic acids) and non-contact cooling water were disposed of through sand sumps at the OCC / RUCO site between 1951 and 1975. The OCC / RUCO site was placed on the National Priorities List (NPL) in 1984 (CERCLIS No. NYD002920312).

In 1976, trichlorethene (TCE) was detected in a Grumman Property-owned supply well and a BWD off-line well located south of the Grumman Property. Based on the Chronological Record of the Bureau of Water Pollution Control prepared by the Nassau County Department Of Health and dated 1977 (1977 NCDOH CR), the New York State Health Department (NYSHD) set 50 ppb as "the maximum permissible level for any single contaminant" and 100 ppb as "the total for a combination of the contaminants involved." The NYSDEC did not agree with the NYSHD and required federal, state and local action "to reduce the risk factors associated with chemical contamination to an absolute minimum." The NYSHD "organic chemical limits" were not promulgated, but served as a guidance values.

In 1983, the NYSDEC added the Grumman Property to the Registry of Inactive Hazardous Waste Disposal Sites (RIHWDS) as a Class 2a site. In 1986 the BWD outlined the VOC-plume emanating from the Grumman Property (VOC-Plume) based on groundwater information from the Nassau County Department of Public Works (NCDPW) and the USGS. The Grumman Property was re-classified by the NYSDEC in 1987 as a Class 2 site.

The BWD implemented a VOC treatment system in 1987 to remediate the groundwater and bring monitoring well(s) back into service (funded by Grumman). Subsequently, the BWD implemented VOC removal systems to treat the groundwater in advance of VOC-impacted groundwater reaching two additional BWD facilities (supply wells). One remediation system was funded by Grumman and one remediation system was funded by the U.S. Navy.

Grumman entered into a consent order with the NYSDEC on October 25, 1990 to address the groundwater contamination (also Grumman Property soil). An RI conduced at the Grumman Property between 1991 and 1994 included installation and sampling of 43 monitoring wells and an RI conducted between 1991 and 1993 at the NWIRP included installation and sampling of 18 monitoring wells. Based on a remedial investigation / feasibility study (RI / FS) conducted by Grumman between 1989 and 1994, the Grumman Property and NWIRP were identified as the source of the VOC-Plume. As reported in the September 1994 G & M RIR, based on the USGS study that began in 1985, the VOC-Plume "beneath and extending southward from the Grumman, U.S. Navy, and OCC / RUCO Polymer Corporations sites" was approximately 5,700 feet wide, 12,000 feet long and greater than 500 feet thick.

The OU2 program was developed through the RI / FS to investigate and remediate the on and off-site groundwater impacts. An on-site groundwater containment and treatment (ONCT) system was installed in the southern portions of the Grumman Property and NWIRP in November 1997 and became fully operational in September 1998. Baseline groundwater quality data was obtained in May 1997. The ONCT system for VOC-impacted groundwater includes four groundwater pumping wells (three extraction wells [ONCT-4, ONCT-2 and ONCT-3] and one production well [GP-1]), two treatment facilities consisting of air stripping

towers, and two sets of recharge basins. The groundwater is pumped, treated and discharged into the aquifer via recharge basins.

Based on the Proposed Remedial Action Plan (PRAP) prepared by the NYSDEC for OU2 and dated October 2000 (October 2000 NYSDEC OU2 PRAP), the groundwater plume totaled approximately 2,000 acres in area and was greater than 500 feet deep. The NYSDEC issued a Record of Decision (ROD) for OU2 in March 2001, stating that the OU2 remedy will continue operating until the NYSDEC makes a determination that remediation is no longer required. As per the ROD, the U.S. Navy installed a remediation system to address the groundwater impacts in the GM-38 area (in the vicinity of Arthur Avenue and Broadway in Bethpage, New York). The groundwater is pumped via extraction wells to a treatment system. The OU2 monitoring well network has been sampled quarterly since the system was fully operational (the record search included a review of quarterly groundwater monitoring data between 1999 and 2011 [details are provided in the Section 3.1).

Effective July 4, 2005, the NYSDEC and NGC executed an Order on Consent (CO; Index Number W1-0018-04-01) for implementation of a groundwater pump-and-treat system IRM for OU3. The groundwater IRM for OU3 consists of groundwater extraction via four remedial wells, groundwater treatment via air stripping to reduce VOCs (including Freon-22™), groundwater filtration to remove oxidized metals, and groundwater return to the aquifer via a recharge basin. A vapor phase treatment system reduces the concentrations of VOCs in the air stripper off-gas prior to discharge into the atmosphere. The OU3 groundwater IRM monitoring well network has been sampled periodically since the system was operational on July 21, 2009 (the record search included a review of quarterly groundwater monitoring date between 2009 and 2011 [details are provided in the Section 3.1).

3.2.3. Freon™ Use

Freon™ Use

Based on the December 1986 RGH IAS, halogenated solvent wastes accumulated within Plants 03 and 10 at NWIRP Bethpage. The drums stored at Plants 03 and 10 contained “freon”. Filled drums were then relocated to the Main Drum Marshalling Area, which was located inside a building in the Salvage Storage Area, Site 9. Trichloroethane, methylene chloride, perchloroethylene, trichloroethylene, and “all freons” were classified as “Type 4” waste. Based on Table 6-4 of the December 1986 RGH IAS, approximately 80,000 gallons of Type 4 waste was handled by the Main Drum Marshalling Area between 1982 and 1985.

Halliburton summarized the December 1986 RGH IAS as follows:

- The former drum marshalling area at the NWIRP was identified as an area that “may pose a threat to human health or the environment”.
- From the early 1950s, drummed waste was stored on a cinder-covered surface over a cesspool field located east of Plant No. 3. In 1978, the collection and marshalling point was relocated south of the original unpaved area to a concrete pad (with no cover or berms). The drummed waste storage area was re-located to the Drum

Marshalling Facility in 1982, within the Salvage Storage Area and a cover was added in 1983. The drums were taken off-site for treatment or disposal.

- No leaks or spills were reported.
- The area identified as "Site 1" is underlain by an abandoned septic drainage system.

Additionally, Registration Sheets dated 1988 and included in the New York State Site Registry Delisting Petition for the Headquarters Complex prepared by D & B and dated March 1995 (March 1995 D & B Headquarters Complex SRDP) indicated that "Plant 111 stored freon...at one indoor location..." Based on the Application for a Toxic or Hazardous Materials Storage Facility Permit dated June 1988, approximately 360 gallons of "Freon 11, 12, 22 (Gas)" were stored within storage areas at the Headquarters Complex.

Based on the April 1993 D & B Hangar 7 SRDP, an inspection of Hangar 7 on February 26, 1993 identified a 30-gallon drum refrigerant (trichloromonofluoromethane [Freon-11™]) in the Mechanical Equipment Room # 2. Based on the March 1995 D & B Headquarters Complex SRDP, the following were identified at the Headquarters Complex sometime between 1960 and 1995:

- Flammable Chemical Storage Cabinets – containing "small quantities" of "freon";
- Thermodynamics Lab – utilizing "freon" as the working fluid for the manufacture of thermal control devices;
- Stock Room – storing dichlorodifluoromethane (Freon-12™);
- 90 Day Storage Building (with secondary containment) –storing "freon";
- Assembly and Fabrication Shop – Receiving Area (Temporary Storage) – storing "freon" and Freon-12™;
- Shop Area – storing "freon" in flammable chemical cabinets;
- Basement (Original Section) – storing 30 gallon drums containing Freon-11™; and
- First Floor (Original Section) – storing toner ("1,1, Dichlorol-Fluoroethane" [Freon-132™]).

Based on the New York State Site Registry Delisting Petition for Plants 4 and 25 prepared by D & B and dated September 1995 (September 1995 D & B Plants 4 and 25 SRDP), the following were identified at Plants 4 and 25 sometime between 1950 and 1995:

- Boiler Room – containing 200-pound drums of Freon-11™ and an additional 30-gallon drum of Freon-11™; and
- Plant 5, Department 161 Stock Room – storing trichlorotrifluoroethane (Freon-113™).

Two former Town ice rinks are known to have utilized Freon-22™ as a coolant for the ice surface. Town personnel have indicated that coolant pipes carrying Freon-22™ occasionally

leaked, requiring repair. Prior investigations associated with the Site area show high concentrations of Freon™ in the vicinity of the Site, both in groundwater and soil vapor.

Freon-22™

Based on the documents reviewed during the records search (Section 3.1), the following is a summary of available Freon-22™ analytical data obtained from groundwater samples collected within the Site, Park and surrounding area:

- In 2001 Freon-22™ was detected as a TIC, at a concentration greater than the NYSDEC Class GA SGV at monitoring well GM21I, which is located immediately south of a former recharge basin in the southern portion of the Grumman property. Monitoring well GM-21I is located at a distance greater than 4,500 feet southwest of the Site (cross-gradient of the OU3 / Study Area VOC-Plume).
- In 2005 Freon-22™ was identified as a TIC, at a concentration greater than the NYSDEC Class GA SGV at monitoring well CAMW4, which located immediately south and down-gradient of the Site.
- Between 2004 and 2006 Freon-22™ was identified at a concentration greater than the NYSDEC Class GA SGV in the following groundwater sampling locations within OU3:
    - B-43E (approximately 100 feet west and cross-gradient of the Site)
    - BCPMW-6-1 (approximately 450 feet south and down-gradient of the of the Site)
    - BCPMW-7-1 (approximately 550 feet south-southeast and down-gradient of the Site)
    - CAMW4 (immediately south and down-gradient of the Site)
    - VP-6 (approximately 500 feet south-southeast and down-gradient of the Site)
    - VP-7 (approximately 550 feet south-southeast and down-gradient of the Site)
    - VP-8 (approximately 550 feet south-southeast and down-gradient of the Site)
    - VP-11 (approximately 450 feet southwest and cross-gradient of the Site)
    - VP-12 (approximately 500 feet south and down-gradient of the Site)
    - VP-13 (approximately 450 feet south-southeast and down-gradient of the Site)
    - VP-14 (approximately 400 feet south and down-gradient of the Site)
    - VP-14A (approximately 400 feet south and down-gradient of the Site)
    - VP-23A (approximately 75 feet south-southwest and down- and cross-gradient of the Site)
    - VP-35 (approximately 50 feet south-southwest and down- and cross-gradient of the Site)

- Between 2006 and 2009 Freon-22™ was identified at a concentration greater than the NYSDEC Class GA SGV in the following groundwater sampling locations down-gradient of OU3 and within the OU3 / Study Area VOC-Plume (eastern portion of the OU2 VOC-Plume). The groundwater sampling depths are indicated in parenthesis and are with respect to land surface.
    - VP-100 (75-85)
    - VP-116 (194) – As detailed in Section 3.1, a segment of VOC-impacted groundwater was identified between VPBs VP-111 and VP-119 at depths of 100 and 330 feet bls. ARCADIS concluded this shallower segment of the VOC-impacted groundwater was "not consistent with the depth of the Study Area VOC-impacted groundwater originating" from the Park (OU3 / Study Area VOC-Plume reached depths greater than 330 feet bls in the area between VPBs VP-111 and VP-119) and therefore not related to the Park.

- In June 2008, Freon-22™ was identified at a concentration greater than the NYSDEC Class GA SGV in the following groundwater sampling location within OU2:
    - VP-115 (greater than 2,000 feet southwest and cross-gradient of the Site)
        - Depth: 242 feet bls;
        - Depth: 402 feet bls;
        - Depth: 442 feet bls; and
        - Depth: 482 feet bls.
- In 2009, Freon-22™ was identified at a concentration greater than the NYSDEC Class GA SGV in the following groundwater sampling locations within OU3:
    - WSP-5 (groundwater IRM treatment system influent Water Sampling Port-5)
    - RW-3 (groundwater IRM treatment system remedial / recovery well)
    - RW-4 (groundwater IRM treatment system remedial / recovery well)
    - B24MW-3 (approximately 900 feet southwest and cross-gradient of the Site)
    - BCPMW-4-1 (approximately 600 feet southwest and cross-gradient of the Site)
    - BCPMW-6-1 (approximately 450 feet south and down-gradient of the of the Site)

- In 2009, Freon-22™ was identified at a concentration greater than the NYSDEC Class GA SGV in the following groundwater sampling location down-gradient of OU3 and within the OU3 / Study Area VOC-Plume (eastern portion of the OU2 VOC-Plume): MW-203-1.
- In 2010, Freon-22™ was identified at a concentration greater than the NYSDEC Class GA SGV in the following groundwater sampling locations within OU3:

- WSP-5 (groundwater IRM treatment system influent Water Sampling Port-5)
- RW-3 (groundwater IRM treatment system remedial / recovery well)
- RW-4 (groundwater IRM treatment system remedial / recovery well)
- BCPMW-6-1 (approximately 450 feet south and down-gradient of the of the Site)
- BCPMW-7-1 (approximately 550 feet south-southeast and down-gradient of the Site)

- In 2010, Freon-22™ was identified at a concentration greater than the NYSDEC Class GA SGV in the following groundwater sampling location down-gradient of OU3 and within the OU3 / Study Area VOC-Plume (eastern portion of the OU2 Plume): MW-203-1.
- Freon-22™ was detected a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.) and less than the NYSDEC Class GA SGV in the following groundwater sampling locations within OU2 (general location and collection date are provided in parenthesis):
  - VP-34 (northwest [up- and cross-gradient] of the Site; 2004 through 2006)
  - VP-36 (west [cross-gradient] of the Site; 2004 through 2006)
  - VP-107 (down-gradient of OU3; 2006 through 2009)
  - VP-105 (down-gradient of OU3; 2006 through 2009)
  - VP-108 (down-gradient of OU3; 2006 through 2009)
  - MW-108-1 (down-gradient of OU3; 2006 through 2009)
  - VP-100, excluding the 75 to 85 feet bls sampling interval (down-gradient of OU3; 2006 through 2009)
  - MW-100-3 (down-gradient of OU3; 2006 through 2009)
  - MW-109-3 (down-gradient of OU3; 2006 through 2009)
  - VP-102 (down-gradient of OU3; 2006 through 2009)
  - VP-109 (down-gradient of OU3; 2006 through 2009)
  - VP-110 (down-gradient of OU3; 2006 through 2009)
  - GM-15D2 (within OU2, in the southeastern portion of the Grumman property, southwest and cross-gradient of the Site; 2006 through 2009)
  - VP-118 (down-gradient of OU3; 2006 through 2009)
  - Well 1 (within OU2, in the southwestern portion of the NGC property; southwest and cross-gradient of the Site; 2006)
  - Well 18 (within OU2, in the southern portion of the Grumman property, southwest and cross-gradient of the Site; 2006, 2010 and 2011)

- Well 19 (within OU2, in the southeastern portion of the Grumman property, southwest and cross-gradient of the Site; 2006 and 2010)
- GM13D (within OU2, in the east-central portion of the Grumman property, southwest and cross-gradient of the Site; 2011)
- GM15D (within OU2, in the southeast portion of the Grumman property, southwest and cross-gradient of the Site; 2011)
- GM35D2 (within OU2, south of the Grumman property, southwest and cross-gradient of the Site; 2006 and 2011)
- GM34D (within OU2, south of the Grumman property, southwest and cross-gradient of the Site; 2006 and 2010)
- GM34D2 (within OU2, south of the Grumman property, southwest and cross-gradient of the Site; 2010)
- GM73D2 (within OU2, in the southwestern portion of the Grumman property, southwest and cross-gradient of the Site; 2011)
- GM74D2 (within OU2, in the southeastern portion of the Grumman property, southwest and cross-gradient of the Site; 2011)
- RW-2 (groundwater IRM treatment system remedial / recovery well; 2009 and 2010)
- RW-3 (groundwater IRM treatment system remedial / recovery well; July 2009)
- BCPMW-4-2 (approximately 600 feet southwest and cross-gradient of the Site; 2009)
- BCPMW-7-1 (approximately 550 feet south-southeast and down-gradient of the Site; 2009)
- BCPMW-4-1 (approximately 600 feet southwest and cross-gradient of the Site; 2010)
- MW-202-1 (down-gradient of OU3; 2010)

Based on the documents reviewed during the records search (Section 3.1), the following is a summary of available Freon-22™ analytical data obtained from soil gas and outdoor air samples collected within the Site, Park and surrounding area:

- Based on the November 2005 H2M IR and RAP, Freon-22™ was not identified in the soil vapor samples collected during the investigation.
- Based on the December 2005 H2M IRM Supplemental IR, Freon-22™ was not identified in the soil vapor samples collected during the investigation.
- Based on the December 2007 EAE & ST SVI Investigation Summary Report, of the samples collected from residential homes located south of OU3 and on the property of BHS, Freon-22™ was not detected at a concentration greater than the laboratory

MDL in the sub-slab soil vapor, indoor air, outdoor air, and duplicate samples collected; and Freon-22 was detected in soil vapor samples collected (includes 1 duplicate sample) at concentrations ranging between approximately 7 µg/m^3 and approximately 98,000 µg/m^3.

- Based on the February 2008 ARCADIS RIR (Site Area), Freon-22™ was identified at a concentration greater than 10 µg/m^3 at the following locations:
    - SGP-10 (adjacent to; south-southwest of the Site; and at 7.5 - 8, 34 - 34.5 and 49 - 49.5 feet bls)
    - SGP-107 (approximately 275 feet southeast of the Site; and at 7 - 7.5 feet bls)

Freon-12™

Based on the documents reviewed during the records search (Section 3.1), the following is a summary of available Freon-12™ analytical data obtained from groundwater samples collected within the Site, Park and surrounding area:

- Freon-12™ was detected at a concentration greater than the NYSDEC SGV for dichlorodifluoromethane in groundwater samples collected from OU2 in 2003 and from OU3 in 2006 and 2008.
- Freon-12™ was detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.) and less than the NYSDEC SGV for dichlorodifluoromethane in groundwater samples collected from OU2 and/or OU3 in 1997, 1999, 2006, 2009, and 2011.
- Freon-12™ was not detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.) in groundwater samples collected from OU2 and/or OU3 in 2002 through 2006 and 2008 through 2011.

Based on the documents reviewed during the records search (Section 3.1), the following is a summary of available Freon-12™ analytical data obtained from soil gas and outdoor air samples collected within the Site, Park and surrounding area:

- Based on the November 2005 H2M IR and RAP, Freon-12™ was identified at a concentration greater than 10 µg/m^3 at the following locations:
    - E-11 (Site; at 10 feet)
    - E-13 (adjacent to and east of the Site, on Stewart Avenue; and at 8 - 10 feet)
    - G-11 (adjacent to and west of the Site; and at 10 feet)
    - H-13 (adjacent to and south of the Site; and at 10 and 52 feet)

- Based on the December 2005 H2M IRM Supplemental IR, Freon-12™ was identified at a concentration greater than 10 µg/m^3 at the following locations:

- R1 (Site; and at 10 - 12, 28 - 30 and 48 - 50 feet)
- R3 (Site; and at 8 - 10, 28 - 30 and 48 - 50 feet)
- R6 (adjacent to and southwest of the Site; and at 8 - 10, 28 - 30 and 48 - 50 feet)

- Based on the December 2007 EAE & ST SVI Investigation Summary Report, of the samples collected from residential homes located south of OU3 and on the property of BHS, Freon-12™ was detected at low concentrations (greater than the laboratory MDL; maximum concentration was 6.08 µg/m^3) in sub-slab soil vapor, indoor air, outdoor air, and duplicate samples collected; and Freon-12 was detected in the soil vapor samples collected (includes 1 duplicate sample), at concentrations ranging between approximately 3.5 µg/m^3 and approximately 4,000 µg/m^3.
- Based on the February 2008 ARCADIS RIR (Site Area), Freon-12™ was identified at a concentration greater than 10 µg/m^3 at the following locations:
  - SGP-10 (adjacent to; south-southwest of the Site; and at 7.5 - 8, 34 - 34.5 and 49 - 49.5 feet bls)
  - SGP-115 (approximately 550 feet southeast of the Site; and at 49.5 - 50 feet bls)

3.2.4. VOC-Plumes

As of September 1994, the OU2 VOC-Plume "beneath and extending southward from the Grumman, U.S. Navy, and OCC / RUCO Polymer Corporations sites" was approximately 12,000 feet long, 5,700 feet wide and greater than 500 feet thick. Subsequently, the OU2 groundwater plume totaled approximately 2,000 acres in area and was greater than 500 feet deep (as of October 2000). As of February 2011, the maximum extent of the OU2 VOC-Plume was approximately 3.5 miles in length, 1.6 miles in width, 790 feet in depth, and 430 feet in thickness.

The OU3 VOC-Plume was identified extending across the Park (located within the northeast portion of the OU2 VOC-Plume). Also, the OU3 / Study Area VOC-Plume was identified in the eastern portion of the OU2 VOC-Plume and south and southeast of the OU3 (hydraulically down-gradient of the Park and Sycamore Avenue). As of February 2008, the OU3 VOC-Plume was approximately 1,200 feet in width and at a maximum depth of 150 feet bls. Based on groundwater investigations conducted between June 2006 and July 2009, the OU3 / Study Area VOC-Plume was approximately 8,300 feet in length, 2,100 feet in width, 670 feet bls in depth, and 430 feet in thickness (as of February 2011).

3.3. FREON-22™ SUB-PLUME

In a letter dated May 26, 2010, the NYSDEC indicated that a "review of groundwater analytical data shows that Freon-22 groundwater contamination has been identified as a sub-plume within the overall OU3 Grumman groundwater contamination plume." The Freon-22™ groundwater sub-plume was identified in the eastern portion of the Park and delineated

within the OU3 boundary. Freon-22™ was identified in the sub-plume at concentrations ranging between 10 ppb and 290 ppb and as of February 2008, extended over an average width of approximately 250 feet.

Freon-22™ was detected at the highest concentrations in the groundwater samples collected from the southeast portion of OU3. Freon-22™ detections in groundwater down-gradient of OU3 and within the OU2 VOC-Plume were sporadic and irregularly distributed. The detected concentrations of Freon-22™ in groundwater down-gradient of OU3 and within the OU2 VOC-Plume are relatively insignificant compared to the total VOC concentrations in groundwater down-gradient of OU3 and within the OU2 VOC-Plume. Based on the analytical data, the Freon-22™ sub-plume appears to be limited to the OU3 boundary.

4.0 REMEDIAL INVESTIGATION WORK PLAN

To date, extensive environmental sampling of groundwater, soil and soil vapor at the Site and general area has been conducted by various entities including the U.S. Navy, USGS, NYSDEC, NYSDOH, Grumman, NGC, RGH, G & M, Halliburton, D & B, ARCADIS, EAE & ST, and H2M. Groundwater, soil and soil vapor samples were analyzed for various constituents, including, but not limited to metals, pesticides, PCBs, and semivolatile organic compounds (SVOC). Based on the findings of the environmental investigations, several remediations / IRMs were conducted / incorporated at the Site and general area including, but not limited to the following:

- Soil Excavation IRM (Construction Area): Excavation and removal of approximately 175,000 cubic yards (cu yd) of soil impacted with metals, PCBs and VOCs.
- SVE IRM (Former Grumman Plant 24 Access Road Property): An SVE system was installed to intercept / contain impacted soil vapor.
- Groundwater IRM (Former Grumman Plant 24 Access Road Property): A groundwater extraction and treatment system for impacted groundwater.

Based on the findings of the numerous environmental investigations and remediations / IRMs at the Site and general area, additional sampling for metals, pesticides, PCBs, and SVOCs is not warranted (April 2013 NYSDEC Comment Letter).

In an effort to delineate the nature and extent of the Freon-22™ groundwater sub-plume and soil vapor impact(s) and as required by the NYSDEC in the April 2013 NYSDEC Comment Letter, evaluate the conditions at the Site, Park and general area “in regard to potential impacts of Freon-12, Freon-22 and other Brownfield Site-related VOCs to soil vapor and groundwater”, we propose conducting an RI. According to the February 2008 ARCADIS RIR (Site Area), the southwest portion of the Park (“Areas ‘B’, ‘C’, ‘D’, and ‘I’”, as defined by ARCADIS) “appear to be continuing sources of VOCs to groundwater.” Based on the March 2013 NYSDEC OU3 ROD, the “approximately one-acre VOC rag pit area” is the source area(s) for VOCs.

Considering the above, this RIWP has been prepared to include groundwater and soil vapor sampling for VOCs, Freon-12™, Freon-22™, plus VOC TICs analysis. It is understood that the contaminant of concern associated with the subject Site is limited to Freon™, and that non-Freon™ VOC analytical data, that may be generated as part of the Remedial Investigation, will be utilized for information purposes regarding the Site setting and not for consideration as contaminants of concern associated with the Site.

This RIWP has been prepared to meet the requirements specified in Chapter 3 - Site Characterization and Remedial Investigation of the NYSDEC DER-10 and the NYSDEC Guidance for Evaluating Soil Vapor Intrusion in the State of New York dated October 2006 (SVI Guidance). The RI will be conducted with NYSDEC oversight and has the following goals:

1) Define the nature and extent of contamination;
2) Identify the source(s) of the contamination;
3) Assess the impact of the contamination on public health and the environment; and
4) Provide information to support the development of a proposed remedy to address the contamination or the determination that cleanup is not necessary.

4.1. OBJECTIVES

The specific RI objectives identified in NYSDEC DER-10, and their statuses (achieved [based on information obtained from the records search] or requires investigation), are provided below:

Objective 1

Delineate the areal and vertical extent of Freon-22™, and as required by the NYSDEC, Freon-12™ and "other Brownfield Site-related VOCs" in groundwater and soil vapor at and/or emanating from the Site. Although this RIWP has been prepared to include groundwater and soil vapor sampling for VOCs, Freon-12™, Freon-22™, plus VOC TICs analysis, it is understood that the contaminant of concern associated with the subject Site is limited to Freon™.

STATUS: Information regarding the areal and vertical extent of the Freon-12™, Freon-22™ and VOCs groundwater and soil vapor impacts were obtained from the records search and summarized in Section 3.0 – Records Search of this RIWP. A significant volume of data from many sampling and monitoring points is available showing historic impacts and ongoing monitoring results.

Based on the February 2008 ARCADIS RIR (Site Area), February 2011 ARCADIS RIR (Study Area), May 2012 NYSDEC PRAP, September 2012 NYSDEC Letter, and March 2013 NYSDEC OU3 ROD:

- The southwest portion of the Park ("Areas 'B', 'C', 'D', and 'I'", as defined by ARCADIS) "appear to be continuing sources of VOCs to groundwater."
- The "approximately one-acre VOC rag pit area" is the source area(s) for VOCs.
- VOCs are present in the groundwater beneath the Park and the VOC-plume was delineated in the up-, cross- and down-gradient directions and in the vertical direction;
- An OU3 remedy was selected by the NYSDEC based on, but not limited to the following:
    - NYSDEC and NYSDOH confidence that the "nature and extent of contamination at OU3 has been fully characterized";
    - NYSDEC determined that "sufficient investigation had been conducted for both the on and off-site components of OU3";
    - "The nature and extent of the OU3 plume has been defined by the OU3 RI sampling program"; and
    - "The off-site remedial investigation generated the information necessary to quantify the overall extent of the OU3 groundwater plume."
- The Freon-22™ groundwater sub-plume was delineated within the Park;
- Freon-12™ and Freon-22™ were detected sporadically in the groundwater down-gradient of the Park;
- The OU3 groundwater IRM was implemented in July 2009 to prevent migration of groundwater in the upper 20 feet of the aquifer containing total VOCs at concentrations greater than 5 ppb;
- The groundwater IRM effectiveness is periodically monitored via the Groundwater Monitoring Network; and
- The continued off-site migration of impacted groundwater has largely been addressed by the on-site groundwater pump and treatment system IRM.
- Soil gas impacts related to OU3 are limited to the Park Area and do not extend off-site.
- The soil vapor IRM located south of the Park "pulls contaminated vapor away from the school and toward the Grumman Access Road."
- Soil vapor impacts to adjacent residences have been addressed by Grumman through implementation of the SVE IRM.
- The soil gas IRM effectively prevents off-site migration of VOCs in soil gas and that additional off-site soil gas investigation is not required.
- "Freon 12 and Freon 22 have both been detected in soil gas, however, to date, only Freon 22 has been detected in the groundwater."

As required by the NYSDEC in the April 2013 NYSDEC Comment Letter, "environmental samples, analyzed for full VOC scan, must be taken in order to determine the lateral and vertical extent of contamination from the TOB former ice rink(s)." As such, this RIWP includes "monitoring well sampling...and soil gas sampling." Although this RIWP has been prepared to include groundwater and soil vapor sampling for VOCs, Freon-12™, Freon-22™, plus VOC TICs analysis, it is understood that the contaminant of concern associated with the Site is limited to Freon™. Existing data will be compiled as necessary to document delineation and will be reiterated within the RI Report. Additional data obtained during the RI will be presented in the RI Report.

Objective 2

Determine the surface and subsurface characteristics of the Site, including topography, geology and hydrogeology.

STATUS: Site surface and subsurface characteristic information was obtained from the records search and information is provided in Section 2.0 - Site and Area Description of this RIWP. Objective 2 has been achieved. This information will be reiterated in the RI report.

Objective 3

Identify the source(s) of contamination to the extent possible, the migration pathway(s) and actual or potential receptor(s) of Freon-22™, and as required by the NYSDEC in the April 2013 NYSDEC Comment Letter, Freon-12™ and "other Brownfield Site-related VOCs" on or through air, soil, groundwater, surface water, utilities, and structures at the contaminated site, without regard to property boundaries. Although this RIWP has been prepared to include groundwater and soil vapor sampling for VOCs, Freon-12™, Freon-22™, plus VOC TICs analysis, it is understood that the contaminant of concern associated with the Site is limited to Freon™.

STATUS: Based on information obtained from the records search (Section 3.0 – Records Search of this RIWP), the southwest portion of the Park ("Areas 'B', 'C', 'D', and 'I'", as defined by ARCADIS) "appear to be continuing sources of VOCs to groundwater"; the "approximately one-acre VOC rag pit area" is the source area(s) for VOCs; and Freon-22™ was "released to the environment at the Park". In an NYSDEC letter dated September 17, 2008, the NYSDEC concluded that the former Town of Oyster Bay ice rinks were the source of the Freon-22™ groundwater and soil vapor impacts. Although details / information regarding a Freon-12™ release at the Site was not obtained during the records search, in the April 2013 NYSDEC Comment Letter, the NYSDEC states that "the site is a source of Freon 12". A further review of available data and available periodic monitoring reports will be conducted as part of the RI to evaluate these conclusions. Additional groundwater sample and soil vapor sample data will be obtained during the RI and the findings will be presented in the RI Report.

Objective 4

If necessary, collect and evaluate data necessary for a fish and wildlife resource impact analysis (FWRIA) to determine actual and potential adverse impact(s) to fish and wildlife resources.

STATUS: Based on the available data, nature of the site and scope of the Project, an FWRIA is not necessary.

Objective 5

Collect and evaluate data necessary to evaluate the actual and potential threat(s) to public health and the environment, including an evaluation of current and future potential public health exposure pathway(s) and potential impact(s) to biota.

STATUS: Although a significant volume of data from many sampling and monitoring points is available to have achieved Objective 5, as required by the NYSDEC in the April 2013 NYSDEC Comment Letter, additional data will obtained via groundwater and soil vapor sampling. The existing data and additional data obtained during the RI will be utilized to evaluate the actual and potential threat(s) to public health and the environment. Evaluation of the actual and potential threats to public health and the environment will be included in the RI report.

Objective 6

Collect the data necessary to evaluate any release to groundwater and soil vapor and develop remedial alternative(s) to address the release.

STATUS: Although a significant volume of data from many sampling and monitoring points is available to have achieved Objective 6, as required by the NYSDEC in the April 2013 NYSDEC Comment Letter, additional data will be obtained via groundwater and soil vapor sampling. The existing data, review of available periodic monitoring reports and additional data obtained during the RI will be utilized to evaluate any release to groundwater and soil vapor and develop remedial alternative(s) to address the release.

Objective 7

Identify removal, treatment, containment or other interim remedial measures (IRM) as necessary to remove, treat or contain any source area(s) identified and prevent, mitigate or remedy environmental damage or human exposure to contaminants during remedial alternatives analysis.

STATUS: The OU3 groundwater and soil vapor IRMs have been operational since 2009 and 2008 respectively, to mitigate the migration of contaminants from the OU3 boundary. According to NYSDEC, both systems are effectively controlling migration of VOCs, including Freon-12™ and Freon-22™, from the Park Area. Therefore, Objective 7 is not applicable and additional IRMs are not necessary.

4.2. SCOPE OF WORK

The RI Scope of Work has been developed in accordance with Chapter 2 and Chapter 3 of the NYSDEC DER-10 and the NYSDEC SVI Guidance. Fieldwork will be conducted in accordance with the Health and Safety Plan (HASP; Appendix A) and under the oversight of qualified H2M professionals. Given the availability of data and the status of various RI objectives summarized in Section 4.1 above, the RI Scope of Work will be limited to the following tasks:

- Site visit to identify any changes to the Site or vicinity;
- Further compilation of available groundwater and soil vapor data;
- Field investigation to determine the areal and vertical extent of VOC impacts;
- Comparison of data to applicable SCGs;
- Qualitative exposure assessment;
- Development of recommendations regarding additional investigation and/or remediation, if necessary; and
- Preparation of RI report.

4.2.1. Field Activities Plan

Utility Clearance and Geophysical Survey

Dig Safely New York will be contacted and a utility mark out will be requested at the Site, Park and/or general area. The subcontractor will be responsible for ensuring the utilities have been marked out and confirm that the utility mark out was performed by providing appropriate documentation (ticket numbers, certification, etc.) and visually verifying completion prior to beginning field investigative work.

Prior to the commencement of subsurface investigations, a geophysical survey will be conducted throughout the areas to be investigated using ground penetrating radar (GPR) and electromagnetic (EM) detection equipment. A geophysical survey will be conducted to minimize the potential for sampling activity to impact existing underground utilities, to clear proposed subsurface sampling locations and to accurately locate and document sample points. The survey will result in a map identifying utilities and subsurface anomalies. The survey and associated field observations will also be utilized to identify and evaluate potential subsurface anomalies and/or buried structures and debris.

Site Visit

A Site visit will be conducted to identify any changes to the Site, Park and general area. During the Site visit, monitoring wells, MW-200-1, MW-201-1, MW-202-1, and MW-203-1 will be examined to determine if the monitoring well is intact, clear, accessible, and suitable for sampling.

Groundwater

A groundwater investigation will be conducted in accordance with the NYSDEC DER-10 and will be based on available groundwater data obtained for the Site, Park and general area (as summarized in Section 3.0 of this RIWP).

Groundwater Screening

Four temporary groundwater monitoring wells will be installed as follows: RI-TMW-01 (north and up-gradient of the Site); RI-TMW-02 and RI-TMW-04 (southeast and down-gradient of the Site); and RI-TMW-03 (southwest and cross-gradient of the Site). The temporary monitoring well construction details and groundwater screening program are based on information obtained from the February 2008 ARCADIS RIR (Site Area) and the April 2011 ARCADIS Annual Summary OM&M Report for 2010.

The following is a summary of Freon-22™ concentrations detected (if any) in groundwater samples collected from VPBs located in the vicinity of the above-listed, proposed temporary monitoring wells (as reported in the February 2008 ARCADIS RIR [Site Area]):

- VP-34 (approximately 175 feet southwest of RI-TMW-01)
    - Freon-22™ concentration of 0.9 µg/L was detected in the groundwater sample collected from a depth of 50 to 55 feet bls.
    - Freon-22™ concentration of 0.7 µg/L was detected in the groundwater sample collected from a depth of 57 to 62 feet bls.
    - Freon-22™ was not detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.) in the groundwater sample collected from a depth of 62 to 67 feet bls.
- VP-13 (approximately 175 feet south-southwest of RI-TMW-02)
    - Based on Table 5-14, groundwater samples collected from depths of 60 to 65 feet bls, 70 to 75 feet bls, 80 to 85 feet bls, 92 to 97 feet bls, and 105 to 110 feet bls were not analyzed for Freon-22™.
    - Based on the laboratory analytical data provided in Appendix N (Laboratory Report Number 208511), Freon-22™ was not detected at a concentration greater than the laboratory detection limit (MDL, CRDL, IDL, RL, etc.) in the groundwater sample collected from 105 to 110 feet bgs.
    - Based on Figure 5-11, the maximum concentration of Freon-22™ detected at this location was 290 µg/L. According to Note # 3 on Figure 5-11, the groundwater sample with the maximum concentration of Freon-22™ was collected “at the water table”. Based on the Groundwater/Perched Water Sampling Logs and Perched Water Hydrographs provided in Appendix F, the depth to groundwater at this location was approximately 55 feet bls.
- VP-14 (approximately 175 feet southeast of RI-TMW-03)

- Based on Table 5-14, groundwater samples collected from depths of 65 to 70 feet bls, 75 to 80 feet bls, 85 to 90 feet bls, 95 to 100 feet bls, 105 to 110 feet bls, and 115 to 120 feet bls were not analyzed for Freon-22™.
- Based on Figure 5-11, the maximum concentration of Freon-22™ detected at this location was 37 µg/L (as a TIC). According to Note # 3 on Figure 5-11, the groundwater sample with the maximum concentration of Freon-22™ was collected "at the water table". Based on the Groundwater/Perched Water Sampling Logs and Perched Water Hydrographs provided in Appendix F, the depth to groundwater at this location was approximately 60 feet bls.

- VP-14A (approximately 175 feet southeast of RI-TMW-03)
  - Freon-22™ concentration of 0.9 µg/L was detected in the groundwater sample collected from a depth of 55 to 60 feet bls.
  - Freon-22™ concentration of 0.8 µg/L was detected in the groundwater sample collected from a depth of 60 to 65 feet bls.
  - Freon-22™ concentration of 32 µg/L was detected in the groundwater sample collected from a depth of 70 to 75 feet bls.

The following is a summary of Freon-22™ and OU3 Groundwater IRM information that is pertinent to the proposed temporary monitoring wells (as reported in the April 2011 ARCADIS Annual Summary OM&M Report for 2010):

- Remedial wells (RW-1 through RW-4) are located downgradient of the Site, along the southern portion of the Northrop Grumman Former Plant 24 Access Road and are utilized to extract groundwater.
- Based on the configuration of potentiometric surface and groundwater flow directions presented on Figure 4, groundwater in the location of proposed RI-TMW-03 is most likely to be captured by RW-3. The groundwater flow directions in the locations of proposed RI-TMW-01 and RI-TMW-02 are not shown on Figure 4.
- RI-TMW-01 is located approximately 825 feet north-northeast of RW-3 and approximately 875 feet northeast of RW-4.
- RI-TMW-02 is located approximately 850 feet northeast of RW-3 and approximately 300 feet northeast of RW-4.
- RI-TMW-03 is located approximately 200 feet north-northeast of RW-3 and approximately 325 feet northwest of RW-4.
- RI-TMW-04 is located directly west of RW-4.
- Based on Table A-1 and Figure 9, the recovery well screen is set between 84 and 104 feet bls in RW-3 and between 110 and 130 feet bls in RW-4. Although the groundwater flow presented on Figure 9 does not indicate groundwater from proposed locations for RI-TMW-01, RI-TMW-02 and RI-TMW-03 would be extracted by RW-1 or RW-2, it should be noted that the recovery well screen is set between 108

and 128 feet bls in RW-1 and 84 and 104 feet bls in RW-2. The deepest recovery well screen is set at 110 to 130 feet bls (RW-04).

- Based on the groundwater contours presented on Figure 9, the approximate maximum depth of the groundwater containing 5 µg/L of total VOCs (includes only "Project VOCs", as defined by ARCADIS) is 140 feet bls.
- Based on Figure 9, total VOC concentrations are "representative of the entire well screen interval." Accordingly, 0.4 µg/L of non-Project VOCs, as defined by ARCADIS and including Freon-22™, was detected in a groundwater sample collected from 133 to 143 feet bls in monitoring well, BCPMW-6.2.

Based on the above, a licensed New York State monitoring well driller will utilize a high-capacity direct push drilling rig (i.e., Geoprobe® 78 series, Geoprobe® 80 series, or similar machine capable of reaching the maximum desired sampling depths) to advance temporary monitoring wells, RI-TMW-01, RI-TMW-02 , RI-TMW-03 and RI-TMW-04 to the following proposed final depths:

- RI-TMW-01 will be completed at a final depth of 100 feet bgs (or maximum achievable final depth).
- RI-TMW-02 will be completed at a final depth of 145 feet bgs (or maximum achievable final depth).
- RI-TMW-03 will be completed at a final depth of 145 feet bgs (or maximum achievable final depth).
- RI-TMW-04 will be completed at a final depth of 145 feet bgs (or maximum achievable final depth).

The direct push drilling rig will consist of a dedicated polyvinyl chloride (PVC) screen (Geoprobe® Screen Point 16 Groundwater Sampler or equivalent) that is driven within a sealed, steel sheath and then deployed at the desired sampling depths for the collection of groundwater samples. In this manner, the groundwater at each temporary monitoring well will be screened at varying depths from the groundwater table (approximately 55 feet bgs) to the proposed final depths in 10-foot intervals and sampled as follows:

- RI-TMW-01: 55, 65, 75, 85, 95, and 100 feet bgs (or maximum achievable final depth).
- RI-TMW-02: 55, 65, 75, 85, 95, 105, 115, 125, 135, and 145 feet bgs (or maximum achievable final depth).
- RI-TMW-03: 55, 65, 75, 85, 95, 105, 115, 125, 135, and 145 feet bgs (or maximum achievable final depth).
- RI-TMW-04: 55, 65, 75, 85, 95, 105, 115, 125, 135, and 145 feet bgs (or maximum achievable final depth).

The proposed temporary monitoring well locations are provided in Figure 3. It should be noted that the final temporary monitoring well installation locations, sampling intervals within each temporary monitoring well and maximum achievable final depths may vary slightly due to field conditions.

One groundwater sample from each sampling interval within each temporary monitoring well will be collected using a dedicated bailer (or equivalent). Groundwater samples will be collected by field personnel wearing one-time use nitrile gloves and transferred into laboratory-supplied containers. Based on the above and depending on field conditions, approximately 36 groundwater samples will be submitted under chain of custody protocol to an NYSDOH Environmental Laboratory Approval Program (ELAP)-approved and ASP-certified laboratory for TCL VOCs, Freon-12™, Freon-22™, plus 20 TICs (as required by the NYSDEC in the April 2013 NYSDEC Comment Letter) via EPA Method 8260.

A trip blank sample will accompany field groundwater samples at a rate of one per shipment / sample delivery group (SDG). The trip blank will be analyzed for VOCs. Because dedicated disposable sampling equipment will be used for the groundwater screening program, equipment blank samples will not be collected. Laboratory analytical data will be provided as raw analytical data. The analytical data will be interpreted (groundwater screening results compared with the NYSDEC TOGS Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations dated June 1998 [AWQS]) and the sceen depth for the permanent monitoring wells will be selected.

Non-dedicated equipment, tools, measuring / monitoring devices, etc. coming into contact with the subsurface soil and/or groundwater will be decontaminated between uses at each borehole by steam cleaning or with deionized water and non-toxic laboratory grade detergent (e.g. Alconox). Investigation derived waste (IDW) will be containerized in labeled New York State Department of Transportation (DOT)-approved 55-gallon drums and/or roll-off bins, pending characterization, as necessary. After characterization, the IDW will be removed for off-site disposal at an approved waste disposal facility (to be coordinated by the subcontractor).

Monitoring Well Installation

Three groundwater monitoring wells will be installed in the vicinity of the corresponding temporary monitoring well and as follows:

- RI-MW-01 (vicinity of RI-TMW-01, north and up-gradient of the Site);
- RI-MW-02 (vicinity of RI-TMW-02, southeast and down-gradient of the Site); and
- RI-MW-03 (vicinity of RI-TMW-03, southwest and cross-gradient of the Site).

A fourth monitoring well RI-MW-04 may be installed in the vicinity of RI-TMW-04 based on the outcome of the sampling results of the Freon-22™ concentrations. The decision as to whether a permanent well will be installed at RI-MW-04 will be based upon the presence or

absence of significant Freon impacts in the screening samples as well as consultation with NYSDEC. A licensed New York State monitoring well driller will utilize a hollow stem auger (HSA) drilling rig install the 2-inch diameter, Schedule 40 PVC monitoring wells (RI-MW-01, RI-MW-02 and RI-MW-03) to two feet below where the highest Freon-22™ concentrations were detected in the groundwater screening samples collected from the corresponding temporary monitoring wells. In the absence of Freon-22 detections at a concentration greater than the NYSDEC TOGS AWQS (5 µg/L), the 10-foot screen will be set at the soil and groundwater interface (approximately 55 feet bgs [5 feet above and 5 feet below the groundwater table]). Newly installed monitoring wells RI-MW-01, RI-MW-02 and RI-MW-03 will include a 5-foot section of 0.010 inch (#10) slot-size PVC well screen that will be set across the interval where the highest Freon-22™ concentrations were detected in the groundwater screening samples collected from the temporary monitoring well at that location. Each newly installed monitoring well will consist of a PVC flush-joint riser. The annular space in each monitoring well will be backfilled with a sand filter pack extending from six inches below the base of the borehole to two feet above the screened interval. A 3-foot thick bentonite pellet seal (continuously hydrated for 60 minutes prior to installation) will be placed above the sand filter pack. The depth to the bottom and top of each seal will be measured in the borehole to the nearest 0.1 foot using a weighted tape. The remaining annular space will be grouted with a bentonite / cement slurry using the tremie method. A cement/bentonite surface seal will be constructed by filling the annular space of the borehole and will extend from approximately three feet below-grade to grade where a flush mounted well manhole will be installed. A water tight locking cap will be attached to the top of the PVC casing. A 6-inch diameter protective steel casing in a cement collar will be installed over each well. A flush to grade steel cover assembly will be set around the well casing. This steel cover will be set into a sloped concrete pad, after the grout has been allowed to set.

During installation, the soil cuttings will be screened for total organic vapors with a hand-held photoionization detector (PID). All drilling equipment will be steam-cleaned prior to work and in between monitoring well installation locations. Decontamination water and soil cuttings will be containerized in labeled DOT-approved 55-gallon drums or roll-off bins, pending analytical characterization, as necessary. After characterization, the waste will be disposed of off-site at an approved waste disposal facility (to be coordinated by the subcontractor).

Groundwater Sampling

Monitoring wells will be sampled as follows:

- One sample from each of the following newly installed monitoring wells:
    - RI-MW-01;
    - RI-MW-02;
    - RI-MW-03;
    - RI-MW-04 (if installed).

- One sample from each of the following existing monitoring wells (the monitoring well screen depth interval is shown in parenthesis):
    - MW-200-1 (85 to 95 feet bls);
    - MW-201-1 (70 to 80 feet bls);
    - MW-202-1 (125 to 135 feet bls); and
    - MW-203-1 (103 to 113 feet bls).

Assuming the monitoring wells are suitable for sampling, a total of 7 (or 8, if RI-MW-04 is installed) groundwater samples will be analyzed to evaluate the groundwater quality at the Site. It is assumed that permission will be granted for access to the off-site wells. The proposed sampling locations are provided in Figure 3. It should be noted that the final monitoring well installation locations may vary slightly due to field conditions.

Each monitoring well that is to be sampled will be developed by the subcontractor to remove fine-grained sediment from the filter pack and surrounding formation to increase the overall hydraulic efficiency. Purge water generated during monitoring well development will be containerized in labeled DOT-approved 55-gallon drums for off-site disposal (to be coordinated by the subcontractor). After monitoring well development, the elevation of the top of casing (TOC) and top of manhole cover (ground surface) of each monitoring well will be surveyed to the nearest reference datum to allow for the preparation of an accurate potentiometric surface map of the upper glacial aquifer.

Prior to sample collection, a minimum of three well screen volumes will be purged from the monitoring well with a Grundfos Pump (or equivalent) and dedicated tubing and transferred into labeled DOT-approved 55-gallon drums for off-site disposal (to be coordinated by the subcontractor). Chemical and physical groundwater parameters such as total organic vapors, temperature, pH, electroconductivity, turbidity, oxidation-reduction potential, and dissolved oxygen concentration will be recorded during purging of the monitoring wells. Groundwater samples will be collected after a minimum of three well screen volumes have been purged and the chemical and physical parameters have stabilized (at the discretion of the field sampler). One groundwater sample from each monitoring well and QA/QC samples (blind duplicate [BD], matrix spike and matrix spike duplicate [MS/MSD] samples; each collected at a frequency of 1 sample per 20 samples, but not less than 1 per day) will be collected using a dedicated bailer (or equivalent). Synoptic depth to groundwater measurements will be obtained prior to and after well development and prior to and after groundwater sample collection. The monitoring well construction, development, purging, and sampling details will be documented.

Groundwater samples will be collected by field personnel wearing one-time use nitrile gloves and transferred into laboratory-supplied containers. The groundwater samples and QA/QC samples will be submitted under chain of custody protocol to an NYSDOH ELAP-approved and ASP-certified laboratory for TCL VOCs, Freon-12™, Freon-22™, plus 20 TICs (as required by the NYSDEC in the April 2013 NYSDEC Comment Letter) via EPA Method 8260. Although

this RIWP has been prepared to include groundwater sampling for VOCs, Freon-12™, Freon-22™, plus VOC TICs analysis, it is understood that the contaminant of concern associated with the Site is limited to Freon™.

A trip blank sample will accompany field groundwater samples at a rate of one per shipment / SDG. The trip blank will be analyzed for VOCs. Because dedicated disposable sampling equipment will be used for the sampling program, equipment blank samples will not be collected. Laboratory analytical data will be provided as NYSDEC ASP Category B data packages. Upon completing the data evaluation, a DUSR will be prepared by an independent data validator.

Non-dedicated equipment, tools, measuring / monitoring devices, etc. coming into contact with the subsurface soil and/or groundwater will be decontaminated between uses at each borehole by steam cleaning or with deionized water and non-toxic laboratory grade detergent (e.g. Alconox). IDW will be containerized in labeled DOT-approved 55-gallon drums and/or roll-off bins, pending characterization, as necessary. After characterization, the IDW will be removed for off-site disposal at an approved waste disposal facility (to be coordinated by the subcontractor).

Soil Vapor

A soil vapor investigation will be conducted in accordance with the NYSDOH SVI Guidance and will be based on available soil vapor data obtained for the Site, Park and general area (as summarized in Section 3.0 of this RIWP). The soil vapor investigation will consist of collecting soil vapor samples from 30 locations (set on a grid of approximately 200-feet on center) that will contain two nested temporary soil vapor sampling points. The proposed sampling locations are provided in Figure 4. It should be noted that the final soil vapor sampling locations may vary slightly due to field conditions.

Each nest of soil vapor sampling points will consist of two temporary soil vapor probes, one facilitating the collection of a soil vapor sample from approximately 10 feet bgs and one facilitating the collection of a soil vapor sample from a minimum of 2 feet above the expected depth to groundwater, at approximately 53 feet bgs. The temporary soil vapor probe implants will be installed by boring through the surface cover (asphalt or concrete) with a direct-push drill rig (e.g., Geoprobe®) to a depth of 10 feet bgs for collection of the soil gas samples and with a direct-push drill rig (e.g., Geoprobe®) or hollow stem auger drill rig to a depth of 53 feet bgs for collection of the deep soil gas samples. A soil vapor probe attached to inert tubing (e.g., polyethylene) will be inserted at each soil vapor sample location and the annulus around the probe and tubing will be filled to two feet above the sampling point with inert backfill material (e.g., glass beads, washed #1 crushed stone). The soil vapor probe will be sealed above the sampling zone with a 3-foot thick (minimum thickness) bentonite slurry. The remainder of the borehole will be backfilled with non-impacted backfill material (e.g., sand, soil cuttings).

After installation of the probe and prior to sample collection, up to three volumes (volume of the sample probe and tube) will be purged. A helium tracer gas will be utilized as a QA/QC measure to verify the integrity of the surface seal and to ensure that the soil vapor sampling

point is properly sealed and ambient air does not infiltrate the sample. Prior to sample collection, the soil vapor will be screened for total organic vapors with a hand-held PID.

The soil vapor samples will be collected into laboratory-supplied, certified-clean Summa® canisters that are calibrated for a sampling rate of one hour per sample and with a flow rate not to exceed 0.2 liters per minute. For each day that soil vapor sampling is conducted, one outdoor air sample will be collected into laboratory-supplied, certified-clean Summa® canisters that are calibrated for a sampling rate of one hour per sample and with a flow rate not to exceed 0.2 liters per minute. The soil vapor and outdoor air samples will be submitted under chain of custody protocol to an NYSDOH ELAP-approved and ASP-certified laboratory. Each sample will be analyzed for TCL VOCs, Freon-12™, Freon-22™, plus 20 TICs (as required by the NYSDEC in the April 2013 NYSDEC Comment Letter) via EPA Method TO-15. Although this RIWP has been prepared to include soil vapor sampling for VOCs, Freon-12™, Freon-22™, plus VOC TICs analysis, it is understood that the contaminant of concern associated with the Site is limited to Freon™. Laboratory analytical data will be provided as NYSDEC ASP Category B data packages.

Following sample collection, the in-hole sampling materials will be removed, the borehole will be backfilled with non-impacted backfill material (e.g., sand, soil cuttings) and the surface will be restored to grade with material matching the existing surface (asphalt or concrete). Excess soil cuttings will be containerized in labeled, DOT-approved 55-gallon drums or roll-off bins, pending analytical characterization, as necessary. After characterization, the waste will be disposed of off-site at an approved waste disposal facility (to be coordinated by the subcontractor).

4.2.2. IDW Disposal

IDW generated during the investigation will include, but not be limited to the following: decontamination rinsate; soil cuttings; monitoring well purge water; and monitoring well development water. IDW will be containerized in labeled DOT-approved 55-gallon drums and/or roll-off bins, pending characterization, as necessary. The 55-gallon drums will be staged on pallets at an appropriate location at the Site until final characterization and disposal. Initial labels will be green, non-hazardous and will state the date of drum closure / storage and name of the generator. Pending characterization analysis, the drums will be re-labeled accordingly. The IDW will be removed for off-site disposal at an approved waste disposal facility (to be coordinated by the subcontractor). Solid waste generated during the investigations will include, but not be limited to disposable personal protective equipment (e.g., nitrile gloves) and disposable rags. All solid waste will be disposed of in a waste receptacle.

4.2.3. QAPP

The Quality Assurance Project Plan (QAPP) has been prepared in accordance with the NYSDEC DER-10 (Section 2.4) and is included herein as Appendix B. The following is a summary of the sampling procedures, data quality / usability and decontamination procedures:

- Non-dedicated drill rig tools, sampling equipment, measuring / monitoring devises, etc. coming into contact with the subsurface soil and/or groundwater will be decontaminated between uses at each borehole with deionized water and non-toxic laboratory grade detergent (e.g. Alconox).
- HSAs will be steam cleaned in a decontamination pad (to be constructed by the subcontractor) and the rinsate will be containerized in DOT-approved 55-gallon drums for off-site disposal (to be coordinated by the subcontractor).
- Samples will be handled by field personnel wearing clean nitrile gloves to eliminate the potential for cross-contamination between samples.
- QA/QC samples will include, but not be limited to BD samples, MS/MSD samples, and TB samples. The BD and MS/MSD samples will be collected at a frequency of 1 sample per 20 samples, but not less than 1 per day. A TB sample will accompany field groundwater samples at a rate of one per SDG.
- Analytical results, including QA/QC sample results, will be subjected to independent data validation. Laboratory data packages will be reviewed for quality control parameters including, but not limited to, custody documentation, holding times, surrogate and matrix spike recoveries, duplicate correlation, calibration standard and blank performance, instrument performance, blank contamination, matrix interferences and method compliance.
- Upon completing the data evaluation, a DUSR will be prepared. Data validation services will be subcontracted to an independent data validator.

4.2.4. HASP

A HASP is included herein as Appendix A. Fieldwork will be conducted in accordance with the HASP and under the oversight of qualified H2M professionals.

4.2.5. CAMP

A copy of the NYSDEC Community Air Monitoring Plan (CAMP) is included herein as Appendix C. The CAMP will be implemented during any drilling, well construction and/or soil vapor probe installation.

4.2.6. RI Report

Following completion of the RI outlined above, an RI report will be prepared consistent with NYSDEC DER-10 requirements. The RI Report will include information collected by the investigation(s) completed as per the NYSDEC-approved RIWP(s), addenda or supplements; data collected during the RI; and the conclusions drawn from that data. The RIR will include, but not be limited to the following:

- Description of the field investigation activities (i.e., sample logs);
- Field observations (including, but not limited to weather during field activities, odors [if any], PID readings) and findings;

- Photograph log;
- Chain(s) of custody;
- Laboratory NYSDOH ELAP certification;
- Raw analytical data report(s);
- NYSDEC ASP Category B analytical data package(s);
- Analytical results presented in summary tables;
- Analytical data interpretation (sampling results compared with the relevant standards and guidelines):
    - Groundwater sample analytical results compared to the NYSDEC TOGS AWQS; and
    - Soil vapor sample analytical results compared to the NYSDOH Air Guideline Values (AGV) established for methylene chloride, PCE and TCE and evaluated utilizing the applicable Matrices 1 or 2 provided in the NYSDOH SVI Guidance.
    - Soil vapor sample analytical results compared to background outdoor air levels.
- Field investigation drawings (e.g., survey map, geophysical survey map, updated base map, sample locations, north orientation, and summary of findings); and
- Recommendations for further action, as appropriate, based on the investigation results.

5.0 RI SCHEDULE AND PROJECT PERSONNEL

5.1. RI SCHEDULE

The proposed RI schedule is provided below.

TASK	PROPOSED START DATE	PROPOSED END DATE	DURATION		
Receipt of final Fact Sheet from the NYSDEC	11/1/2013	11/1/2013	1	Day	(Calendar)
Receive NYSDEC instructions to:					
Notify Brownfield Site Contact List of availability of Draft RI Work Plan for review by providing the Fact Sheet	11/5/2013	11/5/2013	1	Day	(Calendar)
Place Fact Sheet and Draft RI Work Plan in document repository	11/5/2013	11/5/2013	1	Day	(Calendar)
Commence public comment period	11/6/2013	12/5/2013	30	Days	(Calendar)
Provide certification of mailing to the NYSDEC	11/5/2013	11/14/2013	10	Days	(Calendar)
Receive NYSDEC approval of the Draft RI Work Plan	12/20/2013	12/20/2013	1	Day	(Calendar)
Place NYSDEC-approved RI Work Plan (and any modification letters) in document repository	1/27/2014	1/27/2014	1	Day	(Calendar)

TASK	PROPOSED START DATE	PROPOSED END DATE	DURATION		
Remove Draft RI Work Plan from document repository	1/27/2014	1/27/2014	1	Day	(Calendar)
Notify NYSDEC of anticipated start of field work	1/27/2014	1/27/2014	1	Day	(Calendar)
Field Work					
Utility clearance	2/10/2014	2/10/2014	10	Days	(Business)
Geophysical Survey	2/10/2014	2/14/2014	5	Days	(Business)
Site Visit	2/10/2014	2/14/2014	4	Days	(Business)
Groundwater Investigation (includes laboratory analyses time)	2/17/2014	4/9/2014	60	Days	(Business)
Soil Vapor Investigation (includes laboratory analyses time)	2/17/2014	5/23/2014	70	Days	(Business)
Prepare RIR, draft Fact Sheet, Alternatives Analysis Report (as warranted), and Remedial Work Plan (as warranted)	5/23/2014	9/22/2014	4	Months	
Submit RIR, Fact Sheet, Alternatives Analysis Report (as warranted), and Remedial Work Plan (as warranted) to NYSDEC	9/22/2014	9/23/2014	1	Day	(Calendar)
Receipt of final Fact Sheet from the NYSDEC	9/23/2014	11/7/2014	45	Days	(Calendar)
Receive NYSDEC instructions to:					
Commence public comment period	11/7/2014	12/4/2014 to 12/19/2014	30 to 45	Days	(Calendar)
Submit Fact Sheet to the Brownfield Site Contact List	11/7/2014	11/7/2014	1	Day	(Calendar)
Place Fact Sheet, RIR, Alternatives Analysis Report (as warranted), and Remedial Work Plan (as warranted) in document repository	11/7/2014	11/7/2014	1	Day	(Calendar)
Provide certification of mailing to the NYSDEC	11/7/2014	11/17/2014	10	Days	(Calendar)

The NYSDEC will be notified a minimum of 10 days prior to commencing field activities.

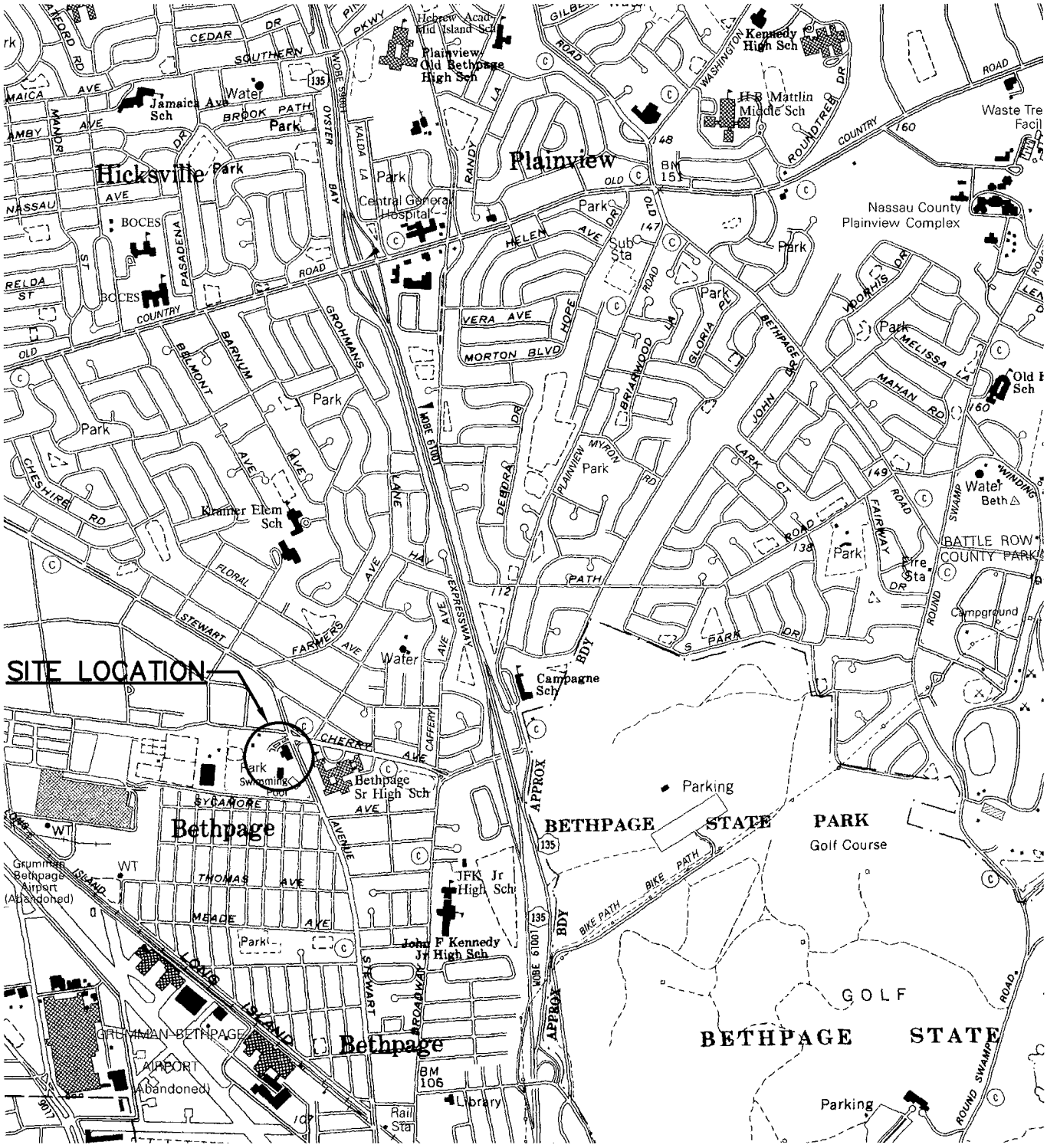
5.2. PROJECT PERSONNEL

A list of the names, contact information and roles of the principal personnel who will participate in the investigation are provided in the HASP included as Appendix A.

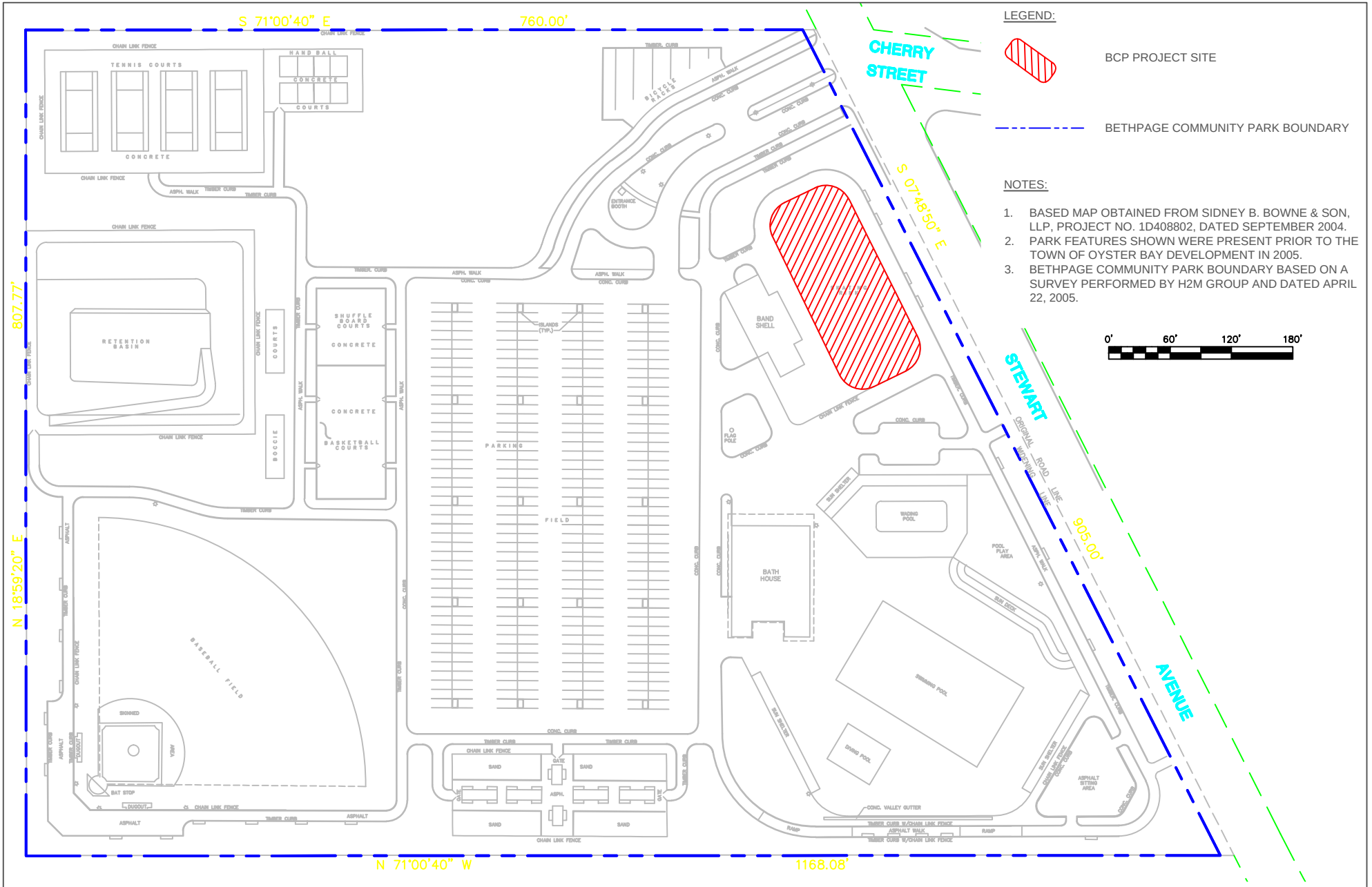
6.0 CITIZEN PARTICIPATION ACTIVITIES

A Citizen Participation Plan (CPP) has been prepared for the project and submitted to NYSDEC for approval. A copy of the CPP is included herein as Appendix D.

FIGURES



PROJECT: BROWNFIELD CLEANUP PROGRAM BETHPAGE COMMUNITY PARK ICE RINK AREA REMEDIAL INVESTIGATION WORK PLAN TOWN OF OYSTER BAY BETHPAGE, NEW YORK NYSDEC SITE NO.: C130212	DRAWING: FIGURE 1: SITE LOCATION MAP	H2M PROJECT NO.: TOBY 1203	H2M architects + engineers Melville, NY · Albany, NY New City, NY · Parsippany, NJ
	SCALE: AS SHOWN	DATE: OCTOBER 2012	



PROJECT:
BROWNFIELD CLEANUP PROGRAM
BETHPAGE COMMUNITY PARK ICE RINK AREA
REMEDIAL INVESTIGATION WORK PLAN
TOWN OF OYSTER BAY
BETHPAGE, NEW YORK
NYSDEC SITE NO.: C130212

DRAWING:
FIGURE 2: PARK AND SITE VICINITY

SCALE:
AS SHOWN

H2M PROJECT NO.:
TOBY1203

DATE:
JUNE 2013

H2M architects + engineers
Melville, NY Albany, NY
New City, NY Parsippany, NJ

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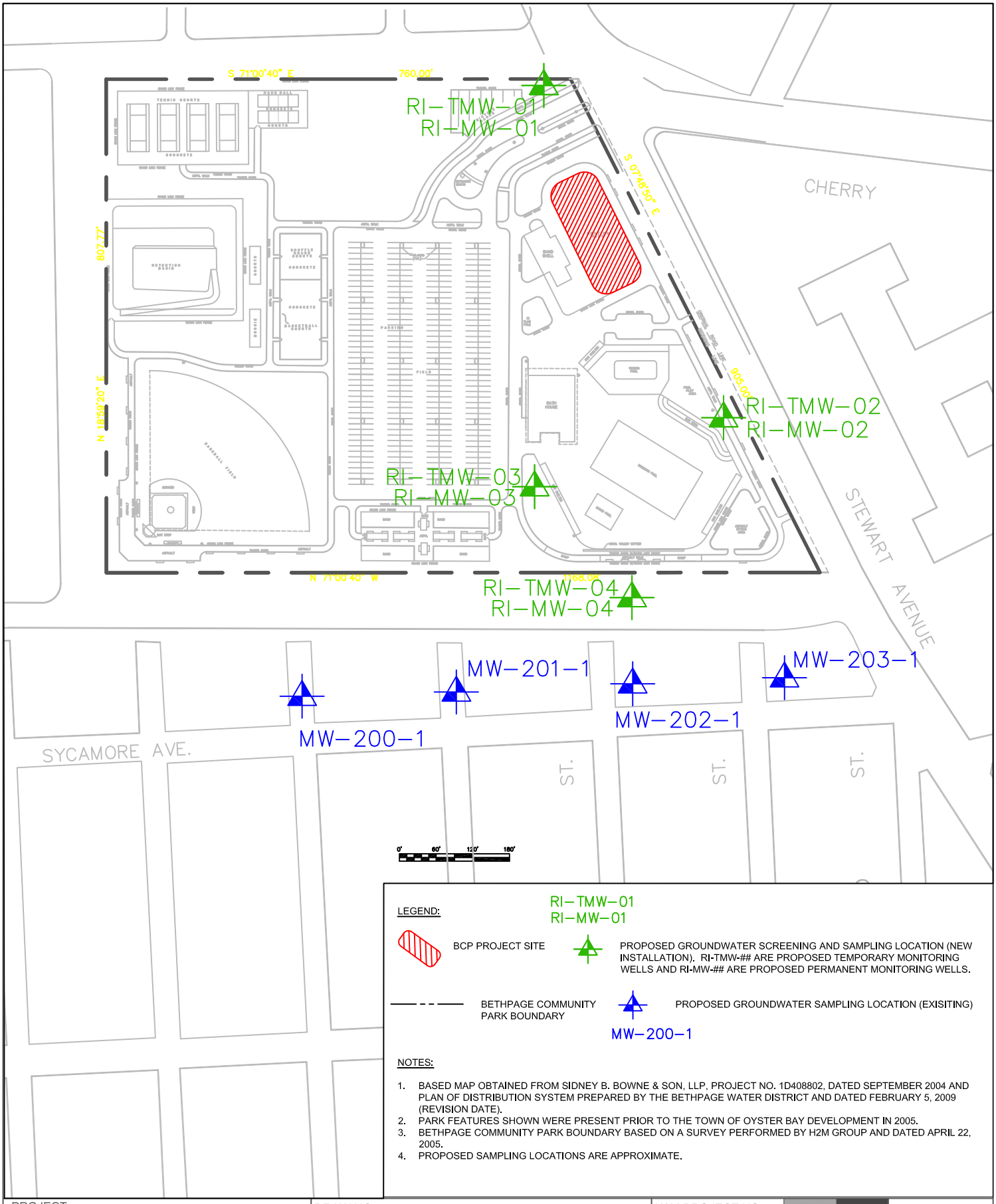


NOTES:

1. BASED MAP OBTAINED FROM SIDNEY B. BOWNE & SON, LLP, PROJECT NO. 1D408802, DATED SEPTEMBER 2004 AND PLAN OF DISTRIBUTION SYSTEM PREPARED BY THE BETHPAGE WATER DISTRICT AND DATED FEBRUARY 5, 2009 (REVISION DATE).
2. PARK FEATURES SHOWN WERE PRESENT PRIOR TO THE TOWN OF OYSTER BAY DEVELOPMENT IN 2005.
3. BETHPAGE COMMUNITY PARK BOUNDARY BASED ON A SURVEY PERFORMED BY H2M GROUP AND DATED APRIL 22, 2005.
4. PROPOSED SAMPLING LOCATIONS ARE APPROXIMATE.

PROJECT:
BROWNFIELD CLEANUP PROGRAM
BETHPAGE COMMUNITY PARK ICE RINK AREA
REMEDIAL INVESTIGATION WORK PLAN
TOWN OF OYSTER BAY
BETHPAGE, NEW YORK
NYSDEC SITE NO.: C130212

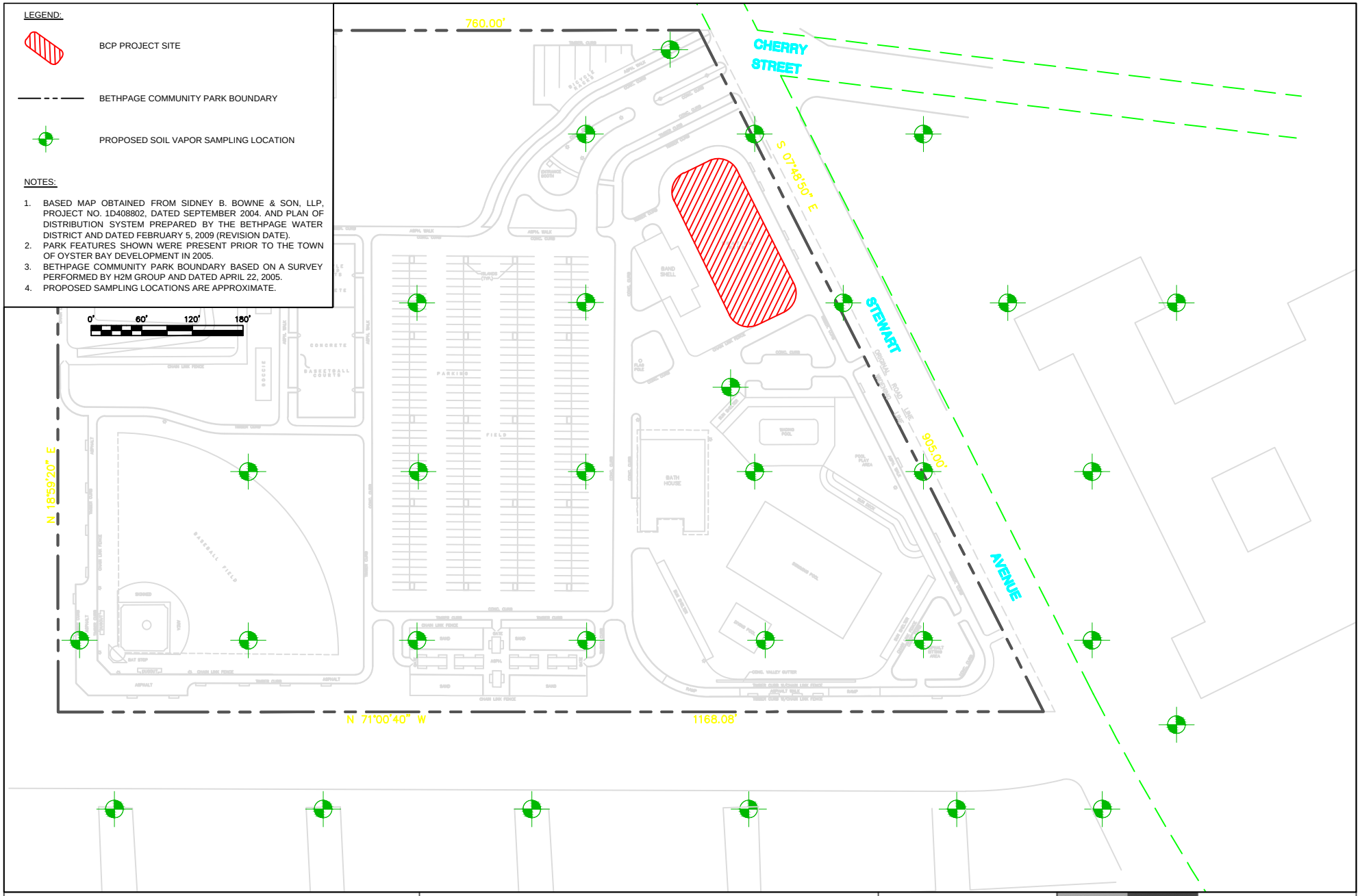
DRAWING:
FIGURE 3: PROPOSED GROUNDWATER SCREENING AND SAMPLING LOCATIONS

SCALE:
AS SHOWN

H2M PROJECT NO.:
TOBY1203

DATE:
DECEMBER 2013

architects + engineers
Melville, NY
New City, NY
Albany, NY
Parsippany, NJ



PROJECT:

BROWNFIELD CLEANUP PROGRAM

BETHPAGE COMMUNITY PARK ICE RINK AREA

REMEDIAL INVESTIGATION WORK PLAN

TOWN OF OYSTER BAY
BETHPAGE, NEW YORK
NYSDEC SITE NO.: C130212

DRAWING:

FIGURE 4: PROPOSED SOIL VAPOR SAMPLING LOCATIONS

SCALE:

AS SHOWN

H2M PROJECT NO.:

TOBY1203

DATE:

JUNE 2013

H2M architects + engineers

Melville, NY
New City, NY
Albany, NY
Parsippany, NJ

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APPENDIX A

HEALTH AND SAFETY PLAN

New York State Department of Environmental Conservation Brownfield Cleanup Program

REMEDIAL INVESTIGATION WORK PLAN
HEALTH AND SAFETY PLAN

Bethpage Community Park Ice Rink Area

Stewart Avenue
Bethpage
Nassau, New York

NYSDEC Site No. C130212

January 2014

Prepared for:

Town of Oyster Bay
Department of Public Works
150 Miller Place
Syosset, New York 11791

Prepared by:

H2M Architects + Engineers
538 Broad Hollow Road
4th Floor East
Melville, New York 11747

H2M architects + engineers

REMEDIAL INVESTIGATION HEALTH AND SAFETY PLAN
BETHPAGE COMMUNITY PARK ICE RINK AREA
TOWN OF OYSTER BAY
BETHPAGE, NASSAU COUNTY, NEW YORK
NYSDEC SITE NO. C130212

JANUARY 2014

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APPENDICES

REMEDIAL INVESTIGATION QUALITY ASSURANCE PROJECT PLAN
BETHPAGE COMMUNITY PARK ICE RINK AREA
TOWN OF OYSTER BAY
BETHPAGE, NASSAU COUNTY, NEW YORK
NYSDEC SITE NO. C130212

JANUARY 2014

1.0 PURPOSE

The purpose of this Health and Safety Plan (HASP) is to establish protocols for protecting Holzmacher, McLendon & Murrell, P.C. (H2M) and other on-site and off-site personnel from incidents that may arise while performing field activities during the Remedial Investigation (RI) to be conducted at the Bethpage Community Park Ice Rink Area in Bethpage, New York. This HASP has been prepared in accordance with the United States Environmental Protection Agency (US EPA) document, "Emergency and Remedial Response Division's Standard Operating Safety Guides", November 1984. The plan establishes personnel protection standards, mandatory operations procedures, and provides contingencies for situations that may arise while field work is being conducted at the site. All H2M field personnel will be required to abide by the procedures set forth in this HASP.

Personnel performing the environmental field work involving chemical substances may encounter conditions that are unsafe or potentially unsafe. In addition to the potential risks associated with the physical, chemical, biological and toxicological properties of the material(s) which may be encountered, other types of hazards (i.e., electricity, water, temperature, heavy equipment, falling objects, loss of balance, tripping, etc.) can have an adverse effect on the health and safety of personnel. It is important that personnel protective equipment (PPE) and safety requirements be appropriate to protect against potential and/or known hazards. PPE will be selected based on the type(s), concentration(s), and routes of

personnel exposure from hazardous substances at a site. In situations where the type of materials and possibilities of contact are unknown or the potential hazards are not clearly identifiable, a more subjective (but conservative) determination will be made of the PPE required for initial safety.

Adherence to this HASP will minimize the possibility that personnel at the site or the surrounding community will be injured or exposed to site-related contaminants during field activities.

2.0 SITE CONDITIONS

The Bethpage Community Park Ice Rink Area is located in the Hamlet of Bethpage, Town of Oyster Bay (TOB), Nassau County, New York (Site). The approximately 0.4-acre Site is situated within the northeast portion of the approximately 18-acre Bethpage Community Park (Park) and encompasses the footprint of two former ice skating rinks, now demolished and replaced by the current indoor ice skating center. The park includes a pool, skating rink, baseball field, tennis courts, children's play areas and parking. The Park is currently owned and operated by the TOB and contains a swimming pool, basketball court, baseball field, tennis courts, playgrounds, picnic areas, a parking lot, and an indoor ice skating center.

Prior to being donated to the Town of Oyster Bay, the subject site was owned by Grumman Aircraft Engineering Corporation, a predecessor to Northrop Grumman Corporation. According to New York State Department of Environmental Conservation (NYSDEC) and reports prepared on behalf of Northrop Grumman Corporation [1], Grumman utilized the property for waste disposal purposes including industrial wastewater treatment sludge, spent paint operations rags

[1] Dvirka and Bartilucci, December 2003, Town of Oyster Bay Bethpage Community Park Investigation Sampling Program – Field Report.

and possibly used oil. In addition, the site was utilized by Grumman for fire training, which included ignition of waste oil and jet fuel.

Ownership of the site was transferred to the Town of Oyster Bay in 1962, after which the Town constructed the present-day Park. The site was activity utilized by the community until 2002, when the Park was partially closed due to the identification of PCB and metals impacts above state guideline concentrations in surface soils. A portion of the Park was renovated following a soil remediation IRM. Portions of the site (including the ball field) remain closed to this day, pending remediation.

2.1 Proposed Field Activities

The field work will consist primarily of the following tasks:

- Site visit to identify any changes to the Site or vicinity; and
- Field investigation to determine the areal and vertical extent of volatile organic compound (VOC) impacts:
    - Utility clearance and geophysical survey
    - Groundwater screening
    - Monitoring well installation
    - Groundwater sampling for laboratory analysis
    - Soil vapor probe installation
    - Soil vapor probe sampling for laboratory analysis.

3.0 PERSONAL SAFETY

Personnel involved in field operations must often make complex decisions regarding safety. To make these decisions correctly requires more than elementary knowledge. For example, selecting the most effective PPE requires not only expertise in the technical areas of respirators, protective clothing, air

monitoring, physical stress, etc., but also experience and professional judgment. Only competent, qualified personnel having the technical judgment to evaluate a particular situation and determine the appropriate safety requirements will perform field investigations at the site. These individuals, through a combination of professional education, on-the-job experience, specialized training, and continual study, have the expertise to make sound decisions. In addition, each individual must sign an appendix to the Health and Safety Plan, indicating they have read and understood its contents (included in HASP Appendix A).

3.1 Training and Medical Surveillance

All personnel involved in field work will be trained to carry out their designated field operations. Training will be provided in the use of all equipment, including respiratory protection apparatus and protective clothing; safety practices and procedures; general safety requirements; and hazard recognition and evaluation. Each individual involved with the field work must provide documentation of training and medical surveillance, as per 29 Code of Federal Regulations (CFR) 1910.120. A copy of the documentation must be maintained at the job site for the duration of the project.

3.2 Health and Safety Manager

The Health and Safety Manager shall be responsible for overall implementation and coordination of the Health and Safety Program for field personnel at the site. Responsibilities include providing adequate staffing, materials, equipment, and time needed to safely accomplish the tasks under the site investigation. The Health and Safety Manager is also responsible for taking appropriate corrective actions when unsafe acts or practices arise. The Health and Safety Manager for this investigation project is Philip J. Schade, P.E. of H2M.

3.3 Site Health and Safety Officer

A designated individual will perform the function of the project Site Health and Safety Officer (SHSO). Smita Day, P.E. will serve as the Site Health and Safety Officer during the site work. At all times the Site Health and Safety Officer will report directly to the Health and Safety Manager. As a minimum, the Site Health and Safety Officer will be responsible for the following:

1. Conducting and documenting daily site safety briefings for field personnel.
2. Assuring that all personnel protective equipment is available and properly utilized by all field personnel at the site.
3. Assuring that all personnel are familiar with standard operating safety procedures and additional instructions contained in the Health and Safety Plan.
4. Assuring that all personnel are aware of the hazards associated with the field operations.
5. Inspecting and documenting the site for hazards before field operations.
6. Conducting daily work area inspections to determine the effectiveness of the site HASP and identify and correct unsafe conditions in the responsible work area. Daily inspections and corrective actions taken shall be documented on daily inspection forms.
7. Determining personal protection levels including clothing and equipment for personnel and periodic inspection of protective clothing and equipment.
8. If necessary, monitoring of site conditions prior to initiation of field activities, and at various intervals during on-going operations as deemed necessary for any changes in site hazard conditions. (Monitoring parameters include, but are not limited to, VOC levels in the atmosphere, chemical hazard information, and weather conditions.)
9. Executing decontamination procedures, if necessary.
10. Monitoring the work parties for signs of stress such as cold exposure, heat stress, or fatigue.
11. Prepare reports pertaining to incidents resulting in physical injuries or exposure to hazardous materials.

4.0 LEVELS OF PROTECTION

Anyone entering the investigation site must be protected against potential hazards. The purpose of the personal protective clothing and equipment is to minimize exposure to hazards while working on site. Careful selection and use of adequate PPE should protect the respiratory system, skin, eyes, face, hands, feet, head, body and hearing of all personnel.

The appropriate level of protection is determined prior to the initial entry on site based on available information and preliminary monitoring of the site. Subsequent information may warrant changes in the original level selected. Appropriate equipment to protect personnel against exposure to known or anticipated chemical hazards has been divided into four categories according to the degree of protection afforded.

4.1 Level A Protection

The highest degree of protection is used in a Level A situation. It should be worn when the highest available level of respiratory, skin and eye protection is needed. This level of protection is placed in effect when there is no historic information about the site and it is assumed that the worst possible conditions exist.

4.1.1 Personal Protective Equipment

a. Pressure demand, self-contained breathing apparatus approved by the National Institute of Occupational Safety and Health (NIOSH).

b. Fully encapsulating chemical-resistant suit.

c. Coveralls*.

d. Long cotton underwear*.

e. Gloves (inner and outer), chemical-resistant.

f. Boots, chemical-resistant, steel toe and shank. (Depending on suit construction, worn over or under suit boot.)

g. Hard hat* (under suit).

h. Disposable protective suit, gloves and boots* (worn over fully-encapsulating suit).

i. Two-way radio communications (intrinsically safe).

*Optional

4.1.2 Criteria for Selection

Meeting any of the criteria listed below warrants use of Level A protection:

a. The chemical substance(s) has been identified and requires the highest level of protection for skin, eyes and the respiratory system based on:

   (1) Measured (or potential for) high concentrations of atmospheric vapors, gases, or particulates; or

   (2) Site operations and work functions involving high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates.

b. Extremely hazardous substances are known or suspected to be present and skin contact is possible.

c. The potential exists for contact with substances that destroy skin.

d. Operations must be conducted in confined, poorly ventilated areas until the absence of hazards requiring Level A protection is demonstrated.

e. An oxygen deficient atmosphere where the oxygen level is less than 19.5 percent (%) by volume as measured with an oxygen meter. This condition, existing alone, could result in a downgrade to US EPA Level B PPE.

f. Total atmospheric readings on photoionization detector indicate readings above 500 parts per million (ppm) of calibration gas equivalents (cge) of unidentified substances.

4.1.3 Limiting Criteria

a. Fully encapsulating suit material must be compatible with the substances involved.

4.1.4 Minimum Decontamination Procedure

Station 1: Segregated equipment drop.
Station 2: Outer garment, boots and gloves wash and rinse.
Station 3: Outer boot and glove removal.
Station 4: Tank change.
Station 5: Boots, gloves and outer garment removal.
Station 6: Self-Contained Breathing Apparatus (SCBA) removal.
Station 7: Field wash.

4.2 Level B Protection

Level B protection will be used by all personnel entering confined spaces and/or if the conditions outlined in Section 4.2.2 are encountered.

4.2.1 Personal Protective Equipment

a. Pressure-demand, self-contained breathing apparatus or cascade supplied air system (NIOSH approved).

b. Chemical-resistant clothing (coveralls and long-sleeved jacket; coveralls, hooded, one or two-piece chemical-splash suit; disposable chemical-resistant coveralls).

c. Coveralls.*

d. Gloves (outer), chemical-resistant.

e. Gloves (inner), chemical-resistant.

f. Boots, chemical-resistant, steel toe and shank.

g. Boots (outer), chemical resistant (disposable*).

h. Hard hat (face shield*).

i. Two-way radio communications (intrinsically safe).

*Optional

4.2.2 Criteria for Selection

Meeting any one of these criteria warrants use of Level B protection:

a. The type(s) and atmospheric concentration(s) of toxic substances have been identified and require the highest level of respiratory

protection, but a lower level of skin and eye protection than is required with Level A. These would be atmospheres:

(1) With concentrations immediately dangerous to life and health (IDLH); or

(2) Exceeding limits of protection afforded by a full-face, air-purifying mask; or

(3) Containing substances for which air-purifying canisters do not exist or have low removal efficiency; and/or

(4) Containing substances requiring air-supplied equipment, but substances and/or concentrations do not represent a serious skin hazard.

b. The atmosphere contains less than 19.5 % oxygen.

c. Site operations make it highly unlikely that the small, unprotected area of the head or neck will be contacted by splashes of extremely hazardous substances.

d. Total atmospheric concentrations in the breathing zone of unidentified vapors or gases range from 50 ppm to 500 ppm (calibration gas equivalence units) on monitoring instruments, and vapors are not suspected of containing high levels of chemicals toxic to skin.

4.2.3 Limiting Criteria

a. Use only when the vapor or gases present are not suspected of containing high concentrations of chemicals that are harmful to skin or capable of being absorbed through skin contact.

b. Use only when it is highly unlikely that the work being done will generate high concentrations of vapors, gases, or particulates or splashes of material that will affect exposed skin.

4.2.4 Minimum Decontamination Procedures

Station 1: Equipment drop.
Station 2: Outer garment, boots and gloves wash and rinse.
Station 3: Outer boot and glove removal.
Station 4: Tank change.
Station 5: Boot, gloves and outer glove removal.
Station 6: SCBA removal.
Station 7: Field wash.

4.3 Level C Protection

Level C protection will be used by all personnel if the conditions outline in Section 4.3.2 are encountered.

4.3.1 Personal Protective Equipment

a. Full-face, air purifying, canister-equipped respirator (NIOSH approved).

b. Chemical-resistant clothing (coveralls; hooded, two-piece chemical splash suits; chemical-resistant hood and apron; disposable chemical-resistant coveralls).

c. Coveralls.*

d. Gloves (outer), chemical-resistant.

e. Gloves (inner), chemical resistant

f. Boots, steel toe and shank.

g. Boots cover (outer), chemical-resistant (disposable*).

h. Hard hat (face shield*).

i. Escape mask*.

j. Two-way radio communications (intrinsically safe).

*Optional

4.3.2 Criteria for Selection

Meeting all of these criteria permits use of Level C Protection:

a. Measured air concentrations of identified substances will be reduced by the respirator to, at or below the substance's exposure limit, and the concentration is within the service limit of the canister.

b. Atmospheric contaminant concentrations do not exceed IDLH levels.

c. Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect the small area of skin left unprotected by chemical-resistant clothing.

d. Job functions have been determined not to require self-contained breathing apparatus.

e. Total vapor readings register between 5 ppm cge and 50 ppm cge above background on instruments.

f. Air will be monitored periodically.

g. Cartridges are available and are approved by NIOSH and Mine Safety and Health Administration (MSHA) for the specific chemical(s) encountered.

4.3.3 Limiting Criteria

a. Atmospheric concentration of chemicals must not exceed IDLH levels.

b. The atmosphere must contain at least 19.5 % oxygen.

c. Must have sufficient information available regarding specific compounds, and their concentrations, likely to be encountered.

4.3.4 Minimum Decontamination Procedures

Station 1: Equipment drop.
Station 2: Outer boot and glove removal.
Station 3: Canister or mask change.
Station 4: Boots, gloves and outer garment removal.
Station 5: Face piece removal.
Station 6: Field wash.

4.4 Level D Protection

Level D protection has been selected for personnel for this project except during confined space entries. Should conditions change, re-evaluation of personnel protection will be conducted.

4.4.1 Personal Protective Equipment

a. General work clothes or coveralls.

b. Gloves*.

c. Boots/shoes, leather or chemical-resistant, steel toe and shank.

d. Boots (outer), chemical/resistant (disposable)*.

e. Safety glasses or chemical splash goggles*.

f. Hard hat (face shield*).

g. Escape mask*.

*Optional

4.4.2 Criteria for Selection

Meeting any of these criteria allows use of Level D protection:

a. No hazardous air pollutants have been measured.

b. Work functions preclude splashes, immersion, or potential for unexpected inhalation of any chemicals.

c. Extensive information on suspected hazards/risks are known.

4.4.3 Limiting Criteria

a. The atmosphere must contain at least 20.9 % oxygen.

4.4.4 Minimum Decontamination Procedure

Station 1: Equipment drop.

Station 2: Hand and face wash.

4.5 Duration of Work Period

The anticipated duration of the work period will be established prior to daily activities. The work will only be performed during daylight hours. Other factors that affect the length of time personnel may work include:

a. Air supply consumption (SCBA assisted work);

b. Suit/ensemble, air purifying chemical cartridge, permeation and penetration by chemical contaminants; and

c. Ambient temperature and weather conditions.

5.0 DETERMINATION OF THE SITE-SPECIAL LEVEL OF HAZARD

Categories of personnel protection required depend on the degree of hazard and probability of exposure by a route of entry into the body. For this site, the most probable potential route of entry is via inhalation of vapors and/or dust, and potentially by dermal adsorption of contaminates released from field activities. The site-specific chemical contaminants of greatest concern are VOCs.

It has been determined that the appropriate level of protection for the site is Level D, the minimal level of protection. Synthetic gloves with low permeability to liquids and Tyvek suits will be used by all personnel in contact with on-site soil or water to prevent dermal contact.

The determination of Level D protection is based on the fact that field work will be performed in open, well-ventilated areas and that the potential for accidents and injuries due to obstructions caused by and/or magnified by the use of level A, B, or C protection (i.e., slip/trip hazards) is greater than the potential for problems associated with potential exposure from contaminants using level D protection. Level C protection will be used if ambient air monitoring results warrant a

protective equipment upgrade (above Level D conditions). The Site Health and Safety Officer will be responsible for requesting an upgrade in the level of personnel protection. The final decision will be made by the Health and Safety Manager in conjunction with the Project Manager and the appropriate regulatory authorities.

A PID and particulate/dust monitor will be used to monitor air quality throughout the course of field work (drilling and/or well construction). If necessary (based upon field equipment readings), the work zone will be evacuated and consideration will be given to upgrading the level of protection. An upgrade to the appropriate level of protection for field personnel will be required before re-entering the work zone if hazardous conditions persist.

In addition to potential chemical hazards, there also exists potentially greater physical hazards associated with the field investigation activities. Due to the nature of the field investigation, heavy equipment including drilling rigs may be utilized on the job site. Therefore, all personnel should always be aware of vehicular traffic while working at the facility. Further, hard hats and steel-toed safety boots must be worn at all times around heavy equipment. All work must be performed in strict accordance with Occupational Safety and Health Administration (OSHA) regulations.

5.1 Community Air Monitoring Plan

Due to the proximity of nearby residences, real time air monitoring for volatile organic compounds and particulate levels at the perimeter of the work area is necessary during any drilling and/or well construction. A Community Air Monitoring Plan (Appendix C of the RIWP) will be implemented with the following provisions:

5.1.1 Frequency of Monitoring

All suspected contaminants of concern must be monitored at the downwind perimeter of the work area daily at 2 hour intervals. If total vapor or particulate levels exceed 5 ppm above background, work activities must be halted and monitoring continued under the provisions of an Emission Response Plan. All readings must be recorded and be available for State (NYSDEC and New York State Department of Health [NYSDOH]) personnel to review.

5.1.2 Emission Response Plan

If the ambient air concentration of organic vapors or particulates exceeds 5 ppm above background at the perimeter of the work area, activities will be halted and monitoring continued. If the level decreases below 5 ppm above background, work activities can resume but more frequent intervals of monitoring, as directed by the Site Health and Safety Officer, must be conducted. If the levels are greater than 5 ppm over background but less than 25 ppm over background at the perimeter of the work area, activities can resume provided:

- the vapor level 200 feet downwind of the work area or half the distance to the nearest residential or commercial structure, whichever is less, is below 5 ppm over background, and
- more frequent intervals of monitoring, as directed by the Site Health and Safety Officer, are conducted.

If the vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown. When work shutdown occurs, downwind air monitoring as directed by the Health and Safety Officer will be implemented to ensure that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission section.

5.1.3 Major Vapor Emission

If any levels greater than 5 ppm over background are identified 200 feet downwind from the work area or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted.

If, following the cessation of the work activities, or as the result of an emergency, levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the work area, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structures (20 Foot Zone).

If efforts to abate the emission source are unsuccessful and if the following levels persist for more than 30 minutes in the 20 Foot Zone, then the Major Vapor Emission Response Plan shall automatically be placed into effect;

- if vapor levels are approaching 5 ppm above background.

However, the Major Vapor Emission Response Plan shall be immediately placed into effect if organic vapor levels are greater than 10 ppm above background.

5.1.4 Major Vapor Emission Response Plan

Upon activation, the following activities will be undertaken:

1. Appropriate Emergency Response Contacts, as listed in the Health and Safety Plan of the Work Plan, will be contacted.
2. The local police authorities will immediately be contacted by the Health and Safety Officer and advised of the situation.
3. Frequent air monitoring will be conducted at 30 minute intervals within the 20 Foot Zone. If two successive readings below action

levels are measured, air monitoring may be halted or modified by the Health and Safety Officer.

6.0 DESIGNATED WORK ZONES

Work zones will be determined prior to commencement of a specific field activity. An area large enough to encompass the activity will be delineated as the work zone. Only qualified field personnel involved in the field activity, with the proper PPE, will be allowed into the designated work zone. Within the work zone, ambient air quality will be periodically monitored using a PID and particulate/dust monitor to determine any changes from background air quality. If subsequent measurements suggest a significant change in air quality (greater than 5 ppm), the work area will be immediately evacuated. An upgrade to the appropriate level of PPE for field personnel will be required before re-entering the work zone.

7.0 DECONTAMINATION STATIONS

If necessary, decontamination stations will be located in fixed areas to be used for the cleaning of all heavy equipment, vehicles, tools and supplies required for the completion of field operations. Personnel decontamination procedures for the appropriate levels of protection are described in Section 4.0.

All drilling equipment (rigs, augers, etc.) will be steam cleaned between each installation and sampling location. The staged decontamination area will be located at the northeast corner of the facility property or as designated by the TOB. All decontamination procedures will take place in this area.

8.0 SITE ACCESS CONTROL

Appropriate traffic controls and barricades will used in areas of vehicular and pedestrian traffic. Local requirements for traffic control will be adhered to (e.g.,

obtaining appropriate permits, and provisions for a flagman), as may be warranted.

9.0 PERSONAL HYGIENE

The following personal hygiene rules must be followed while performing work at the site:

1. Eating, drinking, chewing gum or tobacco, smoking, or any other practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in the work area.

2. Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking, or any other activities.

3. Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.

4. No excessive facial hair (i.e., beards), which interferes with a satisfactory fit of the mask-to-face seal, is allowed on personnel required to wear respiratory protective equipment.

5. Contact with contaminated or suspected contaminated surfaces will be avoided. Whenever possible, walking through puddles, mud and discolored surfaces; kneeling on ground; leaning, sitting, or placing equipment on drums, containers, vehicles, or the ground will be avoided.

6. Medicine and alcohol can increase the effects from exposure to toxic chemicals. Prescribed drugs will not be taken by personnel on site where the potential for absorption, inhalation, or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverage intake will be prohibited during all on-site field operations.

10.0 CONTINGENCY PLAN

Section 10.0 shall serve as the investigation Contingency Plan. It has been developed to identify precautionary measures, possible emergency conditions, and emergency procedures. The plan shall be implemented by the Site Health and Safety Officer.

10.1 Emergency Medical Care and Treatment

This section addresses emergency medical care and treatment of field personnel, resulting from possible exposures to toxic substances and injuries due to accidents. The following items will be included in emergency care provisions:

a. Name, address and telephone number of the nearest medical treatment facility will be conspicuously posted. Directions for locating the facility, plus the travel time, will be readily available (see Appendix C).

b. Names and telephone numbers of ambulance service, police and fire departments, and procedures for obtaining these services will be conspicuously posted (see Appendix B).

c. Procedure for prompt notification of the H2M Site Health and Safety Officer.

d. Emergency eyewash fountains and first aid equipment will be readily available on site and located in an area known to all personnel.

e. Specific procedures for handling personnel with excessive exposure to chemicals or contaminated soil or water.

f. Readily available dry-chemical fire extinguisher.

10.2 Off-Site Emergency Medical Care

The Site Health and Safety Officer shall pre-arrange for access to emergency medical care services at a convenient and readily accessible medical facility and establish emergency routes. The Site Health and Safety Officer shall establish emergency communications with emergency response services.

10.3 Personnel Accidents

Bodily injuries which occur as a result of an accident during the operation at the site will be handled in the following manner:

a. First aid equipment will be available on site for minor injuries. If the injuries are not considered minor, proceed to the next step.

b. The local first aid squad rescue unit, a paramedic unit, the local hospital and the Site Health and Safety Officer shall be notified of the nature of the emergency.

c. The injured employee shall be transported by the local emergency vehicle to the local hospital.

d. A written report shall be prepared by the Site Health and Safety Officer detailing the events and actions taken during the emergency within 24 hours of the accident.

10.4 Personnel Exposure

In the event that any person is splashed or otherwise excessively contaminated by chemicals, the following procedure will be undertaken:

a. Disposable clothing contaminated with observable amounts of chemical residue is to be removed and replaced immediately.

b. In the event of direct skin contact in Level D, the affected area is to be washed immediately with soap and water, or other solutions as directed by medical personnel.

c. The Site Health and Safety Officer or other individuals who hold a current first aid certificate will determine the immediate course of action to be undertaken. This may involve using the first aid kit and/or eyewash stations.

10.4.1 Weather

Adverse weather conditions are an important consideration in planning and conducting site operations. Hot or cold weather can cause physical discomfort, loss of efficiency, and personal injury. Of particular importance is heat stress resulting when protective clothing decreases natural body ventilation. One or more of the following will help reduce heat stress:

a. Provide plenty of liquids. To replace body fluids (water and electrolytes) lost because of sweating, use a 0.1 % salt water solution, more heavily salted foods, or commercial mixes. The commercial mixes may be preferable for those employees on a low sodium diet.

b. Provide cooling devices to aid natural body ventilation. These devices, however, add weight, and their use should be balanced against worker efficiency. Long cotton underwear help absorb moisture and protect the skin from direct contact with heat absorbing protective clothing.

c. Install mobile showers and/or hose down facilities to reduce body temperature and cool protective clothing.

d. In extremely hot weather, conduct operations in the early morning or evening.

e. Ensure that adequate shelter is available to protect personnel against heat, cold, rain, snow, etc.

f. In hot weather, rotate shifts of workers wearing impervious clothing.

10.4.2 Heat Stress

If field operations are conducted in the warm summer months, heat related fatigue will be closely monitored. Monitoring of personnel wearing impervious clothing should commence when the ambient temperature is 70 degrees Fahrenheit or above. Frequency of monitoring should increase as the ambient temperature increases or as slow recovery rates are indicated. When temperatures exceeds 85 degrees Fahrenheit, workers should be monitored for heat stress after every work period. The following screening mechanism will be used to monitor for heat stress:

> Heart rate (HR) will be periodically measured by the radial pulse for 30 seconds during a resting period. The HR should not exceed 110 beats per minute. If the HR is higher, the next work period should be shortened by 33 percent. If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle should be shortened by 33 percent.

Heat-related illnesses range from heat fatigue to heat stroke, the most serious. Heat stroke requires prompt treatment to prevent irreversible damage or death. Protective clothing may have to be cut off. Less serious forms of heat stress require prompt attention or they may lead to a heat stroke. Unless the victim is obviously contaminated, decontamination should be omitted or minimized and treatment begun immediately. Heat-related problems can be categorized into:

Heat Rash: Caused by continuous exposure to hot and humid air and aggravated by chafing clothes. Decreases ability to tolerate heat as well as being a nuisance.

Heat Cramps: Caused by profuse perspiration with inadequate fluid intake and chemical replacement (especially salts). Signs: muscle spasm and pain in the extremities and abdomen.

Heat Exhaustion: Caused by increased stress on various organs to meet increased demands to cool the body. Signs: shallow breathing; pale, cool, moist skin; profuse sweating; dizziness and lassitude.

Heat Stroke: The most severe form of heat stress. The body must be cooled immediately to prevent severe injury and/or death. Signs and symptoms are: red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma.

Some of the symptoms of heat stress are: hot dry skin, fever, nausea, cramps, red or spotted skin, confusion, lightheadedness, delirium, rapid pulse, convulsions and unconsciousness.

For workers suffering from heat stress, the following actions should be taken:

1. Remove the victim to a cool area
2. Loosen clothing
3. Thoroughly soak the victim in cool water or apply cold compresses
4. Call for medical assistance.

10.4.3 Cold Stress

If field operations are conducted in the cold winter months, cold stress will be monitored. Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10 degrees Fahrenheit air with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18 degrees Fahrenheit.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is perspiration soaked.

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of damage. Frostbite of the extremities can be categorized into:

Frost Nip or

Incipient Frostbite: Characterized by suddenly blanching or whitening of skin.

Superficial Frostbite: Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.

Deep Frostbite: Tissues are cold, pale and solid; extremely serious injury.

Hypothermia: Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperatures. Its symptoms are usually exhibited in five stages: (1) shivering; (2) apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body temperature to less than 95 degrees

Fahrenheit; (3) unconsciousness, glassy stare, slow pulse and slow respiratory rate; (4) freezing of the extremities; and finally, (5) death.

10.5 Fire

The telephone number to the local fire department will be posted along with other emergency numbers conspicuously on-site at all times. (see Appendix B). In the event of a fire occurring at the site, the following actions will be undertaken by the Site Health and Safety Officer and the designated fire control personnel:

a. Evacuate all unnecessary personnel from the area of the fire and site, if necessary.

b. Contact the local fire and police departments informing them of the fire and any injuries if they have occurred.

c. Contact the local hospital of the possibility of fire victims.

d. Contact the Site Health and Safety Officer, Health and Safety Manager, and the H2M Project Manager.

11.0 SUMMARY

The Health and Safety Plan establishes practices and procedures to be followed so that the welfare and safety of workers and the public are protected. It is important that personal equipment and safety requirements be appropriate to protect against the potential or known hazards at a site. Protective equipment will be based upon the type(s), concentration(s), and routes of personal exposure from substances at the site, as well as the potential for hazards due to heavy equipment use, vision impairment, weather, etc. All site operation planning incorporates an analysis of the hazards involved and procedures for preventing or

minimizing the risk to personnel. The following summarizes the rules which must be obeyed:

a. The Health and Safety Plan will be made available to all personnel doing field work on site. All personnel must sign this plan, indicating they have read and understood its terms.

b. All personnel will be familiar with standard operating safety procedures and additional instructions contained in the Health and Safety Plan.

c. All personnel going on site will be adequately trained and thoroughly briefed on anticipated hazards, equipment to be worn, safety practices to be followed, emergency procedures and communications.

d. Any required respiratory protective devices and protective clothing will be worn by all personnel going into work areas.

e. Prior to commencement of work activities, notification to local police, fire and potential rescue personnel will be made.

HASP APPENDIX A
HEALTH AND SAFETY ACKNOWLEDGEMENT FORM

I have read the Health and Safety Plan (HASP) for the Remedial Investigation at the Bethpage Community Park Ice Rink Area, and I have reviewed and understand the potential hazards and the precautions/contingencies of each potential hazard.

I agree to abide by the stipulations of this HASP and further agree to hold Holzmacher, McLendon & Murrell, P.C. harmless from, and indemnify against, any accidents which may occur as a result of activities in the site regardless of whether or not they were covered in the HASP.

Name	Date	Name	Date

HASP APPENDIX B
EMERGENCY CONTACT INFORMATION

EMERGENCY TELEPHONE NUMBERS

HOSPITAL

North Shore Hospital-Central General 888 Old Country Road Plainview, New York 11803	(516) 719-3000

POLICE DEPARTMENT

Emergency	911
Non-emergency	(516) 573-6800

FIRE DEPARTMENT

Emergency	911

AMBULANCE

Emergency	911

H2M GROUP

(631) 756-8000

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Site Safety Officer	Smita Day, P.E. (H2M) Office: ext. 1608 Mobile: (646) 247-9121

HASP APPENDIX C

ROUTE TO HOSPITAL

HOSPITAL

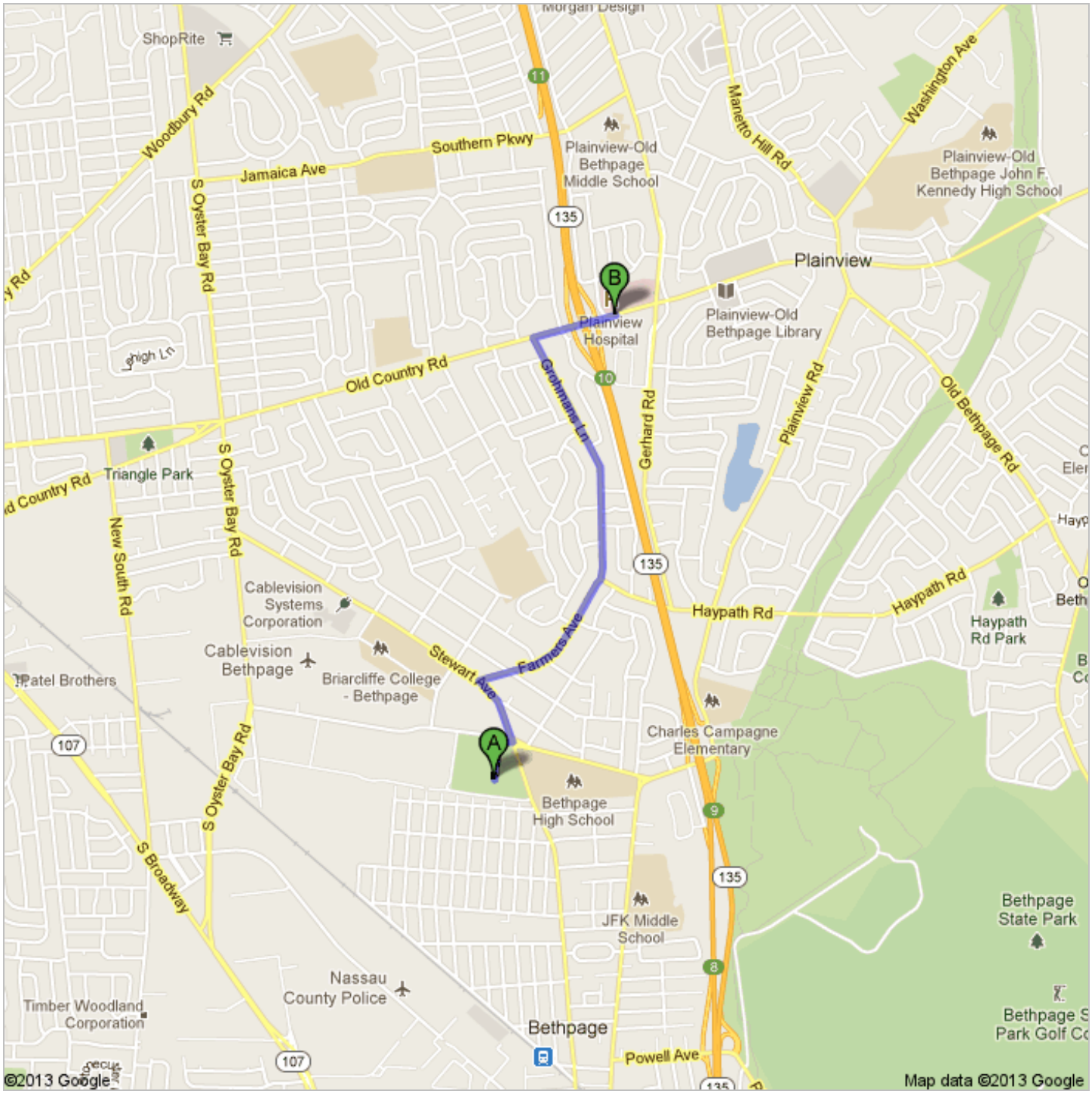
North Shore Hospital-Central General (516) 719-3000
888 Old Country Road
Plainview, New York 11803

Route

1. Head north, toward Stewart Avenue.
2. Turn left onto Stewart Avenue.
3. Turn right onto Farmers Avenue.
4. Contiune onto Grohmans Lane.
5. Turn right onto Old Country Road.
6. Destination will be on the left.

Google

Directions to 888 Old Country Rd, Plainview, NY 11803
1.9 mi – about **6 mins**



Bethpage Community Park
1 Stewart Ave, Bethpage, NY 11714

1.	Head **north** toward **Stewart Ave**	go 0.2 mi total 0.2 mi
2.	Turn left onto **Stewart Ave** About 54 secs	go 0.2 mi total 0.4 mi
3.	Turn right onto **Farmers Ave** About 1 min	go 0.5 mi total 0.9 mi
4.	Continue onto **Grohmans Ln** About 1 min	go 0.7 mi total 1.6 mi
5.	Turn right onto **Old Country Rd** Destination will be on the left About 2 mins	go 0.2 mi total 1.9 mi

888 Old Country Rd, Plainview, NY 11803

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN

New York State Department of Environmental Conservation Brownfield Cleanup Program

REMEDIAL INVESTIGATION WORK PLAN
QUALITY ASSURANCE PROJECT PLAN

Bethpage Community Park Ice Rink Area

Stewart Avenue
Bethpage
Nassau, New York

NYSDEC Site No. C130212

January 2014

Prepared for:

Town of Oyster Bay
Department of Public Works
150 Miller Place
Syosset, New York 11791

Prepared by:

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538 Broad Hollow Road
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H 2 M architects + engineers

REMEDIAL INVESTIGATION QUALITY ASSURANCE PROJECT PLAN
BETHPAGE COMMUNITY PARK ICE RINK AREA
TOWN OF OYSTER BAY
BETHPAGE, NASSAU COUNTY, NEW YORK
NYSDEC SITE NO. C130212

JANUARY 2014

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TOWN OF OYSTER BAY
BETHPAGE, NASSAU COUNTY, NEW YORK
NYSDEC SITE NO. C130212

JANUARY 2014

1.0 QUALITY ASSURANCE PROJECT PLAN

This Quality Assurance Project Plan (QAPP) has been prepared in general accordance with the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER)-10 / Technical Guidance for Site Investigation and Remediation and the requirements set forth in the NYSDEC letter dated April 10, 2013 (NYSDEC Comment Letter). The overall Quality Assurance / Quality Control (QA/QC) objective for the Bethpage Community Park Ice Rink Area Remedial Investigation (RI) is to produce data at the highest level to provide direct support for the development of a Remedial Action Plan (RAP), as necessary. Sampling activities used directly to support the RI will use Level IV Data Quality Objectives. These activities include groundwater, shallow soil vapor and deep soil vapor sampling. Specifically, data will be gathered or developed using procedures appropriate for the intended use. Standard procedures are used so that known and acceptable levels of accuracy, precision, representativeness, completeness and comparability are maintained for each data set. Descriptions of these criteria are presented in the following subsections.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Holzmacher, McLendon & Murrell, P.C. (H2M), as a professional engineering corporation, has been retained by the Town of Oyster Bay to conduct an RI of the Bethpage Community Park Ice Rink Area in the Hamlet of Bethpage, TOB, Nassau County, New York (Site), including the performance of field sampling activities. For projects involving a field investigation program, a project team is assembled with each team member responsible for specific elements of the work. To ensure that every project is completed with the highest degree of quality, each member of the project team must be aware of the quality assurance objectives for his/her specific element of the work. An H2M organization chart for the Bethpage Community Park Ice Rink Area RI is presented in Figure 1 and the resumes of the Project Manager (PM) and Quality Assurance Officer (QAO) are provided in Appendix A.

As indicated in Figure 1, the Project Director is the direct contact between H2M and the Town of Oyster Bay. The Project Director is responsible for overall project technical direction and quality assurance, including:

- Defining project objectives;
- Allocation of resources;
- Establishing chains of command; and
- Periodic evaluation of the project.

The H2M PM is responsible for directing and overseeing the technical and administrative elements of the project. This includes:

- Day to day direction, communication and coordination with the project team;
- Review of all project documents;
- Monitoring overall work progress, schedules, project costs; and
- Day to day direction of QA/QC activities.

Reporting directly to the PM is the Field Team Supervisor, who is responsible for directing the field investigation activities. Depending upon the specific project requirements, the field investigation work is carried out by staff engineers, geologists, hydrogeologists and/or field technicians. The Field Team Supervisor is responsible for ensuring that the work performed by the field investigation staff is carried out in a manner consistent with the project Quality Assurance (QA) requirements. The Field Team Supervisor is also responsible for direction and coordination of subcontractors, which may be utilized for surveying, drilling and geophysical investigations, and acts as an intermediary between the field staff and the analytical laboratory.

The QAO operates independently of the PM, reporting directly to the Project Director. The primary responsibilities of the QAO are as follows:

- Assist in the development of the work plan and evaluate its effectiveness;
- Monitor work to ensure conformance with the requirements of the work plan;
- Evaluate the need for and, if necessary, conduct field and laboratory QA audits;
- Supervise data validation and review report deliverables.

3.0 QA OBJECTIVES

The primary aim of this QAPP is to establish policies and procedures to be followed by project personnel when conducting field sampling and laboratory analyses in support of the remedial investigation. Quality assurance requires careful planning, organization and the dedication of every member of the firm to the concepts of QA/QC. This must be accompanied by the understanding and coordination of the roles of personnel involved in a particular project, if this quality objective is to be met. The overall QA objective for the Bethpage Community Park Ice Rink Area RI is to produce data at the highest level to provide direct support for the development of a RAP, as necessary.

4.0 FIELD SAMPLING ACTIVITIES

As part of the Bethpage Community Park Ice Rink Area RI, groundwater sampling will be conducted to assess groundwater quality beneath the Site and surrounding area. The proposed groundwater sampling locations are provided as Figure 2. Final monitoring well installation locations may vary slightly due to field conditions.

4.1. GROUNDWATER SCREENING AND SAMPLING

Three temporary groundwater monitoring wells will be installed as follows:

- RI-TMW-01 (north and up-gradient of the Site);
- RI-TMW-02 (southeast and down-gradient of the Site); and
- RI-TMW-03 (southwest and cross-gradient of the Site).

The groundwater at each temporary monitoring well will be screened at varying depths from the groundwater table (approximately 55 feet below ground surface [bgs]) to the proposed final depths in 10-foot intervals and sampled as follows:

- RI-TMW-01: 55, 65, 75, 85, 95, and 100 feet bgs (or maximum achievable final depth).
- RI-TMW-02: 55, 65, 75, 85, 95, 105, 115, 125, 135, and 145 feet bgs (or maximum achievable final depth).
- RI-TMW-03: 55, 65, 75, 85, 95, 105, 115, 125, 135, and 145 feet bgs (or maximum achievable final depth).

One groundwater sample from each sampling interval within each temporary monitoring well will be collected using a dedicated bailer (or equivalent). Groundwater samples will be collected by field personnel wearing one-time use nitrile gloves and transferred into laboratory-supplied containers. A total of 26 groundwater samples and appropriate QA/QC samples will be collected for laboratory analysis. The proposed groundwater sampling

locations are provided as Figure 2. Based on laboratory analytical results from the groundwater screening, three groundwater monitoring wells will be installed as follows:

- RI-MW-01 (north and up-gradient of the Site);
- RI-MW-02 (southeast and down-gradient of the Site); and
- RI-MW-03 (southwest and cross-gradient of the Site).

The three newly installed monitoring wells and four existing monitoring wells located south of the Site will be developed and one round of groundwater sampling will be conducted as follows:

- One sample from each of the following newly installed monitoring wells:
  - RI-MW-01;
  - RI-MW-02; and
  - RI-MW-03.

- One sample from each of the following existing monitoring wells (the monitoring well screen depth interval is shown in parenthesis):
  - MW-200-1 (85 to 95 feet bls);
  - MW-201-1 (70 to 80 feet bls);
  - MW-202-1 (125 to 135 feet bls); and
  - MW203-1 (103 to 113 feet bls).

Assuming the monitoring wells are suitable for sampling, a total of nine groundwater samples plus the appropriate QA/QC samples will be collected for laboratory analysis. The proposed groundwater sampling locations are provided as Figure 2.

Sampling equipment will be placed on a sheet of clean polyethylene (poly) plastic to minimize the possibility of cross contaminating sampling equipment with the surrounding surfaces. Upon opening the monitoring well, a photoionization detector (PID) will be used to screen the headspace of the well and the ambient air for volatile organic compounds (VOC). The procedure for groundwater sampling will be as follows:

1. Prior to purging the wells for sample collection, a synoptic static water level measurement to the nearest hundredth (0.01) of a foot will be recorded for each monitoring well.

2. A minimum of three well screen volumes will be purged from the monitoring well with a decontaminated Grundfos Pump (or equivalent stainless steel submersible pump) and dedicated tubing and transferred into labeled New York State Department of

Transportation-(DOT)-approved 55-gallon drums for off-site disposal (to be coordinated by the subcontractor), pending characterization.

3. One groundwater sample from each monitoring well will be collected using a dedicated, laboratory-cleaned, poly, disposable bailer (or equivalent). The bailer will be lowered into the well and the appropriate sample bottles will be filled directly from the bailer as soon as the bailer is removed from the well. Immediately, the samples will be placed on ice, in a cooler.

4.2. FIELD QA/QC

In order to ensure that data collected in the field is consistent and accurate, standardized forms will be utilized for repetitive data collection, such as depth to water in wells, well locations, etc. These field forms include Monitoring Well Purging and Groundwater Sampling Form (Appendix B).

The accuracy of the data collected will be checked by using an additional degree of definition than the minimum wherever possible. For example, if two distances are needed to locate a well, three will be used so that if one distance is inaccurate, the well can still be located and the field measurements can be re-taken. For measurements where this is not possible (i.e., depth to water), measurements will be taken and recorded three times.

4.3. FIELD RECORDS

Information pertinent to any field activity will be recorded in bound, waterproof field notebooks. Duplicates of notes will be prepared and kept in a secure place away from the Site. Proper documentation will consist of field personnel maintaining records of work accomplished including, but not limiting to the items listed below:

- Date and time of work events
- Purpose of work
- Description of methods
- Description of samples
- Number of size and samples
- Description of sampling point
- Date and time of collection of sample
- Name of sample collector
- Field observations
- Any field measurements obtained with portable instruments

Each sample collected in the field will be labeled using waterproof ink. Each bottle will be labeled with a number, location, parameter to be analyzed, sampling time and date. Packaging, shipping and chain-of-custody requirements for the samples shall be in accordance with National Enforcement Investigation Center (NEIC) procedures (see Section 5.0).

5.0 DOCUMENTATION AND CUSTODY

Sample preparation, documentation and custody are important elements of any QA/QC program. Without proper sample preparation and accurate documentation and tracking of sample custody, even well planned and properly implemented field sampling programs can generate data open to interpretation. For the purposes of this QAPP, sample preparation and custody include containerization, preservation, container transfer to field personnel, field handling and sample custody, sample transfer to the laboratory, and internal laboratory custody during sample analysis.

Sample custody is initiated at the designated laboratory where appropriate sample containers with preservatives, if required, are prepared by the analytical laboratory for use by field personnel.

5.1. SAMPLE CONTAINERS

Sample containers will be provided by the analytical laboratory. The wide scopes of analyses performed during field and sampling investigations necessitate the use of several different types of sample containers. Container materials are selected so that there will be no interference with the analysis to be performed on the given sample. Each sample container will have a label that contains the information necessary to identify the sample. Care will be taken to ensure that the sample location designations precisely match those on the container and the Chain of Custody (COC). The information to be provided on the container label will include, but not be limited to the following:

- A unique laboratory identification number;
- Sample identification;
- Sample location (and depth, if appropriate);
- Name of sampler;
- Date and time of collection; and
- Identification of any preservatives, if applicable.

Contract Laboratory Program (CLP) bottles, as used during this RI, are prepared using only CLP approved cleaning techniques with quality control certified by the vendor. Verification data is maintained on file at the laboratory.

5.2. SAMPLE PRESERVATION

Sample preservation is dependent upon the specific type or suite of analyses to be performed. A summary of sample container types and preservation methods is presented in Section 7.2. Sample preservatives will be added in the laboratory prior to shipment and identified on the sample bottle labels. Field personnel are responsible for verifying the addition of preservatives by visually examining the sample bottles, sample bottle labels, and the COC. Any discrepancies should be reported immediately to the laboratory and field personnel should not use the bottles in question.

After samples are collected and transferred into their respective sample bottles by field personnel, the samples are packed on ice, maintained at 4 degrees Celsius (°C), and delivered to the laboratory within twenty-four hours of collection. Samples will be maintained in a refrigerator (4° C) in the laboratory prior to analysis.

5.3. PREPARATION OF SAMPLE BOTTLES AND COOLERS

Coolers used for sample transport will be scrubbed clean prior to use with a non-contaminating detergent followed by a thorough rinse with organic-free distilled water. Coolers will then be dried before packing and use. Sample bottles will be purchased new and specially cleaned and certified by the vendor. As per CLP requirements, the sample bottles for this sampling program will be used once for the specific job intended. Glass containers to be used will be individually packaged in "bubble-wrap" to prevent breakage during transport.

5.4. CUSTODY TRANSFER TO FIELD PERSONNEL

A standard COC form will be utilized for documenting the receipt, tracking and compilation of sample data. In general, the COC procedure begins with the preparation of the sample bottles. After the sample bottles have been prepared, the cooler to be used will be sealed with custody tape and an external COC form prepared. The following information, at a minimum, will be included on the COC at the time of shipment to field personnel:

- Container types including preservatives, if required;
- Number of containers required at each sample location for each analysis, including matrix spike/matrix spike duplicates (MS/MSD), trip blanks and equipment blanks (as necessary);
- Any distinctive sample identification requirements;
- Signature of sample custodian, with a date and time of relinquishment;
- Signature of receiver, with a date and time of receipt.

Sample coolers will be picked up by field personnel at the laboratory. At this point, field personnel are in custody of the sample bottles.

5.5. CUSTODY TRANSFER TO LABORATORY

Upon completion of field sampling, field personnel will pack the sample bottles, including any blank or duplicate samples, and seal the cooler with custody tape. Any breakage of bottles will be noted on the comment section of the COC. If lab prepared glassware is not to be submitted back to the laboratory for analysis, the line designating the unused sample bottles will be crossed-out with a single line through the entry, and the correction initialed by the person in custody of the samples. Corrections to the COC will be made with a single line through the incorrect entry and will be accompanied by the initials of the person in custody of the samples.

Field personnel will verify that the identification labels on the sample bottles and the COC are identical, and that sample bottles are accounted for. Any discrepancies will be resolved

before relinquishing custody of the samples. Once the field personnel are satisfied that the samples are ready for submittal to the lab, the cooler will be returned to the laboratory.

Upon receipt of the sample cooler at the laboratory, the sample custodian will examine the exterior of the cooler to ensure that sample integrity has not been adversely impacted. Once the laboratory is satisfied that the sample integrity has not been compromised, a lab sample custodian will sign and date the COC to acknowledge receipt of the samples. The field personnel when hand delivering samples, as for this project, will also sign and date the COC acknowledging that they have transferred custody of the samples to the laboratory.

6.0 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC) SAMPLES

There are generally three types of QA/QC samples collected during field sampling programs: blank samples, duplicate samples and spiked samples. Each of these types of samples serves a specific purpose. Blank samples provide a measure of contamination that may have been introduced into a sample set in either of two ways:

- In the field while the samples were being collected or transported, or
- In the laboratory during sample preparation or analysis.

Duplicate samples provide a quantitative measurement of the reproducibility of sample results and as such, provide a mechanism for measuring the accuracy of sample collection and laboratory analysis procedures. Spiked samples can be used in several ways; the most common of which are the determination of parameter recoveries and reproducibility of results. Parameter recoveries are important in discussing data usability and the possible use of pseudo-correction factors for sample results.

6.1. BLANKS

There are four basic types of blank samples: trip blanks, field blanks, laboratory calibration blanks, and laboratory reagent (or method) blanks. Only trip blanks and field blanks are utilized by field sampling personnel.

Trip blanks are used to indicate potential contamination due to migration of VOC from the air on the site or in the sample shipping containers into the sample. A trip blank consists of laboratory distilled and deionized water in a 40-milliliter (mL) glass vial sealed with a Teflon septum. The blank accompanies the empty sample bottles to the field as well as the samples returning to the laboratory for analysis. Trip blanks are typically included in field sampling events where VOC analysis is to be performed and the sample matrix is aqueous.

Field blanks, also identified as “equipment blanks,” are used to determine if certain field sampling or cleaning procedures (e.g., decontamination of field equipment) result in cross-contamination of site samples. Like the trip blank, the field blank is a sample of distilled and deionized water taken to the field with empty sample bottles and analyzed with the site

samples. Because dedicated disposable sampling equipment will be used for the sampling program, equipment blank samples will not be collected.

6.2. DUPLICATE SAMPLES

Duplicate samples are used to assess the accuracy and repeatability of field procedures and laboratory analytical procedures. Duplicate site samples are generally collected so that the laboratory is "blind" to the source of the duplicate. Duplicate samples should be collected by sampling the given matrix in accordance with the procedures established for the project, except that approximately double the quantity of sample should be collected. Since sample recoveries are often a limiting factor as to which samples can be collected as duplicates, initial planning is important to ensure that sufficient sample volume is available for an accurate duplicate.

After collection, the sample will be divided evenly so that each half sample is representative of the whole (i.e., the two samples should be as close to identical as possible). Each sample will then be labeled. The first sample will be labeled with the actual sample location and description. The second sample will be labeled with a fictitious sample identifier known only to the sampler and those responsible for data interpretation. The laboratory should not be informed of the presence of a duplicate sample. Both samples will then submitted in an identical manner and documented on the COC. Analysis should include the same parameters that are required for the original site sample (parent sample). Blind duplicate samples will be collected at a frequency of one per twenty field samples, but not less than one per day.

6.3. MATRIX SPIKED SAMPLES

Spiked samples are utilized to potentially improve combined sampling and analytical accuracy. For matrix spiked samples, a selected field sample is collected in triplicate following the same procedure as used for duplicate samples, discussed in Section 6.2. In the laboratory, two of the field samples are spiked with a known concentration of a contaminant of interest. The recovery of the spiked compound is determined after laboratory analysis. The recovery serves as an indicator of the efficiency of the laboratory analysis, and more importantly from the standpoint of the field sampling personnel; the percent recovery can be used as a pseudo-correction factor for other sample results. Sample recoveries outside of a pre-determined control limit can also be used by the personnel responsible for data interpretation to assess the usability of site data.

The two spiked samples are identified as MS/MSD. MS/MSD samples to be collected as part of this remedial investigation sampling program will be collected in the field at a frequency of one set per twenty field samples, but not less than one per day.

A summary of spiking compounds, method, low and high QC limits for spike recovery and relative percent difference values (RPD) for matrices are included in Appendix C. Tables listing surrogate compounds, method, and acceptability QC limits for samples matrices are also included.

7.0 ANALYTICAL PROCEDURES AND LABORATORY TESTING

7.1. ANALYTICAL LABORATORY

Environmental samples will be analyzed by a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-approved and Analytical Services Protocol-(ASP)-certified laboratory.

7.2. SAMPLE ANALYSIS

Groundwater screening samples will be analyzed by an NYSDOH ELAP-approved and ASP-certified laboratory and the results provided as raw analytical data report(s). As discussed in Section 4.1, a total of approximately 26 groundwater screening samples will be collected from three temporary monitoring wells. One trip blank sample will accompany field groundwater samples at a rate of one per shipment / sample delivery group (SDG).

Groundwater samples will be analyzed by an NYSDOH ELAP-approved and ASP-certified laboratory and will include a NYSDEC ASP Category B data package that documents the quality of the analytical work. As discussed in Section 4.1, a total of approximately 7 groundwater samples will be collected from existing and newly installed monitoring wells. One trip blank sample will accompany field groundwater samples at a rate of one per shipment / SDG. Blind duplicate and MS/MSD samples will be collected at a frequency of 1 sample per 20 samples, but not less than 1 per day.

Each groundwater and QA/QC sample will be analyzed for Target Compound List (TCL) VOCs, dichlorodifluoromethane (Freon-12™), chlorodifluoromethane (Freon-22™), plus 20 tentatively identified compounds (TIC) via United States Environmental Protection Agency (EPA) Method 8260. Analytical results will be compared to the NYSDEC Division of Water Technical and Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (TOGS AWQS) for Class GA Water. The parameter reporting limits and standards are provided in Appendix D.

A summary of the analytical parameters, methods of analysis, required sample containers, preservatives and maximum holding times are shown in Table 7.2.1 for a water matrix.

Table 7.2.1 Water Matrix Analysis Requirements and Methods

Parameter	Method	Container	Preservative	Maximum Holding Time[1]
TCL VOCs	ASPB 10/95 8260B	40 mL vial	Cool, 4°C	7 days

[1] All holding times from the Verified Time of Sample Receipt (VTSR) as per NYSDEC ASP Category B

8.0 CALIBRATION PROCEDURES

8.1. CALIBRATION PRACTICES

Instruments and equipment to be used in the analytical laboratory are controlled by a formal calibration program. The program verifies that the equipment is of the proper type, range, accuracy and precision to provide data compatible with the desired requirements. Instruments and equipment that measure a quantity with performance expected at a stated level are subject to calibration. Calibration may be performed by lab personnel using reference standards or externally by calibration agencies or equipment manufacturers. Implementation of the laboratory calibration program is the responsibility of the Laboratory Manager and Analysts. The QA Manager at the analytical laboratory shall review the implementation of the program.

There are two types of calibration pertinent to the laboratory procedures to be utilized during the analysis of samples from the Bethpage Community Park Ice Rink Area RI. These are operational and periodic.

1. Operational calibration, which is routinely performed as part of the instrument usage, such as the development of a standard curve for use with an Atomic Absorption (AA) Spectrophotometer or Inductively Coupled Plasma (ICP) Spectrophotometer. Operation calibration is generally performed for instrument systems.

2. Periodic calibration is performed at prescribed intervals for equipment such as balances and controlled ovens. In general, equipment that can be calibrated periodically is considered a distinct single purpose unit and is relatively stable in performance.

Whenever possible, recognized procedures, such as those published by American Society for Testing and Materials (ASTM), EPA or the equipment manufacturers shall be utilized.

8.2. CALIBRATION FREQUENCY

Instruments and equipment shall be calibrated at prescribed intervals and/or as part of the operational use of the equipment. Frequency shall be based on the type of equipment, inherent stability, manufacturer recommendations, values provided in recognized standards, intended use, effect of error upon the measurement process and prior experience.

8.3. CALIBRATION REFERENCE STANDARDS

Physical and chemical reference standards used for calibration are as follows:

- Physical Standards, such as weights for calibrating balances and certified thermometers for calibrating working thermometers and ovens, are generally used for periodic calibration.

- Chemical Standards are primarily used for operational calibration.

Whenever possible, physical and chemical reference standards shall have known relationships to nationally recognized standards (e.g., National Bureau of Standards) or accepted values of natural physical constants. If national standards do not exist, the basis for the reference standard shall be documented.

8.4. CALIBRATION FAILURE

Equipment that fails calibration or becomes inoperable during use shall be removed from service and segregated to prevent inadvertent use, or shall be tagged to indicate it is out of calibration. Such equipment shall be repaired and satisfactorily recalibrated before reuse.

8.5. CALIBRATION RECORDS

Records shall be prepared and maintained for each piece of equipment subject to calibration. Records demonstrating accuracy of reference standards shall also be maintained.

For instruments and equipment that are calibrated on an operational basis, calibration generally consists of determining instrumental response against compounds of known composition and concentration or the preparation of a standard response curve of the same compound at different concentrations. Records of these calibrations can be maintained in several ways:

1. The calibration data can be kept with analytical sample data.

2. A logbook can be prepared for each instrument that contains all calibration data.

Method 1 provides response factor information, etc., directly with the analytical data so that the data can be readily processed and verified. Also, the raw data package is completed as a unit.

Method 2 provides an on-going record of calibration undertaken for a specific instrument. However, to process and verify the analytical data, the log must be used in conjunction with the raw data.

For operational calibration of instrumentation used for this project, calibration data will be included with the raw analytical data and maintained in project files.

9.0 DATA REDUCTION, VALIDATION AND REPORTING

9.1. DATA REDUCTION

Laboratory data reduction and analysis for organic analyses involves relating a "peak area" to the mass of a constituent. This is accomplished by digital computers. The computer hardware and software is designed to allow the analyst to create libraries or files of calibration standards, and then compare raw sample data against these libraries to produce a report that contains the identification and qualification of constituents present in the sample. The analysts manually check the computer-reduced data.

9.2. DATA VALIDATION

Data validation is a process in which field and analytical data quality is assessed relative to the data quality objectives. The validation process examines the acceptability or validity of data, and assesses data usability. Although data validation usually refers to analytical laboratory data, the same review process is applied to all field-generated data.

In order to ensure that data collected in the field is consistent and accurate, standard reporting forms (Groundwater Sampling/Development Logs, etc.) are utilized. These forms are then checked by the Field Team Supervisor to confirm that the information is complete and that any calculations are correct. A minimum of 20% of the field data reports is checked in this manner. If, during the initial review process, errors are identified, the remaining 80% of the data set are reviewed. Items to be checked by the reviewer will be dependent on the type of data being reported, but in general include the following:

- Proper sampling methods and equipment were employed;
- Proper sample preservation methods were followed;
- COC information is complete;
- Proper QA/QC samples were utilized;
- Equipment decontamination procedures were followed; and
- Instruments were properly calibrated.

9.3. DATA REPORTING

The following are applicable to data presentation:

1. The final presentation shall be checked in accordance with data verification requirements and approved by the Laboratory QA Manager.
2. Data presentation will include:

a. Sample identification number used by the laboratory and/or the sample identification provided to the laboratory (if different).

b. Chemical parameters analyzed, reported values, and units of measurements.

c. Detection limit of the analytical procedure, if the reported value is less than the detection limit.

d. Data for a chemical parameter are reported with consistent significant figures for all samples.

e. Results of QA/QC sample analysis, if appropriate.

f. Footnotes referenced to specific data, if required to explain reported values.

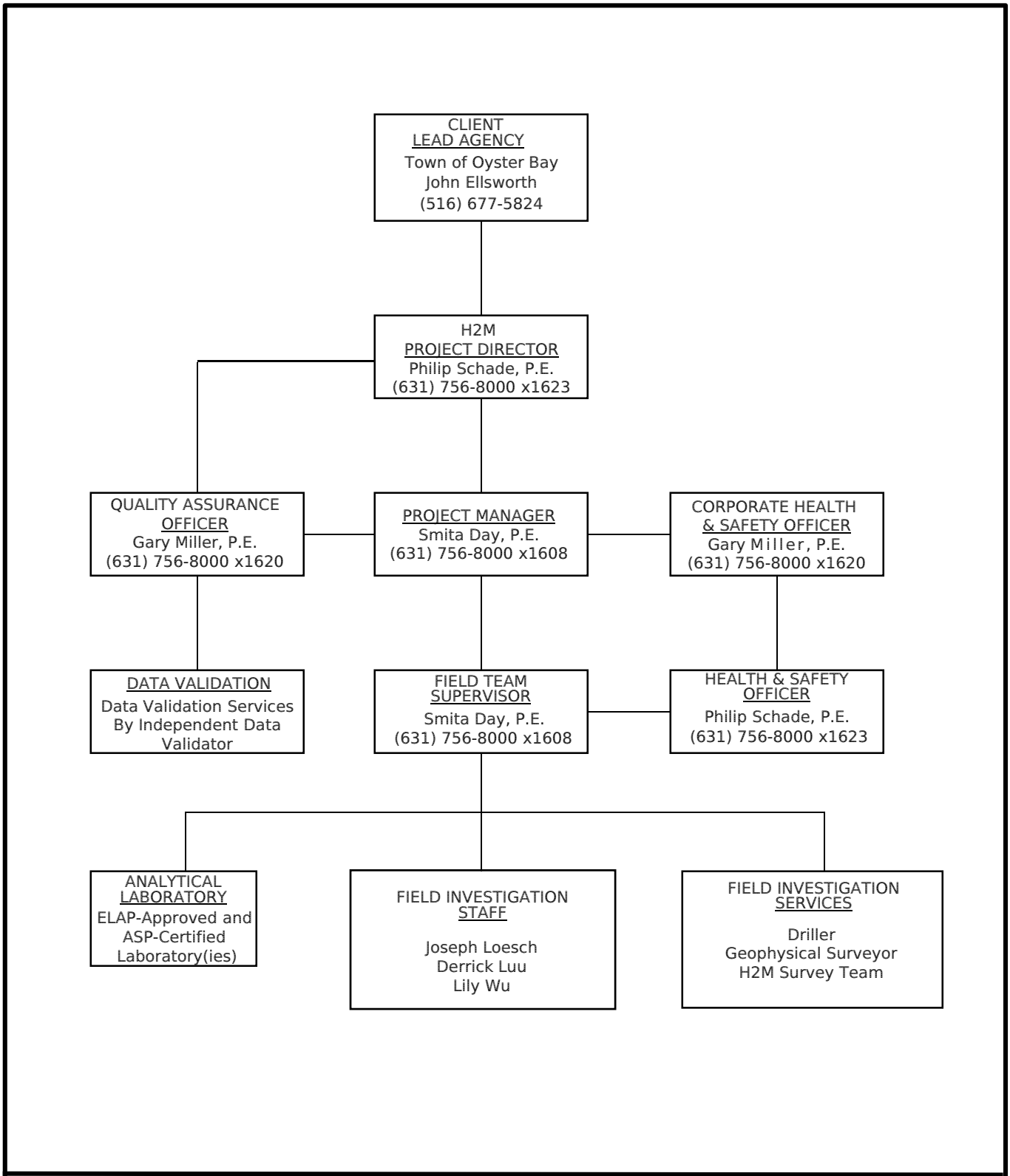
The format for reporting will follow the NYSDEC ASP category B data package.

9.4. LABORATORY DATA VALIDATION

Groundwater analytical results, including QA/QC sample results, will be subjected to independent data validation following the NYSDEC Data Usability Summary Report (DUSR) guidelines. Data validation will be performed by an independent data validator. Laboratory data packages will be reviewed for quality control parameters including, but not limited to custody documentation, holding times, surrogate and matrix spike recoveries, duplicate correlation, calibration standard and blank performance, instrument performance, blank contamination, matrix interferences and method compliance. Upon completing the data evaluation, a DUSR will be prepared. The DUSR will be included in the project RI Report.

FIGURE 1

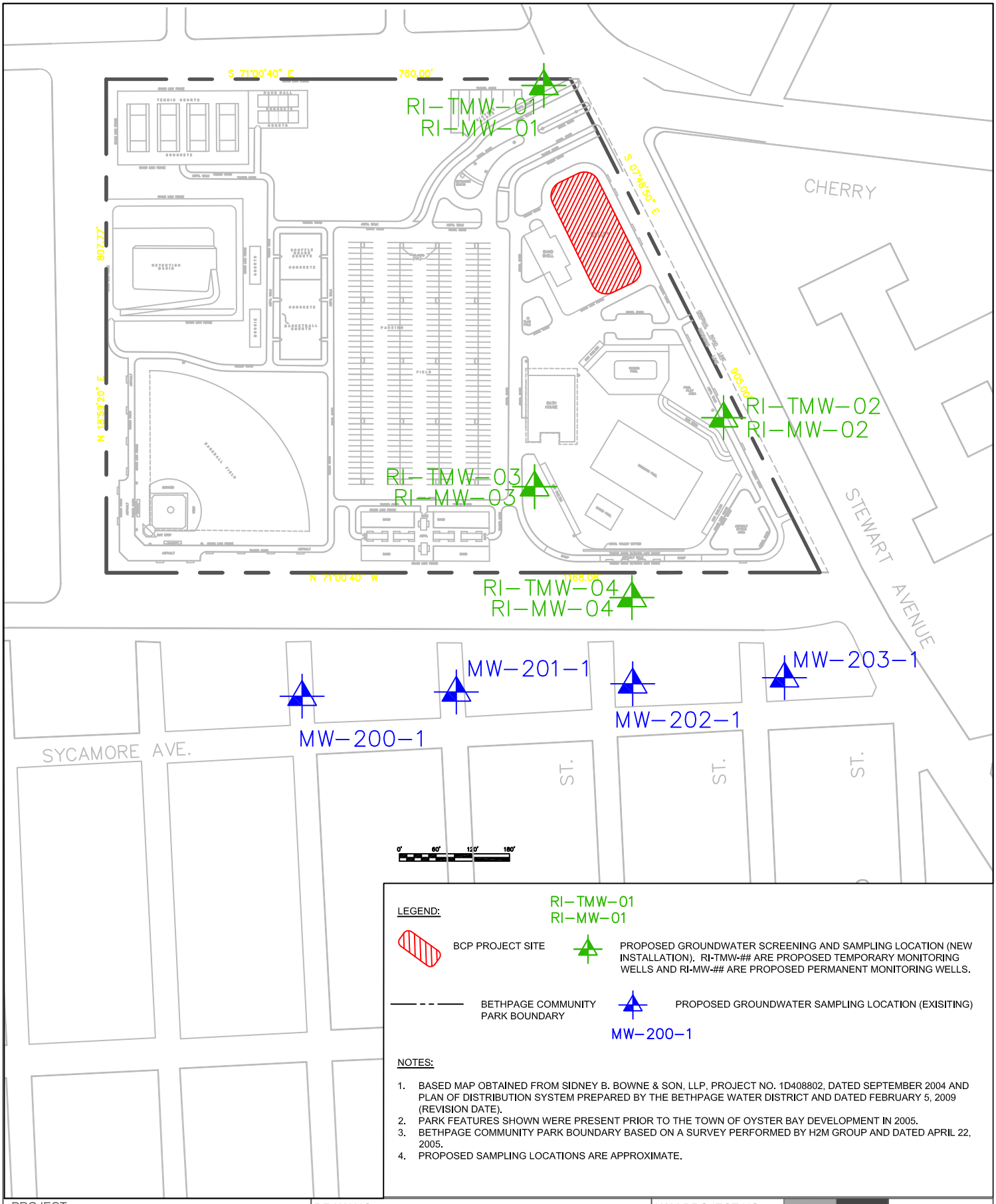
ORGANIZATIONAL CHART



PROJECT: REMEDIAL INVESTIGATION QUALITY ASSURANCE PROJECT PLAN BETHPAGE COMMUNITY PARK ICE RINK TOWN OF OYSTER BAY BETHPAGE, NASSAU COUNTY, NEW YORK NYSDEC SITE NO. C130212	**TITLE:** FIGURE 1: ORGANIZATIONAL CHART	**H2M PROJECT #:** TOBY1203 **DATE:** JUNE 2013	H2M architects + engineers Melville, NY Albany, NY New City, NY Parsippany, NY

FIGURE 2

PROPOSED GROUNDWATER SAMPLING LOCATIONS



NOTES:

1. BASED MAP OBTAINED FROM SIDNEY B. BOWNE & SON, LLP, PROJECT NO. 1D408802, DATED SEPTEMBER 2004 AND PLAN OF DISTRIBUTION SYSTEM PREPARED BY THE BETHPAGE WATER DISTRICT AND DATED FEBRUARY 5, 2009 (REVISION DATE).
2. PARK FEATURES SHOWN WERE PRESENT PRIOR TO THE TOWN OF OYSTER BAY DEVELOPMENT IN 2005.
3. BETHPAGE COMMUNITY PARK BOUNDARY BASED ON A SURVEY PERFORMED BY H2M GROUP AND DATED APRIL 22, 2005.
4. PROPOSED SAMPLING LOCATIONS ARE APPROXIMATE.

PROJECT:
BROWNFIELD CLEANUP PROGRAM
BETHPAGE COMMUNITY PARK ICE RINK AREA
REMEDIAL INVESTIGATION WORK PLAN
TOWN OF OYSTER BAY
BETHPAGE, NEW YORK
NYSDEC SITE NO.: C130212

DRAWING:
FIGURE 3: PROPOSED GROUNDWATER SCREENING AND SAMPLING LOCATIONS

SCALE:
AS SHOWN

H2M PROJECT NO.:
TOBY1203

DATE:
DECEMBER 2013

architects + engineers
Melville, NY
New City, NY
Albany, NY
Parsippany, NJ

APPENDIX A

PROJECT TEAM RESUMES

Gary J. Miller, P.E.

Vice President, Director of Environmental Services

Experience

H2M

Education

B.S., Engineering Technology and Civil-Environmental, Virginia Polytechnic Institute and State University

A.S., Mechanical Technology, CUNY-Queensborough Community College

Dale Carnegie Leadership Training for Managers Course

License/Certifications

Professional Engineer: NY

Asbestos Abatement Inspector/ Management Planner/Project Designer

Hazardous Materials Manager - Master Level

Health and Safety Operations at Hazardous Waste Sites, OSHA

Memberships

Air and Waste Management Association

Hazardous Waste Action Coalition

Institute of Hazardous Materials Management

Water Pollution Control Federation

Articles/Papers

Closure of Industrial Facilities Containing Hazardous Wastes. New York Water Pollution Control Association, Winter Meeting, January 1989.

Design of Hazardous Materials Storage Facilities. Spill Control and Hazardous Materials Conference, New Haven, CT, September 1983.

Mr. Miller has over 35 years of experience in the field of environmental engineering covering a broad range of projects including solid and hazardous waste management, water and wastewater treatment, air pollution control, asbestos abatement, indoor air quality, hazardous material storage, groundwater investigations and site remediation. As head of H2M's Environmental Engineering Division, Mr. Miller oversees and provides technical direction on major environmental projects. His experience at H2M includes all aspects of project engineering and management including engineering studies, economic analyses, treatability studies, design, construction and startup. He has been responsible for projects ranging from landfill leachate collection and methane venting systems for municipal clients to wastewater treatment, air pollution control and hazardous waste management for private industrial clients.

He also has extensive experience inspecting and auditing industrial facilities for environmental compliance. He has worked closely with a spectrum of industries including petrochemical, pharmaceutical, food processing, printing, metal finishing and plating, printing circuit board and electronics, semiconductor, communications and commercial waste treatment. He is a specialist in assisting industrial clients with RCRA and other regulatory compliance programs including the storage and handling of hazardous materials, hazardous material response, and health and safety issues.

Mr. Miller has directed numerous site investigations utilizing a variety of techniques including soil vapor surveys, geophysical surveys, soil borings, monitoring wells and groundwater modeling to assess environmental impacts and implement effective remediation programs. Site investigation projects have ranged from Phase I and II environmental assessments as part of property transactions to remedial investigations/feasibility studies at state and federal Superfund sites.

Selected project experience:

- Study of wastewater collection, treatment and disposal facilities for the New York City Transit Authority. Inspections and sampling of fueling, washing, maintenance/repair and painting facilities at 20 bus depots of varying sizes and age located throughout New York City's five boroughs.
- Preparation of design plans and specifications for bulk chemical storage facilities at Pall Corporation's East Hills manufacturing facility. Design elements included indoor and outdoor storage tanks, portable container and gas cylinder storage, spill containment, tank vent scrubbers, and automated chemical distribution and inventory control systems.
- Closure of five hazardous waste lagoons at a northern New Jersey manufacturing facility. The project involved developing a NJDEP approved closure plan, technical specifications and bid documents, and directing the closure of five lagoons containing over 250,000 gallons of hazardous wastes.
- Managed Toxics Retainer Term Contract with NYCEDC involving multiple Phase I and Phase II ESAs, asbestos and lead surveys, and asbestos abatement projects. Major projects included pre-demolition asbestos abatement and development of a Remedial Action Plan for the former Bronx Terminal Market. Both projects were associated with the new Yankee Stadium and construction of an adjacent Waterfront Park.

Gary J. Miller, P.E.

- RCRA TSD facility permit application package, including personnel training program, waste analysis plan, contingency plan and closure plan for a waste solvent reclamation facility.
- Preparation of a comprehensive stormwater management plan for a petrochemical research and development facility in Edison, New Jersey. Program elements included runoff calculations, evaluation of existing infrastructure, runoff segregation, sizing retention ponds and an assessment of existing differential gravity oil-water separators.
- Comprehensive indoor air quality investigations at two New York State psychiatric facilities. Investigation included inspection of building HVAC systems and controls, examination of system maintenance, monitoring for temperature, relative humidity, carbon dioxide, carbon monoxide and non-methane volatile organic compounds, and air sampling and analysis for formaldehyde, asbestos fibers and bioaerosols.
- Remedial investigations and feasibility studies at two New York State hazardous waste sites under a NYSDEC Division of Environmental Remediation Superfund Standby Contract. Both projects included preparation of site-specific Field Sampling Plans, QA Project Plans and Health and Safety Plans. Field investigation included soil vapor surveys, surface and subsurface soil sampling, source area (disposal systems) sampling and groundwater sampling. Using a combination of temporary well points, vertical profile wells and cluster wells, chlorinated organic plumes were delineated on and off-site. Feasibility Studies for the two sites included evaluations of remedial options addressing groundwater remediation on site and downgradient of the site.
- Design of wastewater treatment system upgrades at a specialty metal finishing facility. System upgrades included a larger slant plate clarifier, polishing sand filter, new process controls and reagent metering systems. H2M also provided construction management, system startup and testing services.
- Remedial design studies at a major NPL Superfund site in Woburn Massachusetts. As part of a multi-consultant remedial design team, H2M developed and implemented a field testing program to measure gaseous emissions from a specific source area. H2M also developed and implemented a groundwater treatability study assessing oxidation and air stripping as the primary unit treatment operations and biological treatment and ion-exchange as polishing operations.
- Preparation of design plans, technical specifications and bid documents for a soil vapor extraction system designed as the final phase of an ongoing remediation program at the site of a former manufacturing facility.
- Feasibility study at a Superfund Site in Hicksville, New York, that evaluated various alternatives including soil vapor extraction, air sparging and bioremediation for the in-situ treatment of soil and groundwater impacted by chlorinated solvents. ■

Philip J. Schade, P.E.

Vice President, Department Manager – Environmental Services

Experience

H2M

Dvirka & Bartilucci, Consulting Engineers

Education

B.M.E., Mechanical Engineering, Villanova University

License/Certifications

Professional Engineer: NY, NJ

Roadway Protection Training, MTA/LIRR

Leadership Training, PSMJ Resources, Inc.

Communication and Leadership Training, Dale Carnegie and Associates, Inc.

Memberships

Association of Energy Engineers

National Society of Professional Engineers

New York State Society of Professional Engineers

Honors/Awards

Who's Who in Engineering & Environmental Consulting. Long Island Business News, July 2007

Articles/Papers

New Environmental Due Diligence Requirements. Commercial Industrial Brokers Society of Long Island, December 2006.

New Air Emission Permitting Regulations Affect Local Businesses. Hauppauge Reporter, March 1997.

Mr. Schade is a principal engineer with more than 25 years of progressive experience as an environmental consultant. His corporate role includes business planning and development, personnel management, work product development and quality control, team building and staff development. Mr. Schade is responsible for the management of projects and initiatives within various industries including electric and gas utility, aerospace manufacturing, electronics manufacturing, printing, real estate development, waste management, railroad, food services, petroleum distribution, pharmaceutical and general manufacturing, and also provides environmental services to municipal agencies.

His technical areas of expertise include site investigation and remediation, phase I and II environmental site assessments, above and underground hazardous material storage tank compliance, facility audits, compliance reporting, treatment system upgrade, cathodic protection issues, environmental permitting, SPCC planning, air emission regulatory compliance, emission calculations, air modeling, stack testing, evaluation of emission control and monitoring systems, RCRA compliance, hazardous waste generation reporting, waste reduction planning, hazardous waste storage area design, contingency and closure planning, preparation of design documents, plans and specifications, construction oversight, employee training, consent order negotiations, and regulatory agency interface. Mr. Schade is also experienced with litigation support including fact witness deposition, expert witness deposition, expert report preparation and defense, as well as document review and opinion development and reporting.

Selected project experience:

- Investigation and remediation of numerous dielectric fluid spills associated with buried electric cables. Projects included containment delineation, impacted soil excavation, installation of groundwater monitoring wells, application of interim remedial measures for product recovery from groundwater, transport analysis, design of groundwater remediation systems, construction oversight and system operation and maintenance.
- Direction of an IRM action performed on a portion of a municipally-owned community park under an Order on Consent between the subject town and the New York State Department of Environmental Conservation. Project included remedial investigation, development and evaluation of remedial alternatives, remedial alternative selection, preparation of a remedial action plan, presentation to and coordination with the public, design of selected remedial alternative, construction oversight, community air monitoring and interface with regulatory agencies.
- Direction of a federally regulated underground injection well investigation and remediation effort at a former aerospace manufacturing facility. The project included remediation of approximately 6,000 tons of PCB and VOC impacted soils.
- Direction of several large scale Phase I environmental site assessments of former electric utility operations sites at various major utility substations in New York City.

Philip J. Schade, P.E.

- Direction of engineering projects in support of environmental remediation at multiple former MGP sites in New York.
- Preparation of hazardous waste reduction plans, facility closure plans and subsequent plan updates for numerous industrial and commercial facilities.
- Management of ongoing operation and maintenance issues relative to a 300 gpm pump and treat ground water remediation system in Suffolk County, New York. The system includes five remediation wells and an air stripping tower for removal of organic contaminants.
- Investigation of former utility operations sites in support of proposed real estate transactions including Phase I, II and III environmental assessments, remedial action and reporting.
- Preparation of hazardous waste contingency plans for various electric power substations for a major electric utility.
- Development of air emission permit applications for a paint manufacturing facility including site inspection, emissions calculations, correspondence with New York State and preparation of system diagrams and schematics.
- Preliminary design/feasibility study to control gasoline vapors at a marine oil/gasoline transport facility in New York City by way of incineration in an existing steam production boiler. Project included feasibility study to determine practicality of using boiler exhaust gas to purge gasoline storage holds.
- Preliminary design/feasibility study of an industrial vapor control system for a major computer manufacturing facility including economic and technical evaluation of thermal oxidizing systems, regenerative systems and refrigeration systems.
- Performance of a facility audit and preparation of air emission permit applications for two major defense electronics manufacturing facilities.
- Preparation of stormwater pollution prevention plans and best management practices plans for various solid waste transfer stations in the New York metropolitan area. ■

APPENDIX B

MONITORING WELL PURGING AND GROUNDWATER SAMPLING FORM

MONITORING WELL PURGING AND GROUNDWATER SAMPLING FORM

Sheet ___ of ___

WELL NUMBER	WELL INFORMATION					Date:
	Well Diameter (inches)	Total Depth[1] (ft)	Depth to Water TOC (ft)	Depth to Product TOC (ft)	PID (ppm)	H2M Personnel:
PERMIT NUMBER						Site Name:
						Site Location:
						H2M Job Number:

(1) Use a previously determined Total Depth. Confirm the total Depth of well after sampling.
TOC = top of casing

PURGING INFORMATION								Rental Meter Name:
Pump Type	Tubing ID/Type	Pump Intake[2] Depth (ft)	Initial DTW TOC (ft)	Purge Start Time	Purge Stop Time	Flow Rate (ml/m)	Total Purge Vol. (gal)	Rental Meter Serial No.:

(2) Below TOC
ID = inner diameter

PURGING PARAMETERS (measurements are to be taken approximately every 5 minutes)										
	Criteria:	<0.3 ft	± 0.1 su	± 3%	± 10%[3]	± 10%	± 3%	± 10 mv	3 WV	
Time	Flow Rate (ml/m)	Depth to Water (ft)	pH (su)	Cond (mS/cm)	Turbidity (NTU)	D.O. (ppm)	Temp (^{o}C)	ORP (mv)	Volume (gal)	Water Conditions/Comments
Comments:										
Analytical Parameters:										Sample Start Time: Sample Finish Time:
Weather Conditions:										

(3) For values greater than 1.
Note: Indicator parametes have stabilized when 3 consecutive readings are within criteria above.

APPENDIX C

QC LIMITS FOR SPIKING AND SURROGATE COMPOUNDS

Volatile Organics – Method ASPB 10/95 8260B
(NYSDEC ASP Category B)

Matrix: Water

Analyte	SPK* (ug/l)	QC Limits Low	QC Limits High
1,1,1-Trichloroethane	50	66	126
1,1,2,2-Tetrachloroethane	50	77	120
1,1,2-Trichloroethane	50	82	116
1,1-Dichloroethane	50	77	114
1,1-Dichloroethene	50	67	120
1,2-Dichloroethane	50	76	120
1,2-Dichloroethene (total)	100	78	128
1,2-Dichloropropane	50	81	115
2-Butanone	50	74	121
2-Hexanone	50	76	119
4-Methyl-2-pentanone	50	79	121
Acetone	50	71	125
Benzene	50	77	116
Bromodichloromethane	50	78	118
Bromoform	50	75	121
Bromomethane	50	50	136
Carbon disulfide	50	61	126
Carbon tetrachloride	50	64	126
Chlorobenzene	50	72	124
Chloroethane	50	71	116
Chloroform	50	75	119
Chloromethane	50	70	114
cis-1,3-Dichloropropene	50	79	116
Dibromochloromethane	50	75	125
Ethylbenzene	50	68	128
Methylene chloride	50	80	112
Styrene	50	72	124
Tetrachloroethene	50	59	133
Toluene	50	70	125
trans-1,3-Dichloropropene	50	77	120
Trichloroethene	50	72	121
Vinyl chloride	50	66	117
Xylene (total)	150	78	133
Dichlorodifluoromethane (Freon-12™)	50	85	115
Chlorodifluoromethane (Freon-22™)	50	85	115

Matrix Spike / Matrix Spike Duplicate Spiking Information:

Analyte	SPK* (ug/l)	QC Limits Low	QC Limits High	RPD**
1,1-Dichloroethene	50	61	145	14
Benzene	50	76	127	11
Chlorobenzene	50	75	130	13
Toluene	50	76	125	13
Trichloroethene	50	71	120	14

Matrix Spike / Matrix Spike Duplicate Surrogate Information:

Analyte	SPK* (ug/l)	QC Limits Low	QC Limits High
1,2-Dichloroethane-d4	50	76	114
4-Bromofluorobenzene	50	86	115
Toluene-d8	50	88	110

* SPK = Spike concentration
** RPD = Relative Percent Difference

APPENDIX D

PARAMETER REPORTING LIMITS AND LEVELS OF CONCERN

PARAMETER REPORTING LIMITS AND STANDARDS

Matrix: Water			
Analyte	MDL (ug/l)	PQL (ug/l)	Class GA Water Quality Standards [1] (ug/l)
Volatile Organic Compounds (Method ASPB 10/95 8260B)			
1,1,1-Trichloroethane	0.48	10	5.0
1,1,2,2-Tetrachloroethane	0.22	10	5.0
1,1,2-Trichloroethane	0.28	10	1.0
1,1-Dichloroethane	0.49	10	5.0
1,1-Dichloroethene	0.60	10	5.0
1,2-Dichloroethane	0.36	10	6.0
1,2-Dichloroethene (total)	0.75	10	-
1,2-Dichloropropane	0.39	10	1.0
2-Butanone	0.73	10	50
2-Hexanone	0.23	10	50
4-Methyl-2-pentanone	0.20	10	-
Acetone	0.58	10	50
Benzene	0.28	10	1.0
Bromodichloromethane	0.36	10	50
Bromoform	0.25	10	50
Bromomethane	0.61	10	5.0
Carbon disulfide	0.45	10	-
Carbon tetrachloride	0.32	10	5.0
Chlorobenzene	0.27	10	5.0
Chloroethane	0.63	10	5.0
Chloroform	0.32	10	7.0
Chloromethane	0.65	10	5.0
cis-1,3-Dichloropropene	0.14	10	-
Dibromochloromethane	0.25	10	5.0
Ethylbenzene	0.25	10	5.0
Methylene chloride	1.09	10	5.0
Styrene	0.16	10	5.0
Tetrachloroethene	1.49	10	5.0
Toluene	0.34	10	5.0
trans-1,3-Dichloropropene	0.20	10	5.0
Trichloroethene	0.48	10	5.0
Vinyl chloride	0.90	10	2.0
Xylene (total)	0.21	10	5.0
Dichlorodifluoromethane (Freon-12™)	0.10	10	5.0
Chlorodifluoromethane (Freon-22™)	0.33	10	5.0

[1] NYSDEC Class GA Water Quality Standards

APPENDIX C

COMMUNITY AIR MONITORING PLAN

New York State Department of Environmental Conservation Brownfield Cleanup Program

REMEDIAL INVESTIGATION WORK PLAN
COMMUNITY AIR MONITORING PLAN

Bethpage Community Park Ice Rink Area

Stewart Avenue
Bethpage
Nassau, New York

NYSDEC Site No. C130212

January 2014

Prepared for:

Town of Oyster Bay
Department of Public Works
150 Miller Place
Syosset, New York 11791

Prepared by:

H2M Architects + Engineers
538 Broad Hollow Road
4th Floor East
Melville, New York 11747

H2M architects + engineers

REMEDIAL INVESTIGATION COMMUNITY AIR MONITORING PLAN
BETHPAGE COMMUNITY PARK ICE RINK AREA
TOWN OF OYSTER BAY
BETHPAGE, NASSAU COUNTY, NEW YORK
NYSDEC SITE NO. C130212

JANUARY 2014

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TABLES

APPENDICES

REMEDIAL INVESTIGATION COMMUNITY AIR MONITORING PLAN
BETHPAGE COMMUNITY PARK ICE RINK AREA
TOWN OF OYSTER BAY
BETHPAGE, NASSAU COUNTY, NEW YORK
NYSDEC SITE NO. C130212

JANUARY 2014

1.0 OBJECTIVE

The intent and objective of environmental/ambient air monitoring during this project is to monitor air quality during the Remedial Investigation (RI) to be conducted at the Bethpage Community Park Ice Rink Area in Bethpage, New York. The air quality will be monitored during any drilling, well construction and/or soil vapor probe installation activities in order to provide a measure of protection for the community from potential airborne contaminant releases as a result of remedial work activities. Air monitoring for Volatile Organic Compounds (VOCs) and particulates (particulate matter less than 10 microns in size) (PM-10) will be conducted upwind of work areas (exclusion zone) to establish background conditions and downwind of the exclusion zone to monitor possible contaminant migration. Environmental air monitoring and observations of visible emissions during excavation activities will be performed according to methods contained in this specification.

2.0 AIR MONITORING METHODOLOGY

2.1 Daily Monitoring Guidelines

Air monitoring will be performed continually at the site for the duration of the RI whenever site activity involves ground intrusive activity, which as outlined in the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (attached as Appendix A), is defined to include, but not limited to soil/waste excavation and handling, trenching or test pits and the installation of soil borings or

monitoring wells. For the RI at the Site, intrusive activity shall include drilling, well construction, soil vapor probe installation, or any activity with the potential to emit VOCs or PM-10.

Prior to each days work, the environmental consultant will enter the exclusion zone(s) to identify areas of high emission potential, i.e., areas of drilling, well construction, soil vapor probe installation, etc., and to collect temperature and wind direction readings. Once wind direction and areas of high emission potential have been established, the environmental consultant will set up the upwind and downwind monitoring equipment. At this point, collection of real-time readings for VOCs and particulates will be initiated at both the upwind and downwind monitoring locations. Depending on the planned daily site work, up to two downwind monitoring stations will be utilized. Site work may commence after air monitoring has been initiated.

Once excavation work begins, the environmental consultant will evaluate the work areas for visible particulates in the air and suppression measures being applied by the excavation contractor. This is in addition to the mechanical and regular data logging of VOC and particulate levels. Based on the air monitoring results, the environmental consultant may order a stoppage of the work or require modified work practices to reduce emissions.

Periodically throughout the day the location of excavation work or the general wind direction may change. When this occurs a new exclusion zone evaluation must be conducted. This would include an evaluation of wind direction in order to establish upwind and downwind directions, and continuous monitoring of VOCs and particulates in upwind and downwind locations.

2.2 Air Sampling Methodology and Equipment

Air Monitoring for VOCS and particulates will be performed at upwind and downwind locations. One upwind and two downwind monitoring stations will be employed, as necessary, to provide sufficient coverage of intrusive activities that have the potential to emit volatile organics or dust. Each monitoring station will comprise real-time air monitoring instruments. The specific air monitoring equipment is summarized in Table 2.2.1. The equipment, which will be field calibrated prior to each days use, will be capable of calculating 15-minute running average or less concentrations for comparison to appropriate action levels.

Table 2.2.1 Air Monitoring Equipment

Analyte	Sampling Method	Duration	Comments
VOCs	MultiRAE Plus PID	Continuously, upwind and downwind of exclusion zone during work hours.	Real Time Analysis
Particulates (PM-10)	TSI DustTRAK Aerosol Monitor	Continuously, upwind and downwind of exclusion zone during work hours.	Real Time Analysis

As shown in Table 2.2.1, each air monitoring station will include a MultiRAE Plus Photolonization Detector (PID) and Multigas Meter (or equivalent) for VOCs and TSI DustTRAK Aerosol Monitor (or equivalent) for particulates. The upwind monitoring station will also include a Davis Vantage Pro2 Weather Station (or equivalent) to record wind speed, wind direction, rainfall, temperature and humidity. All monitoring instruments will be connected with radiofrequency (RF) transmitters (Campbell Scientific CR206). An RF receiver will be located in the on-site field office trailer connected with a computer running Campbell Scientific LoggerNet 3.3 software (or equivalent) for datalogging.

3.0 AIR MONITORING DATA EVALUATION

3.1 Air Quality Action Levels and Responses

Action levels for VOC concentrations will be based on the NYSDOH Generic Community Air Monitoring Plan. The initial threshold for VOC action is 5 parts per million (ppm). If the ambient air concentration of total VOCs at the downwind perimeter of the exclusion zone exceeds 5 ppm above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases below 5ppm over background, work activities can resume with continued monitoring.

If total VOC levels at the downwind perimeter of the work area of exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After this, work activities can resume provided that the total VOC concentration downwind of the exclusion zone is below 5 ppm over background for the 15-minute average. If the VOC level is above 25 ppm at the downwind monitoring location, activities will be shut down.

Particulate (PM-10) concentrations will also be compared to Action levels and responded to, as outlined in the NYSDOH Generic Community Air Monitoring Plan. The initial threshold for particulate/dust action is 100 micrograms per cubic meter (ug/m^3). If the downwind particulate level is 100 ug/m^3 greater than the background (upwind) level for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind particulate levels do not exceed 150 ug/m^3 above the upwind level and provided that no visible dust is migrating form the work area.

If dust suppression techniques have been employed and downwind particulate levels are greater than 150 ug/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind particulate concentration to within 150 ug/m^3 of the upwind level and in preventing visible dust migration.

All 15-minute averages will be datalogged at one-minute intervals and maintained for review by New York State Department of Environmental Conservation (NYSDEC) and NYSDOH personnel.

3.2 Notification

The NYSDEC will be promptly notified prior to any modification of the CAMP and of any corrective actions required for CAMP compliance, and VOC and particulate monitoring.

APPENDIX A

NYSDEC GENERIC CAMP

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

APPENDIX D

CITIZEN PARTICIPATION PLAN

New York State Department of Environmental Conservation Brownfield Cleanup Program

CITIZEN PARTICIPATION PLAN

for

Bethpage Community Park Ice Rink Area

Stewart Avenue
Bethpage
Nassau, New York

NYSDEC Site No. C130212

January 2014

Prepared for:

Town of Oyster Bay
Department of Public Works
150 Miller Place
Syosset, New York 11791

Prepared by:

H2M Architects + Engineers
538 Broad Hollow Road
4th Floor East
Melville, New York 11747

CITIZEN PARTICIPATION PLAN

BETHPAGE COMMUNITY PARK ICE RINK AREA

NYSDEC SITE NO. C130212

STEWART AVENUE

BETHPAGE, NEW YORK

JANUARY 2014

Contents

* * * * *

Note: The information presented in this Citizen Participation Plan was current as of the date of its approval by the New York State Department of Environmental Conservation. Portions of this Citizen Participation Plan may be revised during the site's investigation and cleanup process.

Applicant: **Town of Oyster Bay**
Site Name: **Bethpage Community Park Ice Rink Area (Site)**
Site Address: **Stewart Avenue, Bethpage, New York**
Site County: **Nassau**
Site Number: **C130212**

1. What is New York's Brownfield Cleanup Program?

New York's Brownfield Cleanup Program (BCP) works with property owners and developers to encourage the voluntary cleanup of properties known as "brownfields."

A brownfield typically is a former industrial or commercial property where operations may have resulted in environmental impacts. The presence or potential presence of contamination can affect the use of the property.

The BCP is administered by the New York State Department of Environmental Conservation (NYSDEC) which oversees Applicants that conduct brownfield site investigation and cleanup activities. An Applicant is a person who has requested to participate in the BCP and has been accepted by NYSDEC. The BCP contains investigation and may include cleanup activity, ensuring protection of public health and the environment.

For more information about the BCP, go online at: http://www.dec.ny.gov/chemical/8450.html .

2. Citizen Participation Activities

Why NYSDEC Involves the Public and Why It Is Important

NYSDEC involves the public to improve the process of investigating and cleaning up contaminated properties, and to enable citizens to participate more fully in decisions that affect their health, environment, and social well being. NYSDEC provides opportunities for citizen involvement and encourages early two-way communication with citizens before decision makers form or adopt final positions.

Involving citizens affected and interested in investigation and cleanup programs is important for many reasons. These include:

- Promoting the development of timely, effective investigation and cleanup programs that protect public health and the environment.

- Improving public access to, and understanding of, issues and information related to a particular site and that site's investigation and cleanup process.

- Providing citizens with early and continuing opportunities to participate in NYSDEC's site investigation and cleanup process.

- Ensuring that NYSDEC makes site investigation and cleanup decisions that benefit from input that reflects the interests and perspectives found within the affected community.

- Encouraging dialogue to promote the exchange of information among the affected/interested public, State agencies, and other interested parties that strengthens trust among the parties, increases understanding of site and community issues and concerns, and improves decision making.

This Citizen Participation (CP) Plan provides information about how NYSDEC will inform and involve the public during the investigation and cleanup of the site identified and defined herein (Site). The public information and involvement program will be carried out with assistance, as appropriate, from the Applicant.

Project Contacts

Appendix A identifies NYSDEC project contact(s) to whom the public should address questions or request information about the Site's investigation and cleanup program. The public's suggestions about this CP Plan and the CP program for the Site are always welcome. Interested people are encouraged to share their ideas and suggestions with the project contacts at any time.

Locations of Reports and Information

The locations of the reports and information related to the Site's investigation and cleanup program also are identified in Appendix A. These locations provide convenient access to important project documents for public review and comment. Some documents may be placed on the NYSDEC web site. If this occurs, NYSDEC will inform the public in fact sheets distributed about the Site and by other means, as appropriate.

Site Contact List

Appendix B contains the Site contact list. This list has been developed to keep the community informed about, and involved in, the Site's investigation and cleanup process. The Site contact list will be used periodically to distribute fact sheets that provide updates about the status of the project. These will include notifications of upcoming activities at the Site (such as fieldwork), as well as availability of project documents and announcements about public comment periods.

The Site contact list includes, at a minimum:

- chief executive officer and planning board chairperson of each county, city, town and village in which the Site is located;
- residents[1], owners, and occupants of the Site and properties adjacent to the Site;
- the public water supplier which services the area in which the Site is located;
- any person who has requested to be placed on the Site contact list;
- the administrator of any school or day care facility located on or near the Site for purposes of posting and/or dissemination of information at the facility;
- location(s) of reports and information.

The Site contact list will be reviewed periodically and updated as appropriate. Individuals and organizations will be added to the Site contact list upon request. Such requests should be submitted to the NYSDEC project contact(s) identified in Appendix A. Other additions to the Site contact list may be made at the discretion of the NYSDEC project manager, in consultation with other NYSDEC staff as appropriate.

CP Activities

The table at the end of this section identifies the CP activities, at a minimum, that have been and will be conducted during the Site's investigation and cleanup program. The flowchart in Appendix D shows how these CP activities integrate with the Site investigation and cleanup process. The public is informed about these CP activities through fact sheets and notices distributed at significant points during the program. Elements of the investigation and cleanup process that match up with the CP activities are explained briefly in Section 5.

- **Notices and fact sheets** help the interested and affected public to understand contamination issues related to a site, and the nature and progress of efforts to investigate and clean up a site.

- **Public forums, comment periods and contact with project managers** provide opportunities for the public to contribute information, opinions and perspectives that have potential to influence decisions about a site's investigation and cleanup.

[1] Residential contacts are maintained by NYSDEC in a separate document.

- **Town of Oyster Bay Department of Environmental Resources** (516- 677-5824) can also be contacted for information regarding the Site and the BCP.

The public is encouraged to contact project staff at any time during the Site's investigation and cleanup process with questions, comments, or requests for information.

This CP Plan may be revised due to changes in major issues of public concern identified in Section 3 or in the nature and scope of investigation and cleanup activities. Modifications may include additions to the Site contact list and changes in planned citizen participation activities.

Technical Assistance Grant

NYSDEC must determine if the Site poses a significant threat to public health or the environment. This determination generally is made using information developed during the investigation of the Site, as described in Section 5.

If the Site is determined to be a significant threat, a qualifying community group may apply for a Technical Assistance Grant (TAG). The purpose of a TAG is to provide funds to the qualifying group to obtain independent technical assistance. This assistance helps the TAG recipient to interpret and understand existing environmental information about the nature and extent of contamination related to the Site and the development/implementation of a remedy.

An eligible community group must certify that its membership represents the interests of the community affected by the Site, and that its members' health, economic well-being or enjoyment of the environment may be affected by a release or threatened release of contamination at the Site.

For more information about TAGs, go online at http://www.dec.ny.gov/regulations/2590.html

Note: The table identifying the citizen participation activities related to the Site's investigation and cleanup program follows on the next page:

Citizen Participation Activities

Citizen Participation Requirements (Activities)	Timing of CP Activity(ies)
Application Process:	
• Prepare Site contact list • Establish document repositories	At time of preparation of application to participate in the BCP.
• Publish notice in Environmental Notice Bulletin (ENB) announcing receipt of application and 30-day public comment period • Publish above ENB content in local newspaper • Mail above ENB content to Site contact list • Conduct 30-day public comment period	When NYSDEC determines that BCP application is complete. The 30-day public comment period begins on date of publication of notice in ENB. End date of public comment period is as stated in ENB notice. Therefore, ENB notice, newspaper notice, and notice to the Site contact list should be provided to the public at the same time.
After Execution of Brownfield Site Cleanup Agreement:	
• Prepare Citizen Participation (CP) Plan	Before start of Remedial Investigation
Before NYSDEC Approves Remedial Investigation (RI) Work Plan:	
• Distribute fact sheet to Site contact list about proposed RI activities and announcing 30-day public comment period about draft RI Work Plan • Conduct 30-day public comment period	Before NYSDEC approves RI Work Plan. If RI Work Plan is submitted with application, public comment periods will be combined and public notice will include fact sheet. Thirty-day public comment period begins/ends as per dates identified in fact sheet.
After Applicant Completes Remedial Investigation:	
• Distribute fact sheet to Site contact list that describes RI results	Before NYSDEC approves RI Report
Before NYSDEC Approves Remedial Work Plan (RWP):	
• Distribute fact sheet to Site contact list about proposed RWP and announcing 45-day public comment period • Public meeting by NYSDEC about proposed RWP (if requested by affected community or at discretion of NYSDEC project manager) • Conduct 45-day public comment period	Before NYSDEC approves RWP. Forty-five day public comment period begins/ends as per dates identified in fact sheet. Public meeting would be held within the 45-day public comment period.
Before Applicant Starts Cleanup Action:	
• Distribute fact sheet to Site contact list that describes upcoming cleanup action	Before the start of cleanup action.
After Applicant Completes Cleanup Action:	
• Distribute fact sheet to Site contact list that announces that cleanup action has been completed and that summarizes the Final Engineering Report • Distribute fact sheet to Site contact list announcing issuance of Certificate of Completion (COC)	At the time NYSDEC approves Final Engineering Report. These two fact sheets are combined if possible if there is not a delay in issuing the COC.

3. Major Issues of Public Concern

This section of the CP Plan identifies major issues of public concern that relate to the Site. Additional major issues of public concern may be identified during the course of the Site's investigation process.

A Freon™ compound (chlorodifluoromethane or Freon 22™) has been identified in shallow groundwater and soil vapor near the Site. The presence of Freon 22™ in groundwater and soil vapor has been determined by NYSDEC to have emanated from an ice skating rink that existed at the subject Site prior to construction of the current facility. Impacts to groundwater and soil vapor are a concern for the local community and public water purveyors as well as private water well owners and operators. The Freon 22™ groundwater plume is considered a sub-plume to a much larger volatile organic compound (VOC) plume that exists in the area. The larger plume is predominantly the result of historic manufacturing and discharge activity conducted in the Bethpage area by Grumman Aerospace Corp.

4. Site Information

The subject Site is located on Stewart Avenue in Bethpage, New York, within the Town of Oyster Bay. Appendix C contains a map (Figure 1) identifying the location of the Site. The Site is approximately 0.4 acres in size and is situated within the 18-acre Bethpage Community Park. The Site encompasses the footprint of two former ice skating rinks, now demolished and replaced by a new ice skating center. To the immediate west, southwest, and south are additional recreational facilities within the Park. Within Bethpage Community Park, there exists a swimming pool, basketball court, tennis courts, ball-fields and the recently constructed indoor ice skating facility. The surrounding area, outside the boundaries of the Park, includes a mix of land uses including residential, commercial and school properties. The Site is currently utilized for recreational purposes and the intent is to continue with the same use.

Portions of the overall park property were once utilized for waste disposal purposes including industrial wastewater treatment sludge, spent paint booth rag disposal, and possible used oil disposal by the prior owner, Grumman Aerospace Corp. (a predecessor to Northrop Grumman Corporation (Grumman)). The former park area was also used for fire training. Portions of the park are currently closed, pending remediation. The ice skating center lies within the overall boundaries of the Bethpage Community Park which is being investigated and remediated by Grumman and the NAVY as Operable Unit 3 (OU 3) of the Grumman Aerospace site. Soils in the vicinity of the ice skating rink have been remediated by the Town as part of an interim remedial measure. NYSDEC has determined that two former ice skating rinks, located in the same area as the current ice skating center, leaked Freon™ into the soils and subsequently to groundwater. The Town of Oyster Bay has applied to enter into a Brownfields Cleanup Agreement with NYSDEC to further investigate and/or remediate Freon™ impacts to soil vapor and groundwater.

The Site and immediate surrounding area has been utilized as a Town Park since the mid-1960s. Prior to that it was owned by Grumman. Grumman began operating in the Bethpage area in the

early 1930's. Beginning in the 1940's, Grumman's operations included: chemical milling, plating, and degreasing operations. During this time period, disposal of chromic acid wastes was conducted in open seepage basins or directly on the ground. This practice ended in 1949 after chromium contamination was discovered in a public water supply well located south of the plant. After 1949, neutralized chromic acid wastes were dried in the settling ponds and then shipped offsite for disposal. This ended soon after 1962 when the property was transferred to the Town of Oyster Bay.

The Site is located on Long Island glacial sand deposits which have been designated as a sole source aquifer. Depth to groundwater (in the upper glacial aquifer) is 50 to 60 feet below ground surface and flow is generally south-southeasterly and slightly downward. The upper glacial aquifer is underlain by the magothy aquifer which is a primary source of drinking water. Periodic lower permeability silty-sand and clay lenses exist throughout the area. Most of these confining layers are not continuous in the local area. The Site and Park area are situated approximately 125 feet above mean sea level and topographically, are generally flat.

Investigations in the area of the Park have found significant soil, soil vapor, and groundwater contamination. The primary soil contaminants are VOCs, VOC breakdown products, PCBs, chromium and cadmium. The primary Park area related groundwater and soil vapor contaminants are VOCs. The Park area soil vapor and groundwater concerns are being addressed by Northrop Grumman Corporation through the implementation of two Interim Remedial Measures. As indicated above, the Freon™ compound identified in soil vapor and groundwater has been determined by NYSDEC to have emanated from the former ice skating rink facilities located at the Site. Groundwater migration from the Former Grumman Settling Ponds Area (OU3) has resulted in a significant groundwater plume which has impacted both the Upper Glacial and Magothy formations. It is not currently known whether any significant concentrations of Freon 22™ have migrated south of the Park area. Review and/or delineation of the Freon 22™ impacts to soil vapor and groundwater will be one of the goals of the remedial investigation to be conducted as part of the BCP process.

5. Investigation and Cleanup Process

The Applicant has applied for and been accepted into New York's Brownfield Cleanup Program. This means that the Applicant was the owner of the Site at the time of the disposal or discharge of contaminants. The Participant must fully characterize the nature and extent of contamination on the Site, as well as the nature and extent of contamination that has migrated from the Site.

The Applicant in its application proposes that the Site will be used for recreational purposes. To achieve this goal, the applicant will conduct investigation activities at the Site with oversight provided by NYSDEC. The Brownfield Cleanup Agreement executed by NYSDEC and the Applicant sets forth the responsibilities of each party in conducting these activities at the Site.

Investigation

The Applicant will conduct an investigation of the site officially called a "remedial investigation" (RI). This investigation will be performed with NYSDEC oversight. The Applicant must develop a remedial investigation workplan, which is subject to public comment.

The site investigation has several goals:

1) define the nature and extent of contamination in soil vapor and groundwater;
2) identify the source(s) of the contamination;
3) assess the impact of the contamination on public health and the environment; and
4) provide information to support the development of a proposed remedy to address the contamination or the determination that cleanup is not necessary.

The proposed site investigation will include:

- Data compilation and review;
- Field investigation (groundwater and soil vapor sampling and laboratory analysis of samples) to determine the areal and vertical extent of VOC impacts;
- Comparison to applicable standards, criteria and guidelines;
- Qualitative exposure assessment; and
- Recommendations and reporting.

When the investigation is complete, the Applicant will prepare and submit a report that summarizes the results. This report also will recommend whether cleanup action is needed to address site-related contamination. The investigation report is subject to review and approval by NYSDEC.

NYSDEC will use the information in the investigation report to determine if the site poses a significant threat to public health or the environment. If the site is a significant threat, it must be cleaned up using a remedy selected by NYSDEC from an analysis of alternatives prepared by the Applicant and approved by NYSDEC. If the site does not pose a significant threat, the Applicant may select the remedy from the approved analysis of alternatives.

Remedy Selection

When the investigation of the site has been determined to be complete, the project likely would proceed in one of two directions:

1. The Applicant may recommend in its investigation report that no action is necessary at the site. In this case, NYSDEC would make the investigation report available for public comment for 45 days. NYSDEC then would complete its review, make any necessary revisions, and, if appropriate, approve the investigation report. NYSDEC would then issue a Certificate of Completion (described below) to the Applicant.

or

2. The Applicant may recommend in its investigation report that action needs to be taken to address site contamination. After NYSDEC approves the investigation report, the Applicant may then develop a cleanup plan, officially called a Remedial Work Plan. The Remedial Work Plan describes the Applicant's proposed remedy for addressing contamination related to the site.

When the Applicant submits a proposed Remedial Work Plan for approval, NYSDEC would announce the availability of the proposed plan for public review during a 45-day public comment period.

Cleanup Action

NYSDEC will consider public comments, and revise the draft cleanup plan if necessary, before approving the proposed remedy. The New York State Department of Health (NYSDOH) must concur with the proposed remedy. After approval, the proposed remedy becomes the selected remedy.

The Applicant may then design and perform the cleanup action to address the site contamination. NYSDEC and NYSDOH oversee the activities. When the Applicant completes cleanup activities, it will prepare a final engineering report that certifies that cleanup requirements have been achieved or will be achieved within a specific time frame. NYSDEC will review the report to be certain that the cleanup is protective of public health and the environment for the intended use of the site.

Certificate of Completion

When NYSDEC is satisfied that cleanup requirements have been achieved or will be achieved for the site, it will approve the final engineering report. NYSDEC then will issue a Certificate of Completion (COC) to the Applicant. The COC states that cleanup goals have been achieved, and relieves the Applicant from future liability for site-related contamination, subject to certain conditions.

Site Management

Site management is the last phase of the site cleanup program. This phase begins when the COC is issued. Site management may be conducted by the Applicant under NYSDEC oversight, if contamination will remain in place. Site management incorporates any institutional and engineering controls required to ensure that the remedy implemented for the site remains protective of public health and the environment. All significant activities are detailed in a Site Management Plan.

An institutional control is a non-physical restriction on use of the site, such as a deed restriction that would prevent or restrict certain uses of the property. An institutional control may be used when the cleanup action leaves some contamination that makes the site suitable for some, but not all uses.

An engineering control is a physical barrier or method to manage contamination. Examples include: caps, covers, barriers, fences, and treatment of water supplies.

Site management also may include the operation and maintenance of a component of the remedy, such as a system that is pumping and treating groundwater. Site management continues until NYSDEC determines that it is no longer needed.

Appendix A
Project Contacts and Locations of Reports and Information

Project Contacts

For information about the Site's investigation and cleanup program, the public may contact any of the following project staff:

New York State Department of Environmental Conservation (NYSDEC):

Steven Scharf
Project Manager
NYSDEC
Division of Environmental Remediation
625 Broadway
Albany, NY 12233
(518) 402-9620
sxscharf@gw.dec.state.ny.us

William (Bill) Fonda
Citizen Participation Specialist
NYSDEC
Region 1 Office
SUNY @ Stony Brook
50 Circle Road
Stony Brook, NY 11790
(631) 444-0350

New York State Department of Health (NYSDOH):

Steven Karpinski
NYSDOH
Bureau of Environmental Exposure Investigation
Empire State Plaza, Corning Tower, Room 1787
Albany, NY 12237
(518) 402-7880

Town of Oyster Bay:

Town of Oyster Bay
Department of Environmental Resources
150 Miller Place
Syosset, NY 11791
(516) 677-5824

Locations of Reports and Information

The facilities identified below are being used to provide the public with convenient access to important project documents:

Bethpage Public Library
47 Powell Avenue
Bethpage, NY 11714

NYSDEC Region 1
SUNY @ Stony Brook
50 Circle Road
Stony Brook, NY 11790-3409
Phone: (631)444-0200
Hours: Monday - Friday 8:30 a.m. to 4:45 p.m. (call for appointment)

Appendix B: Site Contact List

County of Nassau
Edward P. Mangano, County Executive
County of Nassau
Office of the County Executive
1550 Franklin Avenue
Mineola, NY 11501

Town of Oyster Bay
John Venditto, Town Supervisor
Town of Oyster Bay, Town Hall
54 Audrey Avenue
Oyster Bay, NY 1 1771

Massapequa Water District
84 Grand Ave.
Massapequa, NY 11758
info@massapequawater.com

South Farmingdale Water District
40 Langdon Rd., P.O. Box 3319
Farmingdale, NY 11735

American Water Works Association
614 Seventh North St.
Liverpool, NY 13088

The Honorable Charles Schumer
U.S. Senate
145 Pine Lawn Road, #300
Melville, NY 11747

The Honorable Peter T. King
U.S. House of Representatives
1003 Park Boulevard
Massapequa Park, NY 11762

The Honorable Carl L. Marcellino

New York State Senate
250 Townsend Square
Oyster Bay, NY 11771

The Honorable James D. Conte
New York State Assembly
1783 New York Avenue
Huntington Station, NY 11746

The Honorable Joseph S. Saladino
New York State Assembly
200 Boundary Ave.
Massapequa, NY 11758

The Honorable David W. Denenberg
Nassau County Legislature
1 West Street
Mineola, NY 11501

The Honorable Rose Marie Walker
Nassau County Legislature
1 West Street
Mineola, NY 11501

The Honorable Kate Murray
Hempstead Town Hall
One Washington Street
Hempstead, NY 11550

The Honorable Ralph Ekstrand
Farmingdale Mayor's Office
361 Main Street
Farmingdale, NY 11735

Nassau County Coalition of Civic Associations
P.O. Box 202,
Rockville Centre, NY 11570

Phillip Franco, President
Seaford Harbor Civic Association
P.O. Box 2452
Seaford, NY 11783

Ms. Adrienne Esposito
Citizen's Campaign for the Environment
225A Main Street
Farmingdale, NY 11735

Newsday
235 Pinelawn Rd
Melville. NY. 11 747

The Bethpage Tribune
PO Box399
Bethpage, NY 11714

Bethpage Water District
25 Adams Avenue
Bethpage, NY 11714

Terrence Claric, Superintendent
Bethpage Union Free School District
Administration Building
10 Cherry Avenue
Bethpage, NY 11714
Bethpage Public Library
47 Powell Avenue
Bethpage, NY 11714

Bethpage Senior High School/ Union Free School District #21
10 Cherry Avenue
Bethpage, NY 11714

Northrop Grumman Corp.
92 Cherry Avenue
Bethpage, NY 11714

Mailing Address: 600 Grumman Road West
Bethpage, NY 11714

Sterling Equities, Inc.
ATTN: Patrick Koster
999 Stewart Avenue
Bethpage, NY 11714

Mailing Address: 111 Great Neck Road
Suite 408
Great Neck, NY 11021

Metro Resources, Inc.
900 Stewart Avenue
Bethpage, NY 11714

Mailing Address: PO Box 1006
West Hampton Beach, NY 11978

Hellenic Orthodox Church of America
910 Stewart Avenue
Bethpage, NY 11714

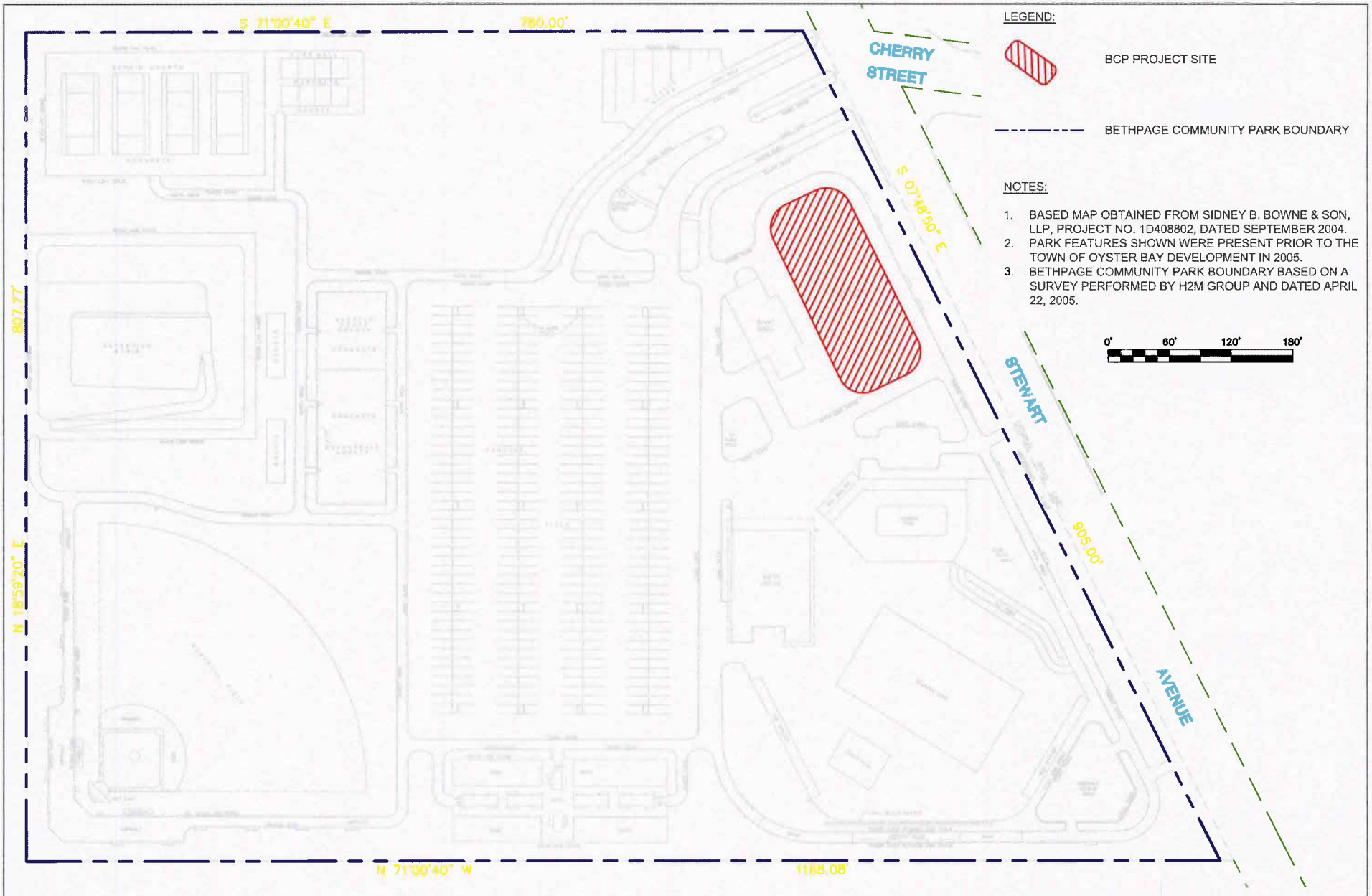
Mailing Address: 22-68 26th Street
Astoria, NY 11105

Mrs. Grace Parsekian/ St. Isidoros Hellenic Church
926 Stewart Avenue
Bethpage, NY 11714

Mailing Address: 910 Stewart Avenue
Bethpage, NY 11714

Note: A residential site contact list is maintained by NYSDEC under separate cover.

Appendix C
Site Location Map



PROJECT:
BROWNFIELD CLEANUP PROGRAM PROJECT
BETHPAGE COMMUNITY PARK ICE RINK AREA
TOWN OF OYSTER BAY
BETHPAGE, NEW YORK
NYSDEC SITE NO.: C130212

DRAWING:
FIGURE 1: SITE LOCATION MAP
CITIZEN PARTICIPATION PLAN

SCALE: AS SHOWN

N

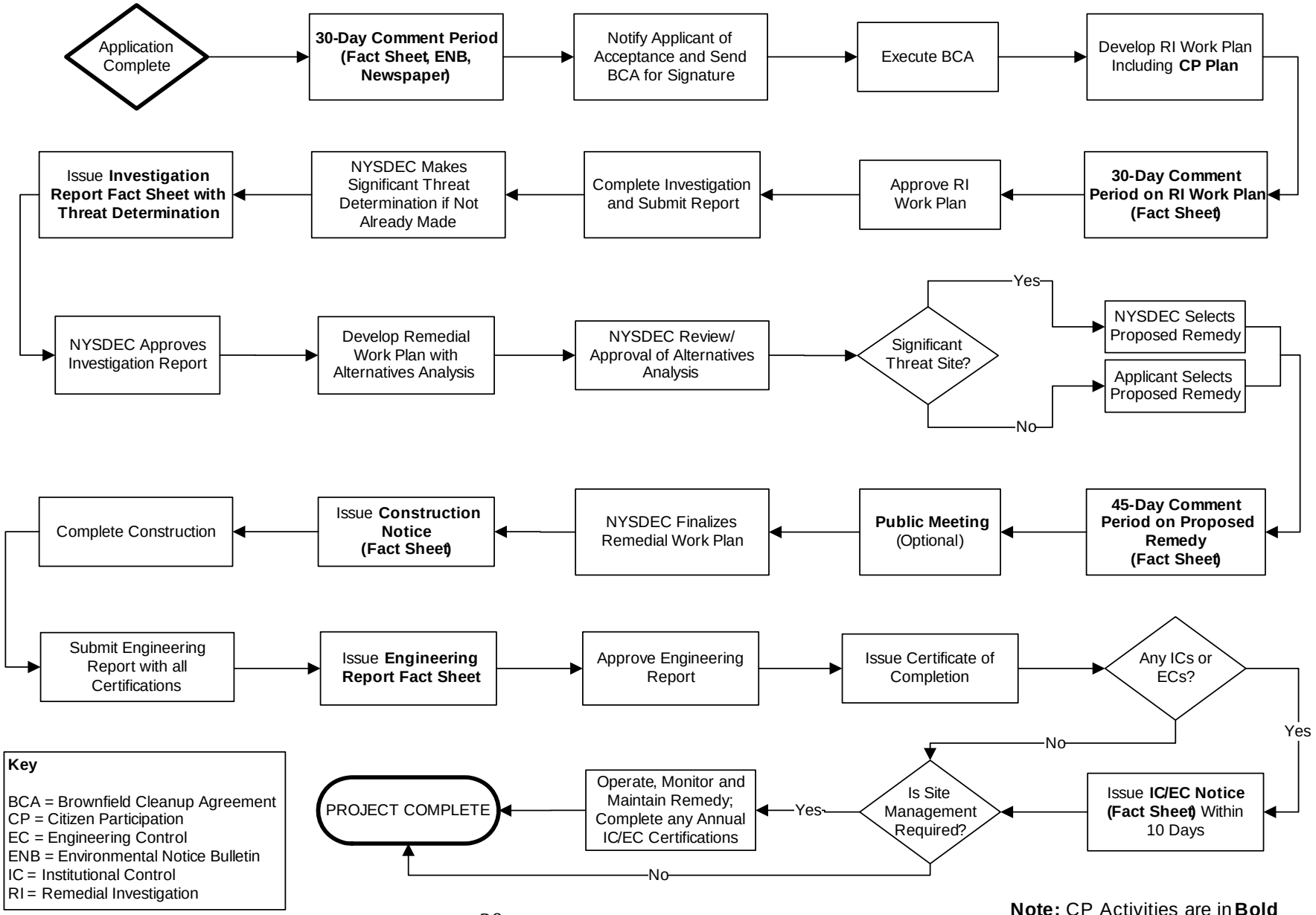
H2M PROJECT NO.:
TOBY1203

DATE:
MAY 31, 2012

H2M architects + engineers
Melville, NY Albany, NY
New City, NY Parsippany, NJ

M:\cadd\TOBY\1203 (Bethpage Pk Env Consulting)\2012-05-31 CPP\Figure 1 - Site Location Map.dwg Last Modified: May 24, 2012 - 10:33am Plotted on: May 24, 2012 - 10:39am By sday

Appendix D– Brownfield Cleanup Program Process



Note: CP Activities are in **Bold**