2015 OU2 GROUNDWATER INVESTIGATION
RE121D1, RE121D2 (VPB155)
INSTALLATION REPORT

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT (NWIRP)
SITE 1 OU2
BETHPAGE, NY

Prepared for:

Department of the Navy
Naval Facilities Engineering Command, Atlantic
9324 Virginia Avenue
Building Z-144
Norfolk, Virginia 23511

March 2016

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9324 Virginia Avenue
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Prepared by:

Resolution Consultants
A Joint Venture of AECOM & EnSafe
1500 Wells Fargo Building
440 Monticello Avenue
Norfolk, Virginia 23510

Contract Number: N62470-11-D-8013
CTO WE15

March 2016

Brian Caldwell
Contract Task Order Manager

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List of Acronyms and Abbreviations

AOC	Area of Concern
bgs	below ground surface
COR	Continuously Operating Reference
EPA	Environmental Protection Agency, United States
ESS	Environmental Sequence Stratigraphy
ft	feet
GOCO	Government-Owned Contractor-Operated
GPS	Global Positioning System
IDW	Investigation Derived Waste
IR	Installation Restoration
Katahdin	Katahdin Analytical Services
NAD	North American Datum
NAVD	North American Vertical Datum
NAVFAC	Naval Facilities Engineering Command
NG	Northrop Grumman
NTU	nephelometric turbidity units
NWIRP	Naval Weapons Industrial Reserve Plant
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
OU	Operable Unit
PCBs	Polychlorinated Biphenyls
POTW	Publicly Owned Treatment Works
PPE	Personal Protective Equipment
PVC	Polyvinylchloride
SAP	Sampling and Analysis Plan
SVOC	Semivolatile Organic Compounds
TCE	Trichloroethene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TOC	Total Organic Carbon
UFP	United Federal Programs
US	United States
VOC	Volatile Organic Compounds
VPB	Vertical Profile Boring

1.0 PROJECT BACKGROUND

Resolution Consultants has prepared this Data Summary Report for the Naval Facilities Engineering Command (NAVFAC), Mid-Atlantic under contract task order WE15 Contract N62470-11-D-8013. This report describes the installation of two monitoring wells and one initial quarterly groundwater monitoring event (specifically at the Vertical Profile Boring [VPB] 155 location) in 2015 for the Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage Operable Unit (OU) 2 Site 1 offsite plume. NWIRP Bethpage is located in east-central Nassau County, Long Island, New York, approximately 30 miles east of New York City (Figure 1).

1.1 Scope and Objectives

This report provides information on the installation of two wells (RE121D1 and RE121D2) associated with the VPB155 location. The purpose of this investigation was to ascertain contaminant levels and depths in the offsite plume area south of Hempstead Turnpike, north of Southern State Parkway, and east of Hicksville Road and to better define the southeastern leading edge of the RE108 hotspot. The locations of RE121D1 and RE121D2, VPBs and monitoring well locations are shown in Figure 2.

The field investigation included completing two monitoring wells, well development, soil/groundwater analysis, groundwater grab samples, and surveying. Field tasks were conducted in 2015 in accordance with the *United Federal Programs Sampling and Analysis Plan (UFP SAP)*, Bethpage, New York (Resolution, 2013a). In addition, the work adhered to the following UFP SAP Addendums: *Groundwater Sampling Using Low Stress (Low Flow) Purging and Sampling Protocol* (Resolution Consultants, 2013b) and *Installation of Vertical Profile Borings and Monitoring Wells* (Resolution Consultants, 2013c).

Documentation of these activities is included in Appendix A of this report.

1.2 Site History

NWIRP Bethpage is in the Hamlet of Bethpage, Town of Oyster Bay, New York. Since its inception in 1941, the plant's primary mission was the research, prototyping, testing, design, engineering, fabrication, and primary assembly of military aircraft. The facilities at NWIRP included four plants used for assembly and prototype testing, a group of quality control laboratories, two warehouse complexes (north and south), a salvage storage area, water recharge basins, the Industrial Wastewater Treatment Plant, and several smaller support buildings.

The Navy's property originally totaled 109.5 acres and was formerly a Government-Owned Contractor-Operated (GOCO) facility that was operated by Northrop Grumman (NG) until September 1998. Prior to 2002, the NWIRP property was bordered on the north, west, and south by current or former NG facilities, and on the east by a residential neighborhood. By March 2008, approximately 100 acres of NWIRP property were transferred to Nassau County in three separate actions. The remaining 9 acres and access easements were retained by the Navy to continue remedial efforts at Installation Restoration (IR) Site 1 – Former Drum Marshalling Area and Site 4 – Former Underground Storage Tanks (Area of Concern [AOC] 22). A parcel of land connecting the two sites was also retained. Currently, the 9-acre parcel of NWIRP is bordered on the east by the residential neighborhood and on the north, south, and west by Steel Equities; however, a small portion is still owned by Nassau County. Access to the NWIRP is from South Oyster Bay Road.

1.3 Geology and Hydrogeology

Overburden at the site consists of well over 1,000 feet (ft) of unconsolidated deposits overlying crystalline bedrock of the Hartland Formation. Overburden is divided into four geologic units: the upper Pleistocene deposits, the Magothy Formation, the clay member of the Raritan Formation ("Raritan Clay") and the Lloyd Sand member of the Raritan Formation ("Lloyd Sand") (Geraghty and Miller, 1994).

The upper Pleistocene ranges in thickness from approximately 50 to 100 ft and consists of till and outwash deposits of medium to coarse sand and gravel with lenses of fine sand, silt and clay (Smolensky and Feldman, 1990); these deposits form the Upper Glacial Aquifer. Directly underlying this unit is the Magothy Formation with a thickness of 650 to 900 ft and lower extent of 700 to 1000 ft below ground surface (bgs), as observed at the former NWIRP and extending southeast to areas south of Southern State Parkway. Locally at the RE121 locations, the bottom of the Magothy (top of the Raritan Clay) is encountered at approximately 950 feet bgs. The Magothy is characterized by fine to medium sands and silts interbedded with zones of clays, silty sands and sandy clays. Sand and gravel lenses are found in some areas between depths of 600 and 880 ft bgs; these deposits form the main producing zones of the Magothy Aquifer.

Investigations performed by the Navy since 2012 indicate that the bottom of the Magothy (top of the Raritan Clay) can extend to depths of 700 to greater than 1,000 ft bgs. The top of the Raritan Clay deepens to the south-southeast, as evidenced by clay depths of 1,000 ft bgs (or more) in borings installed offsite. The Raritan Clay Unit is of continental origin and consists of clay, silty clay, clayey silt, and fine silty sand. This member acts as a confining layer over the Lloyd Sand Unit. The Lloyd Sand Unit is also of continental origin, having been deposited in a large fresh water lacustrine

environment. The material consists of fine to coarse-grained sands, gravel, inter-bedded clay, and silty sand. These deposits form the Lloyd Aquifer.

The Upper Glacial Aquifer and the Magothy Aquifer comprise the aquifers of interest at the NWIRP. Regionally, these formations are generally considered to form a common, interconnected aquifer as the coarse nature of each unit near their contact and the lack of any regionally confining clay unit allows for the unrestricted flow of groundwater between the formations.

The Magothy Aquifer is the major source of public water in Nassau County. The most productive water bearing zones are the discontinuous lenses of sand and gravel that occur within the siltier matrix. The major water-bearing zones are coarse sand and gravel lenses located in the lower portion of the Magothy. The Magothy Aquifer is commonly regarded to function overall as an unconfined aquifer at shallow depths and a confined aquifer at deeper depths. The drilling program at the NWIRP has revealed that clay zones beneath the facility are common, and above depths of approximately 500 feet bgs are laterally discontinuous. Preliminary cross section results from Environmental Sequence Stratigraphy (ESS) analysis suggests that below depths of approximately 500 feet bgs some clay layers may be persistent in a north-south direction; additional ESS cross section analyses are planned for the east-west direction.

Groundwater is encountered at a depth of approximately 50 ft bgs at the facility. Historically, because of pumping and recharge at the facility, groundwater depths have been measured to range from 40 to 60 ft bgs. The groundwater flow in the area is to the south-southeast.

2.0 FIELD PROGRAM

Two monitoring wells (RE121 series wells) were installed in the vicinity of VPB155 between October and November 2015. Field investigation activities consisted of drilling, well installation, well development, sampling, soil/groundwater analysis, and surveying. Drilling during this investigation was performed by Delta Well and Pump Company of Ronkonkoma, New York. A description of these tasks is provided below.

2.1 Drilling and Well Construction

Monitoring wells RE121D1 and RE121D2 were installed using mud rotary drilling techniques (Figure 2). Depths of monitoring wells RE121D1 and RE121D2 were 575 ft and 755 ft respectively. Well construction details are summarized in Table 1. Boring logs with lithologic descriptions of the well screen interval are included in the Appendix A. *2015 OU2 Groundwater Investigation VPB155* (Resolution Consultants, 2016) documents the installation of this VPB including detailed lithologic descriptions, continuous gamma plot and multiple Volatile Organic Compounds (VOC) sample results over the entire boring length.

Prior to installing each monitoring well, the results of the groundwater samples, the geophysical logs, lithology and field data from the vertical profile borings were analyzed. Screen intervals were determined based on this analysis: intervals with the highest VOC concentrations as measured in the hydropunch samples, and coincident intervals with the highest apparent permeability based on the gamma logs. During the monitoring well installation, split spoon samples were collected every 5 ft in the screen interval. One soil sample per monitoring well was analyzed for Total Organic Carbon (TOC) via United States (US) Environmental Protection Agency (EPA) series SW-846 method 9060A by Katahdin Analytical Services (Katahdin). Data validation of TOC data was performed by Resolution Consultants. Data validation packages and analytical data tables are included in Appendix A.

Wells were constructed of 4-inch diameter, Schedule 80, National Sanitation Foundation-approved polyvinylchloride (PVC) riser pipe and .010-slot well screen. Wells were completed at the surface with a 12-inch diameter steel curb box. Well risers were set below grade and fit with lockable J plugs. Detailed monitoring well construction diagrams are included in Appendix A.

2.2 Well Development

Following installation, all monitoring wells were developed to evacuate silts and other fine-grained materials and to establish the filter pack to promote a hydraulic connection between the well and

the surrounding aquifer. Well development was not initiated until at least 24 hours after well installation.

Monitoring well screens were developed using a combination of air lifting, manual surging, and pumping with a submersible pump. Turbidity was monitored during development to determine stabilization. In compliance with New York State Department of Environmental Conservation (NYSDEC) policy, wells were developed until turbidity was less than 50 nephelometric turbidity units (NTUs) if possible. Table 2 summarizes total pumped volume from air and pump development and final turbidity. Well development logs are included in Appendix A.

2.3 Sampling

Following development, wells were allowed to stabilize for at least 2 weeks prior to groundwater sampling in accordance with low flow sampling procedures. Wells were purged using a bladder pump with a drop tube intake placed at the approximate midpoint of the screened interval. The following water quality parameters were continuously measured: water temperature, pH, conductivity, oxidation-reduction potential, dissolved oxygen and turbidity. Groundwater analytical samples were collected when water quality parameters stabilized. Samples were analyzed for VOCs via method 8260B and 1,4-dioxane via Method 8270C by Katahdin. All development and purge water was managed as investigation derived waste (IDW). Groundwater sample logs and data validation packages are included in Appendix A.

Monitoring wells RE121D1 and RE121D2 are sampled quarterly as part of the Navy's ongoing Environmental Restoration Program. Resolution Consultants sampled these two wells during the December 2015 quarterly monitoring event. Analytical results and stabilized field parameters for these data are summarized in Table 3 and 4, respectively. Data validation is documented in Appendix A.

2.4 Decontamination and Investigation Derived Waste (IDW)

Resolution Consultants utilized dedicated and disposable sampling equipment when possible to avoid the potential for cross-contamination of samples. The sampling equipment included dedicated plastic scoops, disposable Teflon or polyethylene tubing, disposable gloves, and laboratory supplied sample bottles. Hand held equipment and split spoons were decontaminated using Liquinox and water wash, a potable water rinse, followed by a distilled water rinse. Water was collected in 5-gallon pails or 55-gallon drums. Non dedicated sampling equipment was decontaminated as outlined in the UFP SAP Addendum - *Groundwater Sampling Using Low Stress (Low Flow) Purging and Sampling Protocol* (Resolution Consultants, 2013b).

As part of the IDW management practices and in accordance with the SAP, the investigation waste (consisting of soil cuttings, drilling muds, IDW fluids, and personal protective equipment [PPE]) generated during the groundwater monitoring well installation and sampling was containerized and staged at NWIRP Bethpage.

IDW solids were containerized in roll offs. Representative samples from each roll off were submitted to Katahdin for analysis of:

- Target Compound List (TCL) VOCs
- TCL Semi-volatile Organic Compounds (SVOCs)
- Toxicity Characteristic Leaching Procedure (TCLP) Metals
- Polychlorinated Biphenyls (PCBs)
- Total petroleum hydrocarbons
- Corrosivity
- Ignitability
- Reactive Cyanide
- Reactive Sulfide
- Paint Filter

IDW fluid generated during well development and purging was containerized in frac tanks and stored at NWIRP Bethpage for characterization and ultimate disposal to the Publicly Owned Treatment Works (POTW), in accordance with the facilities existing discharge permit. A representative water sample was collected from each frac tank and submitted to Katahdin for analysis of VOCs via Method SW 624, pH via Method SW 9040B, PCBs via Method 8082 and Total Metals via Method SW 846. All analytical criteria were met for disposal of water.

2.5 Surveying

A survey of the monitoring well locations was conducted at the end of fieldwork by C. T. Male, Inc., of Latham, NY, under the direct supervision of Resolution Consultants. The locations were tied into the existing base map developed for this investigation. The survey elevation is referenced to the North American Vertical Datum (NAVD) 1988 and has a vertical accuracy of 0.01 foot. Vertical control is based on observations of the Continuously Operating Reference (COR) Stations Queens and Central Islip. The horizontal location is referenced to the North American Datum (NAD) 1983

(2011) N.Y. Long Island Zone 3104 and has an accuracy of 0.1 foot. Local horizontal and vertical control is based on Global Positioning System (GPS) observations using the NYSNet Real Time Network.

A table of survey data (latitude/longitude, northing/easting, elevations of ground, rim and PVC) and a survey map is included in Appendix A.

3.0 REFERENCES

Geraghty and Miller, Inc., 1994. *Remedial Investigation Report, Grumman Aerospace Corporation, Bethpage, New York*. Revised September 1994.

Naval Facilities Engineering Command (NAVFAC), 2003. *Record of Decision Naval Weapons Industrial Reserve Plant Bethpage, New York, Operable Unit 2 – Groundwater*, NYS Registry: 1-30-003B. April 2003.

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Smolensky, D., and Feldman, S., 1990. *Geohydrology of the Bethpage-Hicksville-Levittown Area, Long Island, New York, U.S*. Geological Survey Water-Resourced Investigations Report 88-4135, 25 pp.

Tables

TABLE 1
MONITORING WELL CONSTRUCTION SUMMARY
2015 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

MONITORING WELL	WELL COMPLETION DATE	GROUND ELEVATION (MSL)	PVC ELEVATION (INNER CASING) (MSL)	WELL DEPTH (ft bgs)	CASING DEPTH (ft bgs)	SCREEN INTERVAL (ft bgs)	SUMP DEPTH INTERVAL (ft bgs)	BORING DEPTH (ft bgs)
RE121D1	10/22/2015	79.84	79.03	575	53	550 - 570	570 - 575	587
RE121D2	11/10/2015	79.61	79.24	755	53.5	730 - 750	750 - 755	767

MSL - mean sea level
ft bgs - feet below ground surface

TABLE 2
MONITORING WELL DEVELOPMENT SUMMARY
2015 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

MONITORING WELL	AIR DEVELOPMENT		PUMP DEVELOPMENT			APPROX. TOTAL DEVELOPMENT VOLUME (GAL)	FINAL TURBIDITY (NTUs)
	DATE	APPROX. VOLUME (GAL)	DATE	FINAL PUMP DEPTH (FT BGS)	APPROX. VOLUME (GAL)		
RE121D1	11/16/2015	7,000	11/19/2015-11/20/2015	550-570	10,800	17,800	66.23
RE121D2	11/17/2015	6,700	11/18/2015	730-750	3,100	9,800	19.31

GAL - gallon
FT BGS - feet below ground surface
NTUs - Nephelometric Turbidity Units

TABLE 3. ANALYTICAL DATA SUMMARY
2015 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Location	NYSDEC Groundwater Guidance or Standard Value (Note 1)	RE121D1	RE121D2
Sample Date		12/21/2015	12/21/2015
Sample ID		RE121D1-GW-122115	RE121D2-GW-122115
Sample type code		N	N
VOC 8260C (ug/L)			
1,1,1-TRICHLOROETHANE	5	0.38 J	0.48 J
1,1,2,2-TETRACHLOROETHANE	5	< 0.50 U	< 0.50 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	8.3	17 J
1,1,2-TRICHLOROETHANE	1	< 0.50 U	0.64 J
1,1-DICHLOROETHANE	5	< 0.50 U	0.51 J
1,1-DICHLOROETHENE	5	2.1	3.1 J
1,2,4-TRICHLOROBENZENE	5	< 0.50 U	< 0.50 U
1,2-DIBROMO-3-CHLOROPROPANE	0.04	*< 0.75 U*	*< 0.75 U*
1,2-DIBROMOETHANE	NL	< 0.50 U	< 0.50 U
1,2-DICHLOROBENZENE	3	< 0.50 U	< 0.50 U
1,2-DICHLOROETHANE	5	0.38 J	< 0.50 U
1,2-DICHLOROETHENE, TOTAL	5	0.96 J	2.1 J
1,2-DICHLOROPROPANE	1	< 0.50 U	< 0.50 U
1,3-DICHLOROBENZENE	3	< 0.50 U	< 0.50 U
1,4-DICHLOROBENZENE	3	< 0.50 U	< 0.50 U
1,4-DIOXANE (Method 8270D_SIM)	NL	6.8	4.9
2-BUTANONE	50	< 2.5 UJ	< 2.5 UJ
2-HEXANONE	50	< 2.5 UJ	< 2.5 UJ
4-METHYL-2-PENTANONE	NL	< 2.5 U	< 2.5 U
ACETONE	50	< 2.5 UJ	< 2.5 UJ
BENZENE	1	< 0.50 U	< 0.50 U
BROMODICHLOROMETHANE	50	< 0.50 U	< 0.50 U
BROMOFORM	50	< 0.50 U	< 0.50 U
BROMOMETHANE	5	< 1.0 U	< 1.0 U
CARBON DISULFIDE	60	< 0.50 U	< 0.50 U
CARBON TETRACHLORIDE	5	0.34 J	3.1 J
CHLOROBENZENE	5	< 0.50 U	< 0.50 U
CHLOROETHANE	5	< 1.0 UJ	< 1.0 UJ
CHLOROFORM	7	0.47 J	1.7 J
CHLOROMETHANE	5	< 1.0 U	< 1.0 U
CIS-1,2-DICHLOROETHENE	5	0.96 J	2.1 J
CIS-1,3-DICHLOROPROPENE	0.4	*< 0.50 U*	*< 0.50 U*
CYCLOHEXANE	NL	< 0.50 U	< 0.50 U
DIBROMOCHLOROMETHANE	5	< 0.50 U	< 0.50 U
DICHLORODIFLUOROMETHANE	5	2.2	0.85 J
ETHYLBENZENE	5	< 0.50 U	< 0.50 U
ISOPROPYLBENZENE	5	< 0.50 U	< 0.50 U
M- AND P-XYLENE	NL	< 1.0 U	< 1.0 U
METHYL ACETATE	NL	< 0.75 U	< 0.75 U
METHYL CYCLOHEXANE	NL	< 0.50 U	< 0.50 U
METHYL TERT-BUTYL ETHER	10	< 0.50 U	< 0.50 U
METHYLENE CHLORIDE	5	< 2.5 U	< 2.5 U
O-XYLENE	NL	< 0.50 U	< 0.50 U
STYRENE	5	< 0.50 U	< 0.50 U
TETRACHLOROETHENE	5	< 0.50 U	< 0.50 U
TOLUENE	5	< 0.50 U	< 0.50 U
TRANS-1,2-DICHLOROETHENE	5	< 0.50 U	< 0.50 U
TRANS-1,3-DICHLOROPROPENE	0.4	*< 0.50 UJ*	*< 0.50 UJ*
TRICHLOROETHENE	5	29	480
TRICHLOROFLUOROMETHANE	5	< 1.0 U	< 1.0 U
VINYL CHLORIDE	2	< 1.0 U	< 1.0 U
XYLENES, TOTAL	5	< 1.5 U	< 1.5 U

Notes:

1 New York State Department of Environmental Conservation Division of Water Technical and Operation Guidance series (6 NYCRR 700-706, Part 703.5 summarized in TOGS 1.1.1)
Ambient water quality standards and groundwater effluent limitations, class GA; NL = Not Listed

Bold = Detected; ***Bold and Italics*** =Not detected exceeds NYS Groundwater Standards or guidance value

Yellow highlighted values exceed Groundwater Standards or guidance value

Sample type codes: N - normal environmental sample, FD - field duplicate

U = Nondetected result. The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte.

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

M = the matrix spike or matrix spike duplicate did not meet recovery or precision requirements.

TABLE 4
STABILIZED FIELD PARAMETERS
2015 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Well	Date	Temperature (°C)	pH	Specific Conductance (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Depth to water (ft bgs)	Flow rate (ml/min)
RE121D1	12/21/2015	15.97	5.50	0.071	0.57	154.1	4.2	34.40	895
RE121D2	12/21/2015	15.15	5.16	0.071	2.77	-54.5	8.85	34.41	450

°C - degrees Celsius
µS/cm - Microsiemens per Centimeter
mg/L - milligrams per liter
mV - Millivolts
NTU - Nephelometric Turbidity Unit
ft bgs - feet below ground surface
ml/min - milliliters per minute

Figures

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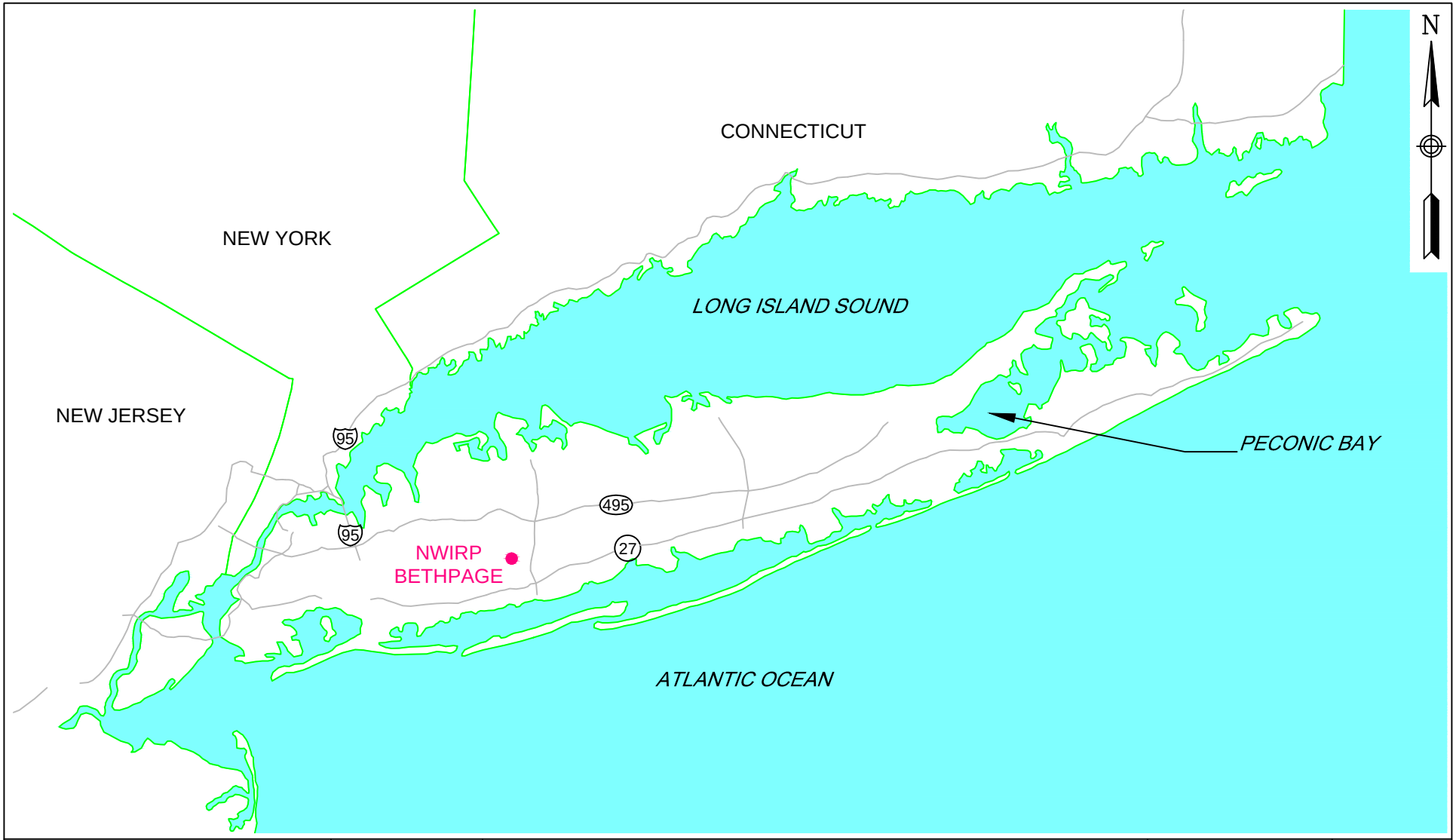

0 15 30

SCALE IN MILES

NAVFAC

GENERAL LOCATION MAP
NWIRP BETHPAGE
BETHPAGE, NEW YORK

CONTRACT NUMBER	CTO NUMBER
N62470-11-D-8013	WE15
APPROVED BY --	DATE --
APPROVED BY --	DATE --
FIGURE NO. 1	REV 0

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Former Naval Weapons Industrial Reserve Plant

Former Northrop Grumman Site

RE121D1
RE121D2

Old Bethpage

Bethpage

South Farmingdale

Plainedge

Levittown

North Wantagh

State Hwy 135

Southern State Pkwy

Hempstead Tpke

Central Ave

Broadway

Powell Ave

Stewart Ave

Wantagh Ave

Seamans Neck Rd

Hicksville Rd

Access Rd

Quaker Meeting House Rd

Merritts Rd

Bethpage State Pkwy

Inset: RE121D1 and RE121D2 Location

0 750 1,500 3,000 Feet

0 375 750 Feet

Legend

- Monitoring Well
- Vertical Profile Boring
- Vertical Profile Boring - Proposed
- Water Supply Well
- Extraction Well

NAVFAC

RE121D1 AND RE121D2 LOCATION MAP
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

CONTRACT NUMBER	CTO NUMBER
N62470-11-D8013	WE15
APPROVED BY: PS	DATE: 2/15/2016
APPROVED BY: —	DATE: —
FIGURE NO.: 2	REV: 0

Appendix **A**

RE121D1, RE121D2

Section 1

Boring Logs

Resolution Consultants

Boring Log

BORING #: RE121D1
Sheet 1 of 2

Client: Department of the Navy, Naval Facilities Engineering Command, Mid-Atlantic		**Logged By:** V. Varricchio
Location: 20 Union Ave and Verly Crt., Bethpage, NY		**Drilling Company:** Delta Well & Pump
Project #: 60266526	**Ground Elevation (msl):** 79.84	**Well Screen Interval (ft):** 550-570
Start Date: 10/16/2015	**Drilling Method:** Auger (0-50' bgs) Mud Rotary (>50' bgs)	**Water Level (ft):**
Finish Date: 10/22/2015	**Northing:** 203062.13 **Easting:** 1126707.85	**Total Depth (ft):** 587.0

DEPTH (ft)	PID (ppm)	Formation	USCS	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion	Well Construction
0 50 100 150 200 250 300 350 400 450					0-587 ft bgs: See VPB155 for Descriptions		10" Diameter Steel Casing Bentonite Grout 4" Diameter Schedule 80 PVC Riser

Resolution Consultants

Boring Log

BORING #: RE121D1
Sheet 2 of 2

Client: Department of the Navy, Naval Facilities Engineering Command, Mid-Atlantic		**Logged By:** V. Varricchio
Location: 20 Union Ave and Verly Crt., Bethpage, NY		**Drilling Company:** Delta Well & Pump
Project #: 60266526	**Ground Elevation (msl):** 79.84	**Well Screen Interval (ft):** 550-570
Start Date: 10/16/2015	**Drilling Method:** Auger (0-50' bgs) Mud Rotary (>50' bgs)	**Water Level (ft):**
Finish Date: 10/22/2015	**Northing:** 203062.13 **Easting:** 1126707.85	**Total Depth (ft):** 587.0

DEPTH (ft)	PID (ppm)	Formation	USCS	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion	Well Construction
486					0-587 ft bgs: See VPB155 for Descriptions *(continued)*		4" Diameter Schedule 80 PVC Riser *(continued)*
488							
490							
492							
494							
496							
498							
500							
502							#00 Filter Sand
504							
506							
508							
510							
512							
514							
516							
518							
520							
522							
524							
526							
528							
530							
532							#1 Filter Sand
534							
536							
538							
540							
542							
544							
546							
548							
550							
552							
554	0		SP		Very pale brown (10YR 7/4) poorly graded medium SAND, lignite/iron banding		
556							
558	0		SW		Yellow (2.5Y 7/6) well graded fine to medium SAND		
560							4" Diameter Schedule 80 PVC, 10 Slot Well Screen (550-570 ft bgs)
562							
564	0		SW/SP		0-5" Gray (10YR 6/1) well graded fine to medium SAND; 6-11" Brown (10YR 5/3) poorly graded subangular coarse SAND		
566							
568	0		SP		Gray (10YR 6/1) poorly graded fine SAND with few lignite bands		
570							
572							Sump
574							
576							
578							
580							#1 Sand to Bottom
582							
584							
586							
					End of boring at 587.0 ft. bgs.		

Resolution Consultants

Boring Log

BORING #: RE121D2
Sheet 1 of 2

Client: Department of the Navy, Naval Facilities Engineering Command, Mid-Atlantic		**Logged By:** V. Varricchio
Location: 20 Union Ave and Verly Crt., Bethpage, NY		**Drilling Company:** Delta Well & Pump
Project #: 60266526	**Ground Elevation (msl):** 79.61	**Well Screen Interval (ft):** 730-750
Start Date: 11/2/2015	**Drilling Method:** Auger (0-50' bgs) Mud Rotary (>50' bgs)	**Water Level (ft):**
Finish Date: 11/10/2015	**Northing:** 203003.36 **Easting:** 1126663.5	**Total Depth (ft):** 767.0

DEPTH (ft)	PID (ppm)	Formation	USCS	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion	Well Construction
0 50 100 150 200 250 300 350 400 450 500 550 600 650					0-767 ft bgs: See VPB155 for Descriptions		10" Diameter Steel Casing Bentonite Grout 4" Diameter Schedule 80 PVC Riser

Resolution Consultants

Boring Log

BORING #: RE121D2
Sheet 2 of 2

Client: Department of the Navy, Naval Facilities Engineering Command, Mid-Atlantic		**Logged By:** V. Varricchio
Location: 20 Union Ave and Verly Crt., Bethpage, NY		**Drilling Company:** Delta Well & Pump
Project #: 60266526	**Ground Elevation (msl):** 79.61	**Well Screen Interval (ft):** 730-750
Start Date: 11/2/2015	**Drilling Method:** Auger (0-50' bgs) Mud Rotary (>50' bgs)	**Water Level (ft):**
Finish Date: 11/10/2015	**Northing:** 203003.36 **Easting:** 1126663.5	**Total Depth (ft):** 767.0

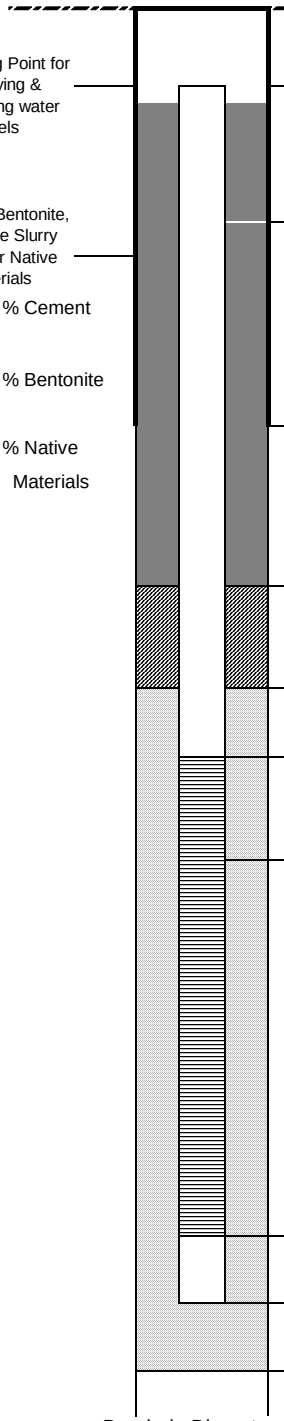
DEPTH (ft)	PID (ppm)	Formation	USCS	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion	Well Construction
686					0-767 ft bgs: See VPB155 for Descriptions *(continued)*		4" Diameter Schedule 80 PVC Riser *(continued)*
688							
690							
692							
694							
696							#00 Filter Sand
698							
700							
702							
704							
706							
708							
710							
712							
714							
716							
718							#1 Filter Sand
720							
722							
724							
726							
728							
730							
732							
734	0		SP-SM		Light gray (10YR 7/1) poorly graded fine SAND with few Silt		
736							
738			SW-GW		Light grayish brown (10YR 6/2) well graded fine to coarse angular SAND mixed with well graded fine to coarse subrounded Gravel		
740	0						4" Diameter Schedule 80 PVC, 10 Slot Well Screen (730-750 ft bgs)
742			ML		Light gray (10YR 7/1) SILT with lamination, trace Clay		
744	0						
746			SP		Light gray (10YR 7/1) poorly graded fine SAND, few Silt		
748							
750	0		SP		Light gray (10YR 7/1) poorly graded fine SAND, few Silt		
752							Sump
754							
756							
758							
760							
762							#1 Sand to Bottom
764							
766							
					End of boring at 767.0 ft. bgs.		

Section 2

Monitoring Well Construction Logs

RESOLUTION CONSULTANTS	Client: NAVFAC	Project Number: 60266526	***WELL ID: RE121D1***
	Site Location: NWIRP BETHPAGE, NY		
	Well Location: Union Ave & Verly Ct., Plainedge, NY		Date Installed: 10/16/2015 - 10/22/2015
	Method: MUD ROTARY		Inspector: V. Varricchio
	Coords: Northing: 203062.13 Easting: 1126707.85		Contractor: DELTA WELL & PUMP

MONITORING WELL CONSTRUCTION DETAIL



	Depth from G.S. (feet)	Elevation(feet) Datum
Ground Surface (G.S.)	0.00	79.84
Top of 12 inch diameter Steel Curb Box		
Top of Riser Pipe fit with locking j-plug	0.81	79.03
Riser Pipe:		
Length: 550 ft		
Inside Diameter (ID): 4 inch		
Type of Material: PVC		
Bottom of 10 inch diameter Steel Surface Casing	53	26.8
Bottom of Bentonite Grout	490	-410.2
Bottom of #00 Filter Sand/Top of #1 Filter Sand	515	-435.2
Top of Screen	550	-470.2
▲ Stabilized Water Level		
Screen:		
Length: 20 ft		
Inside Diameter (ID): 4 inch		
Slot Size: 10		
Type of Material: PVC		
Type/Size of Sand: #1		
Sand Pack Thickness: 72 ft		
Bottom of Screen	570	-490.2
Bottom of Sump:	575	-495.2
Bottom of Borehole	587	-507.2

Borehole Diameter: 10 inch

Approved:

Signature

Date

Describe Measuring Point:

Ground Surface

RESOLUTION CONSULTANTS	Client: NAVFAC	Project Number: 60266526	***WELL ID: RE121D2***
	Site Location: NWIRP BETHPAGE, NY		
	Well Location: Union Ave & Verly Ct., Plainedge, NY		Date Installed: 11/2/2015 - 11/10/2015
	Method: MUD ROTARY		Inspector: V. Varricchio
	Coords: Northing: 203003.36	Easting: 1126663.50	Contractor: DELTA WELL & PUMP

MONITORING WELL CONSTRUCTION DETAIL

	Depth from G.S. (feet)	Elevation(feet) Datum
Ground Surface (G.S.)	0.00	79.61
Top of 12 inch diameter Steel Curb Box		
Top of Riser Pipe fit with locking j-plug	0.37	79.24
Riser Pipe:		
Length: 730 ft		
Inside Diameter (ID): 4 inch		
Type of Material: PVC		
Bottom of 10 inch diameter Steel Surface Casing	53.5	26.1
Bottom of Bentonite Grout	689	-609.4
Bottom of #00 Filter Sand/Top of #1 Filter Sand	705	-625.4
Top of Screen	730	-650.4
▲ Stabilized Water Level		
Screen:		
Length: 20 ft		
Inside Diameter (ID): 4 inch		
Slot Size: 10		
Type of Material: PVC		
Type/Size of Sand: #1		
Sand Pack Thickness: 62 ft		
Bottom of Screen	750	-670.4
Bottom of Sump:	755	-675.4
Bottom of Borehole	767	-687.4

Borehole Diameter: 10 inch

Approved:

Signature

Date

Describe Measuring Point:

Ground Surface

Section 3

Groundwater Sample Log Sheets

RESOLUTION CONSULTANTS

Well ID: RE 121 01

Low Flow Ground Water Sample Collection Record

Client: Navy NWIRP Bethpage Date: ~~12~~ 12/21/15 Time: Start 830 am/pm

Project No: 60266526 Finish 13 am/pm

Site Location:

Weather Conds: Collector(s):

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length _____ c. Length of Water Column _____ (a-b) Casing Diameter/Material 4-inch PVC

b. Water Table Depth _____ d. Calculated System Volume (see back) _____

2. WELL PURGE DATA

a. Purge Method: Geotech bladder pump with drop tube assembly

b. Acceptance Criteria defined (see workplan)

- Temperature ± 3% - Turbidity ± 10% - D.O. ± 10% (values >0.5 mg/L)
- pH ± 0.1 unit - ORP ± 10mV
- Sp. Cond. ± 3% - Drawdown < 0.3' Remove a minimum 1 screen volume

c. Field Testing Equipment used: Make Model Serial Number

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Depth to water (ft)	Color/Odor
855		14.92	10.02	0.136	2.40	165.1			34.40	
900		14.90	6.31	0.080	1.48	146.3	82.4			
905		14.88	6.25	0.085	1.38	146.6			34.72	
910		14.91	6.08	0.075	1.30	146.0	45.5			
915		14.97	5.58	0.072	1.10	149.3			35.40	
920		14.95	5.55	0.071	0.95	150.9	10.9			

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☐	☐	☐
Has required turbidity been reached	☐	☐	☐
Have parameters stabilized	☐	☐	☐

If no or N/A - Explain below.

(continued on back)

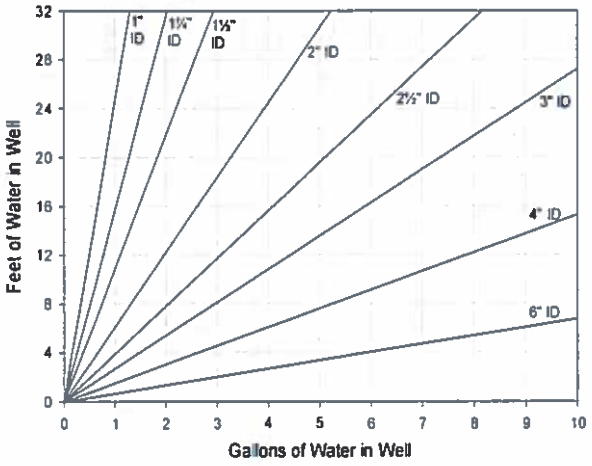
3. SAMPLE COLLECTION: Method: Geotech bladder pump with drop tube assembly

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
	40-mL vials	3	HCl	VOCs	
	1-L amber	2	none	1,4-Dioxane	

Comments

Signature Date

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

One screen volume (4-inch well)

15 ft = 37.1 L / 9.8 G
20 ft = 49.4 L / 13.1 G
25 ft = 61.8 L / 16.3 G

Well ID: RE121 01

(continued from front)

Time (24 hr)	Volume Removed (Liters)	Temp (°C)	pH	Specific Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Depth to water (ft)	Color/Odor
925		14.93	5.55	0.071	0.93	156.8				
930		14.95	5.52	0.071	0.84	153.6				
935		14.95	5.53	0.071	0.84	153.6				
940		14.99	5.51	0.071	0.75	154.2	8.00		35.42	
945	13gal	14.99	5.50	0.071	0.58	154.2				
950	13gal	15.97	5.50	0.071	0.57	154.1	4.21		34.40	

Well ID: RE 121 D2

RESOLUTION CONSULTANTS

Low Flow Ground Water Sample Collection Record

Client: Navy NWIRP Bethpage Date: 12/21/15 Time: Start 1115 am/pm
Project No: 60266526 Finish 1340 am/pm
Site Location: Verly @ Union
Weather Conds: Cloudy 47°F Collector(s): JC

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 575 c. Length of Water Column _____ (a-b) Casing Diameter/Material 4-inch PVC

b. Water Table Depth 34.84 d. Calculated System Volume (see back) _____

2. WELL PURGE DATA

a. Purge Method: Geotech bladder pump with drop tube assembly

b. Acceptance Criteria defined (see workplan)

- Temperature ± 3%
- pH ± 0.1 unit
- Sp. Cond. ± 3%
- Turbidity ± 10%
- ORP ± 10mV
- Drawdown < 0.3'
- D.O. ± 10% (values >0.5 mg/L)

Remove a minimum 1 screen volume

c. Field Testing Equipment used:

	Make	Model	Serial Number
	Hanna	HI98703	U80211X
	YSI	556 MPS	545???

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Depth to water (ft)	Color/Odor
1120									34.34	
1150		15.03	5.29	0.049	7.85	6.7	369	425	34.39	Cloudy
1155		15.05	5.27	0.049	6.63	-1.8	357	425	34.39	"
1200		15.11	5.24	0.063	5.29	-11.0	366	425	34.39	"
1205		15.12	5.25	0.063	5.13	-13.2	362	450	34.40	"
1210		15.12	5.27	0.068	4.40	-22.4	106	450	34.40	"

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☑	☐	☐
Has required turbidity been reached	☑	☐	☐
Have parameters stabilized	☑	☐	☐

If no or N/A - Explain below.

(continued on back)

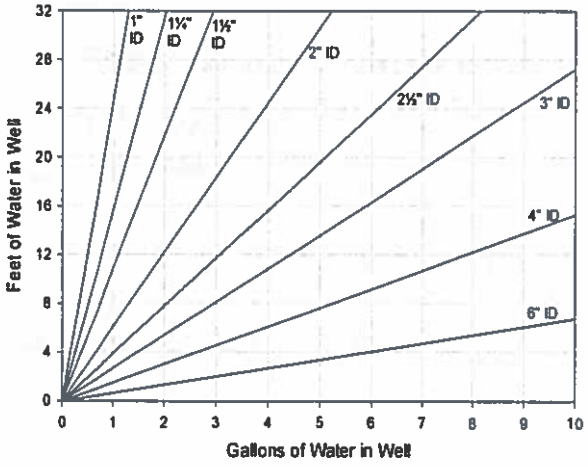
3. SAMPLE COLLECTION: Method: Geotech bladder pump with drop tube assembly

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
RE121D2-GW-12212015	40-mL vials	3	HCl	VOCs	1335
RE121D2-GW-12212015	1-L amber	2	none	1,4-Dioxane	1335

Comments

Signature _____ Date 12/21/2015

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

One screen volume (4-inch well)

15 ft = 37.1 L / 9.8 G
20 ft = 49.4 L / 13.1 G
25 ft = 61.8 L / 16.3 G

Well ID:

(continued from front)

Time (24 hr)	Volume Removed (Liters)	Temp (°C)	pH	Specific Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Depth to water (ft)	Color/Odor
1215		15.12	5.23	0.069	4.08	-26.2	47.7	450	34.40	cloudy
1220	5gal	15.18	5.21	0.070	3.76	-29.4	21.0	450	34.40	"
1225		15.16	5.17	0.070	3.20	-37.2	13.6	450	34.41	clearing
1230		15.16	5.17	0.070	3.16	-38.4	12.9	450	34.41	"
1235		15.22	5.15	0.071	3.03	-41.6	12.6	450	34.41	"
1240		15.18	5.15	0.070	2.98	-43.7	11.4	450	34.41	"
1245		15.15	5.15	0.070	2.97	-45.9	10.9	450	34.41	"
1250		15.15	5.16	0.071	2.91	-48.1	10.5	450	34.41	"
1255	10gal	15.15	5.15	0.071	2.87	-50.1	9.32	450	34.41	"
1300		15.15	5.15	0.070	2.84	-51.5	8.41	450	34.41	"
1315		15.17	5.15	0.070	2.77	-53.9	9.24	450	34.41	"
1320		15.15	5.16	0.071	2.77	-54.5	8.85	450	34.41	"

Section 4

Analytical Data Validation

[Attachment D of the Data Validation report for the December 2015 Quarterly Sampling included here contains only results tables for RE121D1 and RE121D2; for the December 2015 Quarterly Sampling Data Validation report with complete Attachment D with all well results tables see *December 2015 Groundwater Sampling Data Summary Report, Bethpage, NY*, Resolution Consultants, 2016.]

DATA VALIDATION REPORT

Project:	Regional Groundwater Investigation — NWIRP Bethpage	
Laboratory:	Katahdin Analytical	
Sample Delivery Group:	BETHPAGE-3	
Analyses/Method:	Volatile Organic Compounds by U.S. EPA SW-846 Method 8260C 1,4-Dioxane by U.S. EPA SW-846 Method 8270D via Selective Ion Monitoring (SIM)	
Validation Level:	3	
Project Number:	0888812477.SA.DV	
Prepared by:	Dana Miller/Resolution Consultants	Completed on: 02/5/2016
Reviewed by:	Tina Clemmey/Resolution Consultants	File Name: BETHPAGE 3_8260C_8270D

SUMMARY

This report summarizes data review findings for samples listed below, collected by Resolution Consultants from the Regional Groundwater Investigation — NWIRP Bethpage Site on 14 to 29 December 2015 in accordance with the following Sampling and Analysis Plans:

- *Sampling and Analysis Plan, Bethpage, New York.* (Resolution Consultants, April 2013).
- *UFP SAP Addendum, Installation of Vertical Profile Borings and Monitoring Wells, Operable Unit 2, NWIRP Bethpage, New York.* (Resolution Consultants, November 2013).
- *UFP SAP Addendum, Inclusion of Additional Target Analytes for Volatile Organics Analyses, NWIRP Bethpage OU2, Bethpage, New York*. (Resolution Consultants, August 2014).

Sample ID	Matrix/Sample Type	Analysis
FIELD1-FB-121615	Field Blank	8260C/8270D_SIM
RE103D1-GW-121415	Groundwater	8260C/8270D_SIM
RE103D2-GW-121415	Groundwater	8260C/8270D_SIM
RE103D3-GW-121415	Groundwater	8260C/8270D_SIM
RE104D1-GW-121515	Groundwater	8260C/8270D_SIM
RE104D2-GW-121515	Groundwater	8260C/8270D_SIM
DUPLICATE1-GW-121515	Field Duplicate of RE104D2-GW-121515	8260C/8270D_SIM
RE104D3-GW-121515	Groundwater	8260C/8270D_SIM
RE105D1-GW-121715	Groundwater	8260C/8270D_SIM
RE105D2-GW-121715	Groundwater	8260C/8270D_SIM
RE107D1-GW-121815	Groundwater	8260C/8270D_SIM

Sample ID	Matrix/Sample Type	Analysis
RE107D2-GW-121815	Groundwater	8260C/8270D_SIM
RE107D3-GW-122915	Groundwater	8260C/8270D_SIM
RE108D1-GW-122215	Groundwater	8260C/8270D_SIM
RE108D2-GW-122215	Groundwater	8260C/8270D_SIM
RE114D1-GW-122115	Groundwater	8260C/8270D_SIM
RE114D2-GW-121615	Groundwater	8260C/8270D_SIM
RE114D3-GW-121615	Groundwater	8260C/8270D_SIM
RE120D1-GW-121815	Groundwater	8260C/8270D_SIM
RE120D2-GW-122915	Groundwater	8260C/8270D_SIM
RE120D3-GW-122915	Groundwater	8260C/8270D_SIM
RE121D1-GW-122115	Groundwater	8260C/8270D_SIM
RE121D2-GW-122115	Groundwater	8260C/8270D_SIM
RE122D1-GW-121515	Groundwater	8260C/8270D_SIM
RE122D2-GW-121515	Groundwater	8260C/8270D_SIM
RE122D3-GW-121515	Groundwater	8260C/8270D_SIM
RE123D1-GW-122115	Groundwater	8260C/8270D_SIM
RE123D2-GW-122115	Groundwater	8260C/8270D_SIM
RE123D3-GW-122115	Groundwater	8260C/8270D_SIM
TRIP BLANK 121415	Trip Blank	8260C
TRIP BLANK 121615	Trip Blank	8260C
TRIP BLANK-121815	Trip Blank	8260C
TRIP BLANK-122915	Trip Blank	8260C
TT101D1-GW-121715	Groundwater	8260C/8270D_SIM
TT101D2-GW-122115	Groundwater	8260C/8270D_SIM
DUPLICATE-GW-122115	Field Duplicate of TT101D2-GW-122115	8260C/8270D_SIM
TT101D-GW-121715	Groundwater	8260C/8270D_SIM

Data validation activities were conducted using the following guidance documents: *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846, specifically Method 8260C, Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry* (United States Environmental Protection Agency [U.S. EPA] 2006), *SW-846 Method 8270D, Semivolatile Organic Compounds by Gas Chromatograph/Mass Spectrometry* (U.S. EPA 2007), *U.S. Environmental Protection Agency Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review* (U.S. EPA, June 2008), and *Department of Defense Quality Systems Manual for Environmental Laboratories*, Version 4.2 (October 2010). In the absence of method-specific information, laboratory quality control (QC) limits, project-specific requirements, and/or professional judgment were used as appropriate.

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓	Data completeness (chain-of-custody)/sample integrity
✓	Holding times and sample preservation
✓	Gas chromatography/Mass spectrometer performance checks
✗	Initial calibration verification (ICV)/continuing calibration verification (CCV)
✓	Laboratory blanks/trip blanks/field blanks
✗	Surrogate spike recoveries
✗	Matrix spike and/or matrix spike duplicate results
✓	Laboratory control sample/laboratory control sample duplicate results
✗	Field duplicates
✓	Internal standards
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. Acceptable data parameters for which all criteria were met and no qualification was performed and non-conformance or other issues that were noted during validation, but did not result in qualification of data are not discussed further. The symbol (✗) indicates that a QC non-conformance resulted in the qualification of data. Any QC non-conformance that resulted in the qualification of data is discussed below.

RESULTS

Initial Calibration/Continuing Calibration Verification

Calibration data were reviewed for conformance with the QC acceptance criteria to ensure that:

- The initial calibration percent relative standard deviation, correlation coefficient/coefficient of determination, and/or response factor method acceptance criteria were met
- The ICV standard percent recovery acceptance criteria were met
- The CCV method percent difference or percent drift and response factor acceptance criteria were met
- The retention time method acceptance criteria were met

Data qualification to the analytes associated with the specific initial calibration (ICAL) was as follows:

ICAL Linearity Non-conformance:

Criteria	Actions	
	Detected Results	Non-detected Results
%RSD >15% and quantitation based on mean response factor	J	UJ

Notes:
%RSD = Relative standard deviation
J = Estimated
UJ = Undetected and estimated

Data qualification to the analytes associated with the specific ICV was as follows:

ICV Recovery Non-conformance:

Criteria	Actions	
	Detected Results	Non-detected Results
Recovery >120%	J	UJ
Recovery < 80%	J	UJ

Notes:
J = Estimated
UJ = Undetected and estimated

Data qualification to the analytes associated with the specific CCV was as follows:

CCV Linearity Non-conformance:

Criteria	Actions	
	Detected Results	Non-detected Results
%Difference or %Drift > 20%	J	UJ

Notes:
J = Estimated
UJ = Undetected and estimated

ICAL, ICV and CCV non-conformances are summarized in Attachment A in Tables A-1, A-2, and A-3.

Surrogate Spike Recoveries

Surrogates provide information needed to assess the accuracy of analyses. Known amounts of surrogate compounds, or compounds which are not likely to be found in the actual samples, are added to each organic sample to check for accuracy. If surrogate percent recoveries (%Rs) are close

to the known concentrations, the reported target compound concentrations are assumed to be accurate. Data qualification on the basis of surrogate recovery was as follows:

Surrogate Recovery Non-conformance Chart:

Criteria	Action	
	Detected	Non-detected
% R > Upper Limit	J	No qualification
20% ≤ %R < Lower Limit	J	UJ
% R < 20%	J	Rejected

Notes:
%R = Percent recovery
J = Estimated
UJ = Undetected and estimated

Surrogate recovery non-conformance is summarized in Attachment A in Table A-4.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

MS/MSDs are generated to provide information about the effect of each sample matrix on the sample preparation and the measurement methodology. MS/MSD percent recoveries (%Rs) assess the effect of the sample matrix on the accuracy of the analytical results and %Rs above the laboratory control limit could indicate a potential high result bias while %Rs below QC limits could indicate a potential low result bias. The relative percent differences (RPDs) between the MS and MSD results are evaluated to assess sample precision. The MS/MSD %Rs and RPDs were reviewed for conformance with the QC acceptance criteria. Data qualification to the analytes associated with the specific MS/MSD non-conformances were as follows:

MS/MSD Non-conformances Chart:

Criteria	Action	
	Detected Compounds	Non-detected Compounds
%R>Upper Limit	J	No qualification
20% ≤ %R < Lower Limit	J	UJ
%R <20%	J	Rejected

Notes:
%R = Percent recovery
RPD = Relative percent difference
J = Estimated
UJ = Undetected and estimated

MS/MSD non-conformances are summarized in Attachment A in Table A-5.

Field Duplicate

Two field duplicate pairs were collected to assess precision: RE104D2-GW-121515/ DUPLICATE1-GW-121515 and TT101D2-GW-122115/DUPLICATE-GW-122115. Field duplicate RPDs were reviewed for conformance with the Resolution Consultants QC criteria of ≤30% for aqueous matrices and ≤50% for solid matrices. These criteria apply if both results were greater than two times the limit of quantitation (LOQ). Data qualification to the analytes associated with the specific field duplicate RPDs was as follows:

Field Duplicate Non-conformances Chart:

Criteria	RPD	Action	
		Detected	Non-detected
Sample and duplicate are nondetect	Not calculable (NC)	No qualification	No qualification
Sample and duplicate results ≥2x LOQ	>30 (aqueous)	J	Not Applicable
	>50 (solids)		
If sample or duplicate result is >2x LOQ and the other is not detected	NC	J	UJ
If sample or duplicate result is <2x LOQ and the other is not detected	NC	No qualification	No qualification

Notes:
LOQ = Limit of quantitation
J = Estimated
UJ = Undetected and estimated

Field duplicate non-conformances are summarized in Attachment A in Table A-6.

Qualifications Actions

The data were reviewed independently from the laboratory to assess data quality. All compounds detected at concentrations less than the limit of quantitation but greater than the method detection limit were qualified by the laboratory as estimated (J). This "J" qualifier was retained during data validation. Any sample that was analyzed at a dilution because of high concentrations of target or non-target analytes was checked to confirm that the results and/or sample-specific limit of quantitation and limit of detections were adjusted accordingly by the laboratory. Trichloroethene in sample RE108D2-GW-121215 result value reported above the calibration range and was qualified estimated “J” because the value was off-scale.

No results were rejected; therefore, analytical completeness was calculated to be 100 percent. Data not qualified during data review are considered usable by the project. The remaining results qualified as estimated may be high or low, but the data are usable for their intended purpose,

according to U.S. EPA and Department of Defense guidelines. Final data review qualifiers used to describe results and how they should be interpreted by the end data user are provided in Attachment B and Attachment C. Attachment D provides final results after data review.

ATTACHMENTS

Attachment A: Non-Conformance Summary Tables
Attachment B: Qualifier Codes and Explanations
Attachment C: Reason Codes and Explanations
Attachment D: Final Results after Data Review

Attachment A
Non-Conformance Summary Table

Table A-1 Initial Calibration Non-Conformance					
Method	Analyte	%RSD	Limit	Associated Samples	Qualifier
8260C	CHLOROETHANE	17.80841	<15%	TI0330-1, -2, -5, -6, -11, -4, -7, -3DL, -10RA, -12, -13, -14, -17, -4DL, -6DL, and 7DL	Detects: J Non-detects: UJ
8260C	TETRACHLOROETHENE	15.13611	<15%	TI0428-4, -1, -3RA, -1DL, -2RA, and TI0330-17DL	Detects: J Non-detects: UJ

Notes:

%RSD = Relative standard deviation
UJ = Non-detect estimated value
J = Estimated value

Table A-2 Initial Calibration Verification Non-Conformance						
Method	Analyte	ICV ID	%R	Limit	Associated Samples	Qualifier
8260C	TETRACHLOROETHENE	P3840.D	150.8	80-120	TI0116-1, -2, -3, -4, -5, -6, -7, -8, -9, -11, -10RA, -2DL, -4DL, -9DL, -3DL, -11DL, TI0214-1, -4, -5, -6, -7, -9, -8, -10, 12, -8DL, and - 7DL	Detects: J Non-detects: UJ
8260C	TRANS-1,3-DICHLOROPROPENE	C6396A.D	123.47	80-120	TI0330-1, -2, -5, -6, -11, -4, -7, -3DL,-10RA, -12, -13, -14, -17, -4DL, -6DL, and 7DL	Detects: J Non-detects: UJ
8260C	ACETONE	P4114A.D	72.62	80-120	TI0428-3RA, -1DL, -2RA, -4, -1, and TI0330-17DL	Detects: J Non-detects: UJ

Notes:
ICV ID = Initial calibration verification identification
ID = Identification
%R = Percent recovery
UJ = Non-detect estimated value
J = Estimated value

Table A-3 Continuing Calibration Verification Non-Conformance					
Lab ID /Calibration ID	Analyte	%D	%D Limit	Associated Samples	Qualifier
WG176285-4 / P3940.D	BROMOMETHANE	23.79988	+/- 20	TI0116-1, -2, -3, -4, -5, -6, -7, -8, -9, and -11	Detects: J Non-detects: UJ
WG176319-4 / P3964.D	BROMOMETHANE	24.57249	+/- 20	TI0116-10RA, TI0214-1, -4, -5, -6, -7, and -9	Detects: J Non-detects: UJ
WG176319-4 / P3964.D	4-METHYL-2-PENTANONE	20.68251	+/- 20	TI0116-10RA, TI0214-1, -4, -5, -6, -7, and -9	Detects: J Non-detects: UJ
WG176436-4 / P3989.D	BROMOMETHANE	28.03265	+/- 20	TI0214-8, -10, and -12	Detects: J Non-detects: UJ
WG176436-4 / P3989.D	CHLOROETHANE	27.72207	+/- 20	TI0214-8, -10, and -12	Detects: J Non-detects: UJ
WG176436-4 / P3989.D	4-METHYL-2-PENTANONE	21.50811	+/- 20	TI0214-8, -10, and -12	Detects: J Non-detects: UJ
WG176832-4 / P4138.D	ACETONE	-34.27373	+/- 20	TI0428-4, and -1	Detects: J Non-detects: UJ
WG176788-4 / C6418.D	CHLOROMETHANE	-20.54679	+/- 20	TI0330-10RA, -12, -13, -14, -17, -4DL, -6DL, -and -7DL	Detects: J Non-detects: UJ
WG176788-4 / C6418.D	ACETONE	-27.76004	+/- 20	TI0330-10RA, -12, -13, -14, -17, -4DL, -6DL, -and -7DL	Detects: J Non-detects: UJ
WG176788-4 / C6418.D	TETRACHLOROETHENE	-21.38037	+/- 20	TI0330-10RA, -12, -13, -14, -17, -4DL, -6DL, -and -7DL	Detects: J Non-detects: UJ
WG176788-4 / C6418.D	METHYL ACETATE	-25.56044	+/- 20	TI0330-10RA, -12, -13, -14, -17, -4DL, -6DL, -and -7DL	Detects: J Non-detects: UJ
WG176732-4 / C6394.D	ACETONE	57.49765	+/- 20	TI0330-1, -2, -5, -6, -11, -4, -7, and -3DL	Detects: J Non-detects: UJ
WG176732-4 / C6394.D	2-BUTANONE	25.58556	+/- 20	TI0330-1, -2, -5, -6, -11, -4, -7, and -3DL	Detects: J Non-detects: UJ
WG176732-4 / C6394.D	2-HEXANONE	22.15201	+/- 20	TI0330-1, -2, -5, -6, -11, -4, -7, and -3DL	Detects: J Non-detects: UJ

Notes:

ID = Identification
%D = Percent difference
UJ = Non-detect estimated value
J = Detected estimated value

Table A-4
Surrogate Non-Conformance

Method	Surrogate	%R	Limits	Associated Sample	Qualifier
8260C	1,2-DICHLOROETHANE-D4	121	70-120	RE114D1-GW-122115	Detects: J
8260C	DIBROMOFLUOROMETHANE	117	85-115	RE114D1-GW-122115	Detects: J
8260C	DIBROMOFLUOROMETHANE	116	85-115	RE121D2-GW-122115	Detects: J

Notes:
%R = Percent recovery
UJ = Non-detect estimated value
J = Detected estimated value

Table A-5
Matrix Spike/Matrix Spike Duplicate Non-Conformance
(Micrograms per liter)

Spiked Sample	Analyte	Sample Result	Spike Added	MS %R	MSD %R	%R Limits	Qualifier
TT101D2-GW-122115	METHYLENE CHLORIDE	<2.5	50.0	53.4	60.2	55-140	UJ
TT101D2-GW-122115	CIS-1,2-DICHLOROETHENE	1.7	50.0	54.6	59.8	70-125	J
TT101D2-GW-122115	1,2,4-TRICHLOROBENZENE	<0.50	50.0	50.8	56.2	65-135	UJ
TT101D2-GW-122115	CHLOROBENZENE	<0.50	50.0	55.8	60.2	80-120	UJ
TT101D2-GW-122115	1,1-DICHLOROETHANE	<0.50	50.0	64.4	70.8	70-135	UJ
TT101D2-GW-122115	CIS-1,3-DICHLOROPROPENE	<0.50	50.0	60.8	64.4	70-130	UJ
TT101D2-GW-122115	1,2-DIBROMO-3-CHLOROPROPANE	<0.75	50.0	46.4	57	50-130	UJ
TT101D2-GW-122115	ISOPROPYLBENZENE	<0.50	50.0	56.2	61	75-125	UJ
TT101D2-GW-122115	TRANS-1,2-DICHLOROETHENE	<0.50	50.0	58.4	65.2	60-140	UJ
TT101D2-GW-122115	BENZENE	<0.50	50.0	62.4	67.6	80-120	UJ
TT101D2-GW-122115	1,2-DICHLOROPROPANE	<0.50	50.0	63.8	68.8	75-125	UJ
TT101D2-GW-122115	O-XYLENE	<0.50	50.0	58.8	62.2	80-120	UJ
TT101D2-GW-122115	1,3-DICHLOROBENZENE	<0.50	50.0	51.4	56.8	75-125	UJ
TT101D2-GW-122115	1,1-DICHLOROETHENE	3.6	50.0	56.8	63.4	70-130	J
TT101D2-GW-122115	1,1,2-TRICHLOROETHANE	0.50	50.0	63.4	65.4	75-125	J
TT101D2-GW-122115	CYCLOHEXANE	<0.50	50.0	63.8	69	71-133	UJ
TT101D2-GW-122115	TOLUENE	<0.50	50.0	65	69.6	75-120	UJ
TT101D2-GW-122115	CARBON TETRACHLORIDE	1.3	50.0	63.6	66.6	65-140	J
TT101D2-GW-122115	1,2-DICHLOROETHANE	<0.50	50.0	61.6	66	70-130	UJ
TT101D2-GW-122115	1,2-DICHLOROETHENE, TOTAL	1.7	100	56.5	62.5	84-121	J
TT101D2-GW-122115	XYLENES, TOTAL	<1.5	150	59.8	63.2	89-116	UJ
TT101D2-GW-122115	STYRENE	<0.50	50.0	60.4	63.4	65-135	UJ
TT101D2-GW-122115	DIBROMOCHLOROMETHANE	<0.50	50.0	59.4	63.6	60-135	UJ
TT101D2-GW-122115	1,4-DICHLOROBENZENE	<0.50	50.0	50.8	54.6	75-125	UJ
TT101D2-GW-122115	ETHYLBENZENE	<0.50	50.0	56.2	60.8	75-125	UJ
TT101D2-GW-122115	M- AND P-XYLENE	<1.0	100	60.2	63.8	75-130	UJ
TT101D2-GW-122115	BROMOFORM	<0.50	50.0	55.6	57	70-130	UJ
TT101D2-GW-122115	BROMODICHLOROMETHANE	<0.50	50.0	67.6	70	75-120	UJ
TT101D2-GW-122115	CHLOROFORM	0.90	50.0	57	62.4	65-135	J
TT101D2-GW-122115	1,1,1-TRICHLOROETHANE	0.34	50.0	58.9	64.3	65-130	J
TT101D2-GW-122115	1,2-DIBROMOETHANE	<0.50	50.0	61.2	66.6	80-120	UJ
TT101D2-GW-122115	1,1,2,2-TETRACHLOROETHANE	<0.50	50.0	51.6	59.2	65-130	UJ
TT101D2-GW-122115	1,2-DICHLOROBENZENE	<0.50	50.0	52	57.6	70-120	UJ

Notes:

MS = Matrix spike
MSD = Matrix spike duplicate
%R = Percent recovery
Bold = Percent recovery not within control limit
UJ = Nondetect analyte in associated sample qualified estimated "UJ" because the %R is lower than the control limit.
J = Detected analyte in associated sample qualified estimated "J" because %R is lower than the control limit.

Table A-6
Field Duplicate
(Micrograms per liter)

Sample ID	Duplicate ID	Analyte	Sample Result	Duplicate Result	RPD	Qualifiers
TT101D2-GW-122115	DUPLICATE-GW-122115	1,1-DICHLOROETHENE	3.6	5	32.6	J - both results

Notes:
RPD = Relative percent difference
J = Estimated value

Attachment B
Qualifier Codes and Explanations

Qualifier	Explanation
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual quantitation limit necessary to accurately and precisely measure the analyte in the sample.
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Attachment C
Reason Codes and Explanations

Reason Code	Explanation
be	Equipment blank contamination
bf	Field blank contamination
bl	Laboratory blank contamination
bm	Missing blank information
bt	Trip blank contamination
c	Calibration issue
cr	Chromatographic resolution
d	Reporting limit raised due to chromatographic interference
dt	Dissolved result > total over limit
e	Ether interference
ej	Above calibration range; result estimated.
f	Presumed contamination from FB or ER.
fd	Field duplicate RPDs
h	Holding times
hs	Headspace greater than 6mm in all sample vials
i	Internal standard areas
ii	Injection internal standard area or retention time exceedance
it	Instrument tune
k	Estimated maximum possible concentrations (EMPC)
l	LCS recoveries
lc	Labeled compound recovery
ld	Laboratory duplicate RPDs
lp	Laboratory control sample/laboratory control sample duplicate RPDs
m	Matrix spike recovery
mc	Deviation from the method
md	MS/MSD RPDs
nb	Negative laboratory blank contamination
p	Chemical preservation issue
p-h	Uncertainty near detection limit (< Reporting Limit), historical reason code applied.
pe	Post Extraction Spike
q	Quantitation issue
r	Dual column RPD
rt	SIM ions not within + 2 seconds
s	Surrogate recovery
sp	Sample preparation issue
su	Evidence of ion suppression
t	Temperature Preservation Issue
x	Low % solids
y	Serial dilution results
z	ICS results

Attachment D
Final Results after Data Review

		Sample Delivery Group Lab ID Sample ID Sample Date Sample Type		BETHPAGE-3 TI0330-5 RE121D1-GW-122115 12/21/2015 Groundwater		
Method	**Analyte**	**CAS No**	**Units**	Result	Qual	RC
8260C	1,1,1-TRICHLOROETHANE	71-55-6	UG_L	0.38	J	
8260C	1,1,2,2-TETRACHLOROETHANE	79-34-5	UG_L	0.5	U	
8260C	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	UG_L	8.3		
8260C	1,1,2-TRICHLOROETHANE	79-00-5	UG_L	0.5	U	
8260C	1,1-DICHLOROETHANE	75-34-3	UG_L	0.5	U	
8260C	1,1-DICHLOROETHENE	75-35-4	UG_L	2.1		
8260C	1,2,4-TRICHLOROBENZENE	120-82-1	UG_L	0.5	U	
8260C	1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	UG_L	0.75	U	
8260C	1,2-DIBROMOETHANE	106-93-4	UG_L	0.5	U	
8260C	1,2-DICHLOROBENZENE	95-50-1	UG_L	0.5	U	
8260C	1,2-DICHLOROETHANE	107-06-2	UG_L	0.38	J	
8260C	1,2-DICHLOROETHENE, TOTAL	540-59-0	UG_L	0.96	J	
8260C	1,2-DICHLOROPROPANE	78-87-5	UG_L	0.5	U	
8260C	1,3-DICHLOROBENZENE	541-73-1	UG_L	0.5	U	
8260C	1,4-DICHLOROBENZENE	106-46-7	UG_L	0.5	U	
8260C	2-BUTANONE	78-93-3	UG_L	2.5	UJ	c
8260C	2-HEXANONE	591-78-6	UG_L	2.5	UJ	c
8260C	4-METHYL-2-PENTANONE	108-10-1	UG_L	2.5	U	
8260C	ACETONE	67-64-1	UG_L	2.5	UJ	c
8260C	BENZENE	71-43-2	UG_L	0.5	U	
8260C	BROMODICHLOROMETHANE	75-27-4	UG_L	0.5	U	
8260C	BROMOFORM	75-25-2	UG_L	0.5	U	
8260C	BROMOMETHANE	74-83-9	UG_L	1	U	
8260C	CARBON DISULFIDE	75-15-0	UG_L	0.5	U	
8260C	CARBON TETRACHLORIDE	56-23-5	UG_L	0.34	J	
8260C	CHLOROBENZENE	108-90-7	UG_L	0.5	U	
8260C	CHLOROETHANE	75-00-3	UG_L	1	UJ	c
8260C	CHLOROFORM	67-66-3	UG_L	0.47	J	
8260C	CHLOROMETHANE	74-87-3	UG_L	1	U	
8260C	CIS-1,2-DICHLOROETHENE	156-59-2	UG_L	0.96	J	
8260C	CIS-1,3-DICHLOROPROPENE	10061-01-5	UG_L	0.5	U	
8260C	CYCLOHEXANE	110-82-7	UG_L	0.5	U	
8260C	DIBROMOCHLOROMETHANE	124-48-1	UG_L	0.5	U	
8260C	DICHLORODIFLUOROMETHANE	75-71-8	UG_L	2.2		
8260C	ETHYLBENZENE	100-41-4	UG_L	0.5	U	
8260C	ISOPROPYLBENZENE	98-82-8	UG_L	0.5	U	
8260C	M- AND P-XYLENE	108-38-3/106-42	UG_L	1	U	
8260C	METHYL ACETATE	79-20-9	UG_L	0.75	U	
8260C	METHYL CYCLOHEXANE	108-87-2	UG_L	0.5	U	
8260C	METHYL TERT-BUTYL ETHER	1634-04-4	UG_L	0.5	U	
8260C	METHYLENE CHLORIDE	75-09-2	UG_L	2.5	U	
8260C	O-XYLENE	95-47-6	UG_L	0.5	U	
8260C	STYRENE	100-42-5	UG_L	0.5	U	
8260C	TETRACHLOROETHENE	127-18-4	UG_L	0.5	U	
8260C	TOLUENE	108-88-3	UG_L	0.5	U	
8260C	TRANS-1,2-DICHLOROETHENE	156-60-5	UG_L	0.5	U	
8260C	TRANS-1,3-DICHLOROPROPENE	10061-02-6	UG_L	0.5	UJ	c
8260C	TRICHLOROETHENE	79-01-6	UG_L	29		
8260C	TRICHLOROFLUOROMETHANE	75-69-4	UG_L	1	U	
8260C	VINYL CHLORIDE	75-01-4	UG_L	1	U	
8260C	XYLENES, TOTAL	1330-20-7	UG_L	1.5	U	
8270D_SIM	1,4-DIOXANE	123-91-1	UG_L	6.8		

		Sample Delivery Group		BETHPAGE-3		
		Lab ID		TI0330-6		
		Sample ID		RE121D2-GW-122115		
		Sample Date		12/21/2015		
		Sample Type		Groundwater		
Method	**Analyte**	**CAS No**	**Units**	Result	Qual	RC
8260C	1,1,1-TRICHLOROETHANE	71-55-6	UG_L	0.48	J	s
8260C	1,1,2,2-TETRACHLOROETHANE	79-34-5	UG_L	0.5	U	
8260C	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	UG_L	17	J	s
8260C	1,1,2-TRICHLOROETHANE	79-00-5	UG_L	0.64	J	s
8260C	1,1-DICHLOROETHANE	75-34-3	UG_L	0.51	J	s
8260C	1,1-DICHLOROETHENE	75-35-4	UG_L	3.1	J	s
8260C	1,2,4-TRICHLOROBENZENE	120-82-1	UG_L	0.5	U	
8260C	1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	UG_L	0.75	U	
8260C	1,2-DIBROMOETHANE	106-93-4	UG_L	0.5	U	
8260C	1,2-DICHLOROBENZENE	95-50-1	UG_L	0.5	U	
8260C	1,2-DICHLOROETHANE	107-06-2	UG_L	0.5	U	
8260C	1,2-DICHLOROETHENE, TOTAL	540-59-0	UG_L	2.1	J	s
8260C	1,2-DICHLOROPROPANE	78-87-5	UG_L	0.5	U	
8260C	1,3-DICHLOROBENZENE	541-73-1	UG_L	0.5	U	
8260C	1,4-DICHLOROBENZENE	106-46-7	UG_L	0.5	U	
8260C	2-BUTANONE	78-93-3	UG_L	2.5	UJ	c
8260C	2-HEXANONE	591-78-6	UG_L	2.5	UJ	c
8260C	4-METHYL-2-PENTANONE	108-10-1	UG_L	2.5	U	
8260C	ACETONE	67-64-1	UG_L	2.5	UJ	c
8260C	BENZENE	71-43-2	UG_L	0.5	U	
8260C	BROMODICHLOROMETHANE	75-27-4	UG_L	0.5	U	
8260C	BROMOFORM	75-25-2	UG_L	0.5	U	
8260C	BROMOMETHANE	74-83-9	UG_L	1	U	
8260C	CARBON DISULFIDE	75-15-0	UG_L	0.5	U	
8260C	CARBON TETRACHLORIDE	56-23-5	UG_L	3.1	J	s
8260C	CHLOROBENZENE	108-90-7	UG_L	0.5	U	
8260C	CHLOROETHANE	75-00-3	UG_L	1	UJ	c
8260C	CHLOROFORM	67-66-3	UG_L	1.7	J	s
8260C	CHLOROMETHANE	74-87-3	UG_L	1	U	
8260C	CIS-1,2-DICHLOROETHENE	156-59-2	UG_L	2.1	J	s
8260C	CIS-1,3-DICHLOROPROPENE	10061-01-5	UG_L	0.5	U	
8260C	CYCLOHEXANE	110-82-7	UG_L	0.5	U	
8260C	DIBROMOCHLOROMETHANE	124-48-1	UG_L	0.5	U	
8260C	DICHLORODIFLUOROMETHANE	75-71-8	UG_L	0.85	J	s
8260C	ETHYLBENZENE	100-41-4	UG_L	0.5	U	
8260C	ISOPROPYLBENZENE	98-82-8	UG_L	0.5	U	
8260C	M- AND P-XYLENE	108-38-3/106-42	UG_L	1	U	
8260C	METHYL ACETATE	79-20-9	UG_L	0.75	U	
8260C	METHYL CYCLOHEXANE	108-87-2	UG_L	0.5	U	
8260C	METHYL TERT-BUTYL ETHER	1634-04-4	UG_L	0.5	U	
8260C	METHYLENE CHLORIDE	75-09-2	UG_L	2.5	U	
8260C	O-XYLENE	95-47-6	UG_L	0.5	U	
8260C	STYRENE	100-42-5	UG_L	0.5	U	
8260C	TETRACHLOROETHENE	127-18-4	UG_L	0.5	U	
8260C	TOLUENE	108-88-3	UG_L	0.5	U	
8260C	TRANS-1,2-DICHLOROETHENE	156-60-5	UG_L	0.5	U	
8260C	TRANS-1,3-DICHLOROPROPENE	10061-02-6	UG_L	0.5	UJ	c
8260C	TRICHLOROETHENE	79-01-6	UG_L	480		
8260C	TRICHLOROFLUOROMETHANE	75-69-4	UG_L	1	U	
8260C	VINYL CHLORIDE	75-01-4	UG_L	1	U	
8260C	XYLENES, TOTAL	1330-20-7	UG_L	1.5	U	
8270D_SIM	1,4-DIOXANE	123-91-1	UG_L	4.9		

DATA VALIDATION REPORT

Project:	Regional Groundwater Investigation — NWIRP Bethpage	
Laboratory:	Katahdin Analytical	
Sample Delivery Groups:	SI8384	
Analyses/Method:	Total Organic Carbon (TOC) by U.S. EPA SW-846 Method 9060A and Standard Method 5310B for Total Organic Carbon by High-Temperature Combustion	
Validation Level:	3	
Project Number:	0888812477.SA.DV	
Prepared by:	Dana Miller/Resolution Consultants	Completed on: 12/01/2015
Reviewed by:	Tina Clemmey/Resolution Consultants	File Name: SI8384_ 9060A_5310B

SUMMARY

This report summarizes data review findings for samples listed below, collected by Resolution Consultants from the Regional Groundwater Investigation — NWIRP Bethpage site on 21 October 2015 in accordance with the following Sampling and Analysis Plans:

- *Sampling and Analysis Plan, Bethpage, New York.* (Resolution Consultants April 2013).
- *UFP SAP Addendum, Installation of Vertical Profile Borings and Monitoring Wells, Operable Unit 2, NWIRP Bethpage, New York.* (Resolution Consultants November 2013).
- *UFP SAP Addendum, Inclusion of Additional Target Analytes for Volatile Organics Analyses, NWIRP Bethpage OU2, Bethpage, New York*. (Resolution Consultants August 2014).

Sample ID	Lab ID	Matrix/Sample Type	Analysis
RE121D1-SOIL-102115-553-555	SI8384-1	Soil	9060A
RE121D1-EB-102115	SI8384-2	Equipment Blank	5310B

Data validation activities were conducted using the following guidance documents: *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846, specifically Method 9060A, Total Organic Carbon* (U.S. EPA, 1996), *Method SM5310B, Total Organic Carbon by High-Temperature Combustion, U.S. Environmental Protection Agency (U.S. EPA) Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review* (NFG, January 2010, and Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 4.2 (October 2010). In

the absence of method-specific information, laboratory quality control (QC) limits, project-specific requirements and/or professional judgment were used as appropriate.

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓	Data completeness (chain-of-custody)/sample integrity
✓	Holding times and sample preservation
✓	Gas chromatography/Mass spectrometer performance checks
✓	Initial calibration/continuing calibration verification
✓	Laboratory blanks/equipment blanks/field blanks/trip blanks
NA	Surrogate spike recoveries
NA	Matrix spike and/or matrix spike duplicate results
✓	Laboratory control sample laboratory control sample duplicate results
NA	Field duplicates
NA	Internal standards
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Acceptable data parameters for which all criteria were met and no qualification was performed and non-conformance or other issues that were noted during validation, but did not result in qualification of data are not discussed further.

Qualifications Actions

The data was reviewed independently from the laboratory to assess data quality. Any sample that was analyzed at a dilution because of high concentrations of target or non-target analytes was checked to confirm that the results and/or sample-specific limit of quantitation and limit of detections were adjusted accordingly by the laboratory.

No results were qualified during this review. Analytical completeness was calculated to be 100% and the data are usable for their intended purpose, according to U.S. Environmental Protection Agency and Department of Defense guidelines. Attachment A, Table A-1 provides final results after data review.

ATTACHMENTS

Attachment A: Table A-1 Final Results after Data Review

Attachment A
Final Results after Data Review

Table A-1
Final Results after Data Review
Regional Groundwater Investigation NWIRP Bethpage

		Sample Delivery Group		SI8384	SI8384
		Lab ID		SI8384-1	SI8384-2
		Sample ID		RE121D1-SOIL-102115-553-555	RE121D1-EB-102115
		Sample Date		10/21/2015	10/21/2015
		Sample Type		Soil	Equipment Blank
Method	Analyte	CAS No	Units	Result	Result
2540G	TOTAL SOLIDS	-29	PCT	87	NA
5310B	TOTAL ORGANIC CARBON	-28	MG_L	NA	0.6
9060A	TOTAL ORGANIC CARBON	-28	UG_G	640	NA

Notes:

ID = Identification
PCT = Percent
MG_L = Milligrams per liter
UG_G = Micrograms per gram
NA = Not analyzed

DATA VALIDATION REPORT

Project:	Regional Groundwater Investigation — NWIRP Bethpage	
Laboratory:	Katahdin Analytical	
Sample Delivery Groups:	SI9043	
Analyses/Method:	Total Organic Carbon (TOC) by U.S. EPA SW-846 Method 9060A and Standard Method 5310B for Total Organic Carbon by High-Temperature Combustion	
Validation Level:	3	
Project Number:	0888812477.SA.DV	
Prepared by:	Dana Miller/Resolution Consultants	Completed on: 12/10/2015
Reviewed by:	Tina Clemmey/Resolution Consultants	File Name: SI9043_ 9060A_5310B

SUMMARY

This report summarizes data review findings for samples listed below, collected by Resolution Consultants from the Regional Groundwater Investigation — NWIRP Bethpage site on 6 November 2015 in accordance with the following Sampling and Analysis Plans:

- *Sampling and Analysis Plan, Bethpage, New York.* (Resolution Consultants April 2013).
- *UFP SAP Addendum, Installation of Vertical Profile Borings and Monitoring Wells, Operable Unit 2, NWIRP Bethpage, New York.* (Resolution Consultants November 2013).
- *UFP SAP Addendum, Inclusion of Additional Target Analytes for Volatile Organics Analyses, NWIRP Bethpage OU2, Bethpage, New York*. (Resolution Consultants August 2014).

Sample ID	Lab ID	Matrix/Sample Type	Analysis
RE121D2-SOIL-110615-743-745	SI9043-1	Soil	9060A
RE121D2-EB-110615	SI9043-2	Equipment Blank	5310B

Data validation activities were conducted using the following guidance documents: *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846, specifically Method 9060A, Total Organic Carbon* (U.S. EPA, 1996), *Method SM5310B, Total Organic Carbon by High-Temperature Combustion, U.S. Environmental Protection Agency (U.S. EPA) Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review* (NFG, January 2010, and Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 4.2 (October 2010). In

the absence of method-specific information, laboratory quality control (QC) limits, project-specific requirements and/or professional judgment were used as appropriate.

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓	Data completeness (chain-of-custody)/sample integrity
✓	Holding times and sample preservation
✓	Gas chromatography/Mass spectrometer performance checks
✓	Initial calibration/continuing calibration verification
✓	Laboratory blanks/equipment blanks/field blanks/trip blanks
NA	Surrogate spike recoveries
NA	Matrix spike and/or matrix spike duplicate results
✓	Laboratory control sample laboratory control sample duplicate results
NA	Field duplicates
NA	Internal standards
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Acceptable data parameters for which all criteria were met and no qualification was performed and non-conformance or other issues that were noted during validation, but did not result in qualification of data are not discussed further.

Qualifications Actions

The data was reviewed independently from the laboratory to assess data quality. Any sample that was analyzed at a dilution because of high concentrations of target or non-target analytes was checked to confirm that the results and/or sample-specific limit of quantitation and limit of detections were adjusted accordingly by the laboratory.

No results were qualified during this review. Analytical completeness was calculated to be 100% and the data are usable for their intended purpose, according to U.S. Environmental Protection Agency and Department of Defense guidelines. Attachment A, Table A-1 provides final results after data review.

ATTACHMENTS

Attachment A: Table A-1 Final Results after Data Review

Attachment A
Final Results after Data Review

Table A-1
Final Results after Data Review
Regional Groundwater Investigation NWIRP Bethpage

			Sample Delivery Group	SI9043	SI9043
			Lab ID	SI9043-1	SI9043-2
			Sample ID	RE121D2-SOIL-110615-743-745	RE121D2-EB-110615
			Sample Date	11/6/2015	11/6/2015
			Sample Type	Soil	Equipment Blank
Method	Analyte	CAS No	Units	Result	Result
2540G	TOTAL SOLIDS	-29	PCT	82	NA
5310B	TOTAL ORGANIC CARBON	-28	MG_L	NA	0.12
9060A	TOTAL ORGANIC CARBON	-28	UG_G	780	NA

Notes:

ID = Identification
PCT = Percent
MG_L = Milligrams per liter
UG_G = Micrograms per ~~liter~~gram
NA = Not analyzed

Section 5

Survey

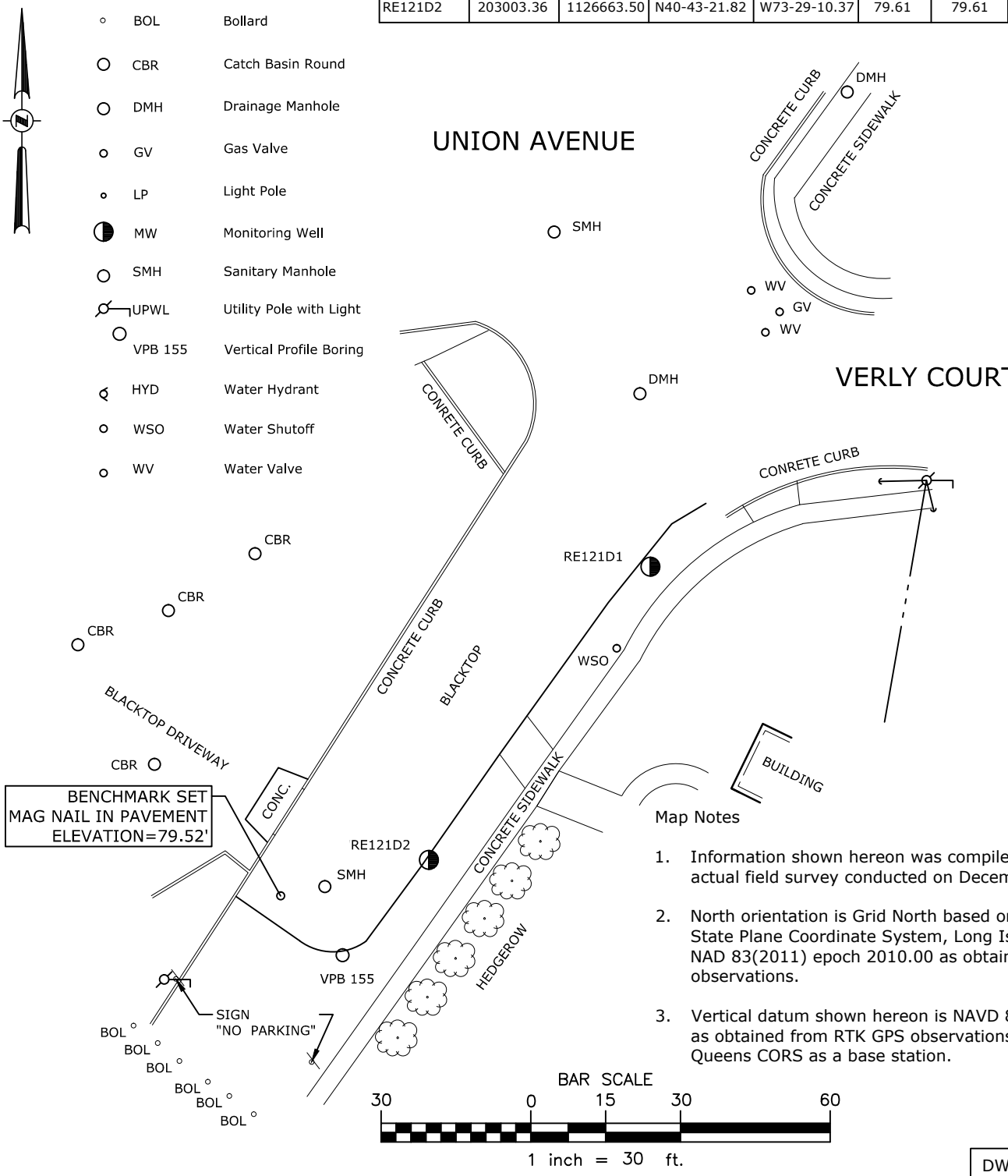
NONE :XREFS

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DOCUMENT IS A VIOLATION OF SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

Description	Northing	Easting	Latitude	Longitude	Ground	Rim	PVC
VPB 155	202984.27	1126646.18	N40-43-21.63	W73-29-10.60	79.19	79.19	NA
RE121D1	203062.13	1126707.85	N40-43-22.40	W73-29-09.79	79.84	79.84	79.03
RE121D2	203003.36	1126663.50	N40-43-21.82	W73-29-10.37	79.61	79.61	79.24

LEGEND

BOL	Bollard
CBR	Catch Basin Round
DMH	Drainage Manhole
GV	Gas Valve
LP	Light Pole
MW	Monitoring Well
SMH	Sanitary Manhole
UPWL	Utility Pole with Light
VPB 155	Vertical Profile Boring
HYD	Water Hydrant
WSO	Water Shutoff
WV	Water Valve



Map Notes

1. Information shown hereon was compiled from an actual field survey conducted on December 7, 2015.
2. North orientation is Grid North based on the New York State Plane Coordinate System, Long Island Zone, NAD 83(2011) epoch 2010.00 as obtained from GPS observations.
3. Vertical datum shown hereon is NAVD 88(Geoid12A) as obtained from RTK GPS observations using the Queens CORS as a base station.

DWG NO. 15-703

Date	RECORD OF WORK	Appr.

VERTICAL PROFILE BORING 155 SURVEY LOCATION
RE121D1-RE121D2
UNION AVENUE

TOWN OF PLAINEDGE | NASSAU COUNTY, NEW YORK

C.T. MALE ASSOCIATES
Engineering, Surveying, Architecture & Landscape Architecture, D.P.C.
50 CENTURY HILL DRIVE, LATHAM, NY 12110
518.786.7400 * FAX 518.786.7299

Drafter:	Checker: JFC
Appr. by: JFC	Proj. No. 14.4121
SCALE: 1"=30'	DATE: DECEMBER 7, 2015

CAD DWG. FILE NAME: K:\Projects\144121\Survey\Drawings and Maps\VPB 155.dwg