



NOR-02997

January 4, 2023

Ms. Kristi Granzen  
New York State Department of Environmental Conservation  
Division of Environmental Remediation  
Remedial Bureau D, Section B  
625 Broadway  
Albany, New York 12233-7015

Reference: CLEAN Contract No. N6247016D9008  
Contract Task Order WE13

Subject: Operable Unit 2 Plume Data Gap Investigation  
Monitoring Well Installation Summary Report  
Monitoring Well TT161S1  
Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage, New York

Dear Ms. Granzen:

On behalf of the Department of the Navy, Tetra Tech is providing the *Operable Unit 2 Plume Data Gap Investigation, Monitoring Well Installation Summary Report, Monitoring Well TT161S1, NWIRP Bethpage* to the New York State Department of Environmental Conservation (NYSDEC) for information. This report provides documentation for installation of groundwater monitoring well TT161S1. The Navy is issuing this document as a final. If no comments are received by February 3, 2023, the Navy will include this report as a final in the NWIRP Bethpage Administrative Record.

If you have any questions, please contact Mr. Scott Sokolowski, NAVFAC MIDLANT, at [scott.c.sokolowski.civ@us.navy.mil](mailto:scott.c.sokolowski.civ@us.navy.mil) or (757) 341-2011.

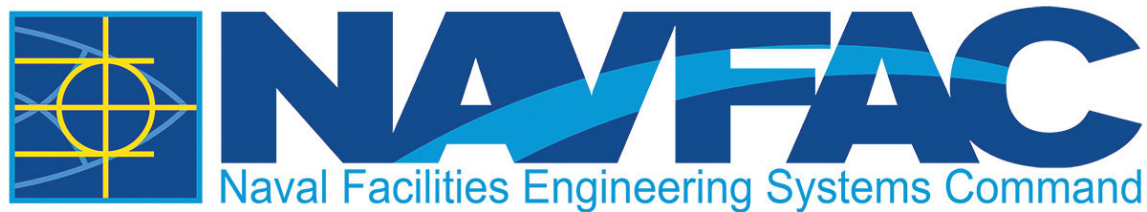
Sincerely,

A handwritten signature in black ink, appearing to read 'Ernie Wu'.

Ernie Wu  
Project Manager

Enclosures: Final Operable Unit 2 Plume Data Gap Investigation  
Monitoring Well Installation Summary Report  
Monitoring Well TT161S1  
Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage, New York

Distribution:  
NYSDEC, Jason Pelton  
NAVFAC MIDLANT, Scott Sokolowski  
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Tetra Tech, Vin Varricchio  
Project File



Naval Facilities Engineering Systems Command Atlantic  
Norfolk, Virginia

**Operable Unit 2 Plume Data Gap Investigation  
Monitoring Well Installation Summary Report  
for Monitoring Well TT161S1**

Naval Weapons Industrial Reserve Plant  
Bethpage, New York

December 2022

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**OPERABLE UNIT 2 PLUME DATA GAP INVESTIGATION  
MONITORING WELL INSTALLATION SUMMARY REPORT  
MONITORING WELL TT161S1**

**NAVAL WEAPONS INDUSTRIAL RESERVE PLANT  
BETHPAGE, NEW YORK**

**COMPREHENSIVE LONG-TERM  
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT**

**Submitted to:  
Department of the Navy  
Naval Facilities Engineering Systems Command  
9324 Virginia Avenue  
Norfolk, VA 23511-3095**

**Submitted by:  
Tetra Tech  
4433 Corporation Lane, Suite 300  
Virginia Beach, Virginia 23462**

**CONTRACT NUMBER N62470D9008  
CONTRACT TASK ORDER WE13**

**December 2022**

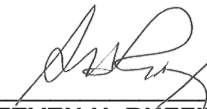
**PREPARED UNDER THE DIRECTION OF:**



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**ERNIE WU  
PROJECT MANAGER  
TETRA TECH  
VIRGINIA BEACH, VIRGINIA**

**APPROVED FOR SUBMISSION BY:**



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**STEVEN H. RUFFING, P.E.  
PROGRAM MANAGER  
TETRA TECH  
VIRGINIA BEACH, VIRGINIA**

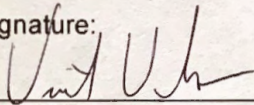
**NEW YORK PROFESSIONAL GEOLOGIST SEAL**

As a New York-licensed Professional Geologist, I have reviewed and approved the geological information and drawings in the Operable Unit 2 Plume Data Gap Investigation, Monitoring Well Installation Summary Report for Monitoring Well TT161S1, Naval Weapons Industrial Reserve Plant, Bethpage and seal it in accordance with Article 145 Section 7209 of the New York State Education Laws. In sealing this document, I certify that the geological information contained in it is true to the best of my knowledge and the geological methods and procedures included herein are consistent with currently accepted geological practices.

It is a violation of this law for any person to alter the contained drawings in anyway, unless he or she is acting under the direction of a NY-licensed Professional Geologist.

Name: Vincent J. Varricchio  
NY PG License Number: 000095  
State: New York

Signature:

  
\_\_\_\_\_

Date:

12/8/2022  
\_\_\_\_\_



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## Acronyms and Abbreviations

|        |   |
|--------|---|
| AOC    | Area of Concern   |
| bgs    | below ground surface                                    |
| COR    | Continuously Operating Reference                        |
| DoD    | Department of Defense                                   |
| ELAP   | Environmental Laboratory Accreditation Program          |
| EPA    | Environmental Protection Agency, United States          |
| ft     | feet  |
| GOCO   | Government-Owned Contractor-Operated                    |
| GPS    | Global Positioning System                               |
| IDW    | Investigation Derived Waste                             |
| IR     | Installation Restoration                                |
| NAD    | North American Datum                                    |
| NAVD   | North American Vertical Datum                           |
| NAVFAC | Naval Facilities Engineering Systems Command            |
| NG     | Northrop Grumman  |
| NGS    | National Geodetic Survey                                |
| NTU    | Nephelometric Turbidity Units                           |
| NWIRP  | Naval Weapons Industrial Reserve Plant                  |
| NYSDEC | New York State Department of Environmental Conservation |
| OU     | Operable Unit   |
| PCBs   | Polychlorinated Biphenyls                               |
| PID    | Photoionization Detector                                |
| POTW   | Publicly Owned Treatment Works                          |
| PPE    | Personal Protective Equipment                           |
| PVC    | Polyvinyl Chloride                                      |
| ROD    | Record of Decision                                      |
| SVOC   | Semivolatile Organic Compounds                          |



VOC            Volatile Organic Compounds  
VPB            Vertical Profile Boring

## 1.0 Introduction

Tetra Tech has prepared this Monitoring Well Installation Summary Report for the Naval Facilities Engineering Systems Command (NAVFAC) Atlantic Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N6247016D9008 Task Order WE13, which is part of the Navy's ongoing Environmental Restoration Program for the Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage Operable Unit (OU) 2 Site 1 plume identified in the 2003 Record of Decision (ROD) (NAVFAC, 2003). This report describes monitoring well installation activities for TT161S1 under the OU2 Plume Data Gap Investigation. As shown in Figure 1, NWIRP Bethpage is located in east-central Nassau County, Long Island, New York, approximately 30 miles east of New York City.

### 1.1 Scope and Objectives

The shallow OU2 VOC plume (0 to 300 feet below ground surface [bgs]) downgradient of the former NWIRP is delineated primarily based on vertical profile boring (VPB) data. Similarly, the southern boundary of the intermediate plume (300 to 500 feet bgs) is also delineated based on VPB data. The VPB data consists of groundwater grab samples that represent primarily a single non-reproducible sampling event. The OU2 Plume Data Gap Investigation includes installation of eleven monitoring wells (eight shallow and three intermediate depth wells) to allow collection of current data to delineate the OU2 volatile organic compounds (VOC) plume in this area and allows for the collection of future groundwater data to evaluate potential changes in the VOC concentrations over time. Groundwater data collected from these wells will be used to support the Navy's ongoing and planned remediation of the OU2 VOC plume.

The monitoring wells installed in this investigation are located at or near former VPB locations. The well screen intervals were selected based on data from the VPBs, such as presence/absence of VOCs and subsurface geology. The location of these wells is shown on Figure 2.

This monitoring well installation summary report provides information on the installation of monitoring well TT161S1 associated with VPB-161 (Figure 2). VPB-161 was installed in 2016. The purpose of monitoring well TT161S1 is to address data gaps in the shallow (0 to 300 feet bgs) interval of the OU2 plume.

Field tasks were conducted in February and March 2022 in accordance with the CERCLA Letter Work Plan Site 1 Operable Unit 2 Plume Data Gap Investigation Monitoring Well Installation Program (Tetra Tech, 2021). The field investigation included

the installation and development of one monitoring well, groundwater sampling and surveying.

Documentation of these activities is included in the appendices of this report. Appendix A contains the summary packet for monitoring well TT161S1. Appendix B contains the survey 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 a residential neighborhood and on the north, south, and west by Steel Equities; however, a small portion near Sites 2 and 3 is still owned by Nassau County. Access to the NWIRP is from South Oyster Bay Road.

## **1.3 Geology and Hydrogeology**

### **1.3.1 Stratigraphy**

Overburden at the site consists of approximately 1,100 ft of unconsolidated deposits overlying crystalline bedrock of the Hartland Formation. Overburden is divided into four geologic units in descending order: the Upper Glacial Formation, 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 crystalline bedrock consists primarily of metamorphic and igneous rocks.

The Upper Glacial Formation consists of till and outwash deposits of medium to coarse sand and gravel with lenses of fine sand, silt, and clay (Smolensky and Feldman, 1988); these deposits form the Upper Glacial Aquifer. Directly underlying this unit is the Magothy Formation with a thickness of 650 to 900 ft that extends to a depth of 700 to 1,000 ft bgs, as observed at the former NWIRP and extending southeast to areas south of Southern State Parkway. 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 425 and 820 ft bgs; these deposits form the main groundwater 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.

### **1.3.2 Hydrogeology**

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. Because of the presence of intermittent clay layers and the depths, the Magothy Aquifer is commonly regarded to function overall as an unconfined aquifer at shallow depths and a confined aquifer at greater depths. The drilling program at the NWIRP has revealed that clay zones beneath the facility are common but laterally discontinuous. No confining clay units of facility-wide extent have been encountered.

Groundwater is encountered at an average 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 15 to 60 ft bgs. The groundwater flow in the area is to the south- southeast.

## **2.0 Field Program**

Field investigation activities at TT161S1 consisted of drilling, groundwater sampling, geophysical logging, monitoring well installation, monitoring well development, and surveying. After the borehole drilling and geophysical logging were completed, the data was reviewed and used to confirm the planned monitoring well screen interval was acceptable. Drilling during this investigation was performed by Delta Well and Pump Company of Ronkonkoma, New York under the oversight of Tetra Tech. A description of these tasks is provided below.

### **2.1 Borehole Drilling**

Borehole TT161S1 was completed during this field effort in February 2022. The total depth of the borehole was 240 ft bgs. The location is shown in Figure 2 and details are summarized in Table 1.

#### **2.1.1 Drilling**

In order to prevent sloughing of the borehole through unconsolidated lithologies, the borehole was installed by setting a 10-inch diameter surface casing using a hollow stem auger drill rig. The surface casing was set to 52 ft bgs at the borehole location. The remainder of the drilling depth was advanced using mud rotary drilling techniques. Drilling mud consisted of potable water and polymer-free sodium bentonite. Drilling mud was contained and re-circulated in baffled, high-capacity mud tubs. A sand separator was used intermittently to remove fines from circulation.

#### **2.1.2 Sampling**

A total of three (3) split spoon samples were collected from borehole TT161S1 to confirm lithology at the proposed screen interval. Samples were logged by the field geologist and screened for VOCs utilizing a photoionization detector (PID). A detailed boring log for TT161S1 is included in Appendix A.

Groundwater grab samples were collected from the top and bottom of the proposed screen interval (200 to 202 ft bgs and 220 to 222 ft bgs). Groundwater grab samples were collected with a hydropunch sampler and analyzed for VOCs using Environmental Protection Agency (EPA) Method SW846-8260B. The groundwater grab samples were analyzed by Chemtech, a Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP), and New York State Department of Environmental Conservation (NYSDEC)-certified laboratory. During the collection of groundwater grab

samples, field parameters were measured (pH, temperature, specific conductivity, oxidation reduction potential, dissolved oxygen, and turbidity). These groundwater samples were collected for screening level data and did not receive validation. Groundwater grab sample logs, and analytical data tables for TT161S1 are included in Appendix A.

During drilling, air sampling was conducted under a Community Air Monitoring Plan (CAMP). At this drilling location, during active drilling operations, the air was monitored upwind and downwind of the borehole for dust and VOCs using particulate meters and photoionization detector (PID) meters. No exceedances which would cause drilling operations to cease under the CAMP were observed during the active drilling operations.

### **2.1.3 Geophysics**

Borehole geophysical logs (gamma) were recorded after the borehole was drilled but prior to the removal of drill rods. A copy of the log was printed in the field for review once the probe reached the bottom of the borehole. The instrument was then raised to the top of the boring and a second log was generated and printed in the field. The gamma log is included in Appendix A.

## **2.2 Monitoring Well Installation**

Monitoring well TT161S1 was installed in February 2022. The geophysical logs and the groundwater analytical data collected from the hydropunch sampler were used to confirm the planned screened interval for the monitoring well. The total depth of the monitoring well is 225 ft bgs.

### **2.2.1 Drilling and Well Construction**

The well was installed using mud rotary drilling techniques. Well construction details are summarized in Table 2. The well was installed near VPB-161. The well screen interval for monitoring well TT161S1 was selected using the data (VOC and subsurface geology) from the VPB-161.

During the monitoring well installation, split spoon soil samples were collected every ten feet in the screen interval to confirm the presence of a higher permeability interval.

The monitoring well was constructed of 4-inch diameter, Schedule 80, National Sanitation Foundation-approved polyvinylchloride (PVC) riser pipe and 0.010-slot well screen. The well was completed at the surface with a 12-inch diameter steel curb box.

The well riser was set below grade and fit with a lockable J plug. A detailed monitoring well construction diagram for monitoring well TT161S1 is included in Appendix A.

## **2.2.2 Well Development**

Following installation, the monitoring well was 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 5 days after well installation.

The monitoring well screen was developed using a combination of air lifting and pumping with a submersible pump. The following groundwater quality parameters were collected during development to determine stabilization: pH, specific conductivity, dissolved oxygen, turbidity, temperature, and oxidation-reduction potential. In compliance with NYSDEC policy, wells were developed until turbidity was less than 50 nephelometric turbidity units (NTUs) if possible. Table 3 summarizes total pumped volume from air lifting and pump development and final turbidity. The well development log for monitoring well TT161S1 is included in Appendix A.

Groundwater samples were collected at the end of development activities using the submersible pump dedicated for development. These samples were collected to provide initial screening level data for VOCs and 1,4-dioxane using Methods SW846-8260B and SW846-8270 SIM, respectively. This data did not receive data validation since the samples are not considered high quality samples. The unvalidated analytical data, laboratory form I for TT161S1 is included in Appendix A. This monitoring well is sampled as part of the ongoing routine groundwater sampling program and data from these sampling events are reported/documented under separate reports.

## **2.3 Decontamination and Investigation Derived Waste (IDW)**

As part of the IDW management practices and in accordance with the work plan, the investigation waste (consisting of soil cuttings, drilling muds, groundwater monitoring well development water, decontamination fluids, and personal protective equipment [PPE]) generated during the boring installation was containerized and staged at NWIRP Bethpage. IDW solids were characterized and disposed of properly under requirements outlined in NYSDEC subpart 375-6.8(b) and CP-51. Representative samples of soil IDW were collected from roll off containers and submitted to Chemtech for analysis, which includes VOCs, semi-volatile organic compounds (SVOCs), Metals and polychlorinated biphenyls (PCBs)/Pesticides.



IDW water 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 Chemtech for analysis of VOCs via EPA Method 624.1, PCBs via Method 8082A and Total Metals via Method 6010. To the extent feasible, soil and water were not mixed.

All IDW generated during this investigation was characterized as non-hazardous.

## **2.4 Surveying**

A survey of the monitoring well location was conducted by Borbas Surveying & Mapping, LLC, of Boonton, NJ, under the direct supervision of Tetra Tech. The location was 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 National Geodetic Survey (NGS) Continuously Operating Reference (COR) Stations NYBR, NYCI, NYVH and SHK6. The horizontal location is referenced to the North American Datum (NAD) 1983 New York, Long Island State Plane Coordinate System and has an accuracy of 0.1 foot. Horizontal control is based on Global Positioning System (GPS) observations using the NGS COR Stations NYBR, NYCI, NYVH and SHK6.

A table of survey data (grade elevation, northing/easting, and latitude/longitude) is included in Appendix B.

### 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.

Tetra Tech, 2021. *CERCLA Letter Work Plan Site 1 Operable Unit 2 Plume Data Gap Investigation Monitoring Well Installation Program, NWIRP Bethpage, New York*, February.

Smolensky, D., and Feldman, S., 1988. *Geohydrology of the Bethpage-Hicksville-Levittown Area, Long Island, New York*, U.S. Geological Survey Water-Resourced Investigations Report 88-4135, 25 pp.

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## **TABLES**

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**TABLE 1**  
**BORING SUMMARY - TT161S1**  
**OU2 PLUME DATA GAP INVESTIGATION**  
**NWIRP BETHPAGE, NY**

| <b>BORING</b> | <b>BORING START DATE</b> | <b>BORING COMPLETION DATE</b> | <b>GROUND ELEVATION (MSL)</b> | <b>TOTAL DEPTH (ft bgs)</b> | <b>SURFACE CASING SET AT (ft bgs)</b> | <b>NO. OF SPOON SAMPLES</b> | <b>GAMMA LOG (ft bgs)</b> | <b>NO. GW SAMPLES COLLECTED/ ATTEMPTED</b> | <b>DATE OF AIR SAMPLE</b> | <b>MONITORING WELLS INSTALLED AT LOCATION</b> |
|---------------|--------------------------|-------------------------------|-------------------------------|-----------------------------|---------------------------------------|-----------------------------|---------------------------|--|---------------------------|---|
| TT161S1       | 2/8/2022                 | 2/21/2022                     | 62.0                          | 240                         | 52                                    | 3                           | 240                       | 2 / 2                                      | N/A                       | TT161S1                                       |

MSL - mean sea level

ft bgs - feet below ground surface

N/A - not applicable

**TABLE 2**  
**MONITORING WELL CONSTRUCTION SUMMARY**  
**OU2 PLUME DATA GAP INVESTIGATION**  
**NWIRP BETHPAGE, NY**

| <b>MONITORING WELL</b> | <b>ADJACENT VPB</b> | <b>WELL COMPLETION DATE</b> | <b>GROUND ELEVATION (MSL)</b> | <b>TOP OF CASING ELEVATION (MSL)</b> | <b>WELL DEPTH (ft bgs)</b> | <b>CASING DEPTH (ft bgs)</b> | <b>SCREEN INTERVAL (ft bgs)</b> | <b>SUMP DEPTH INTERVAL (ft bgs)</b> | <b>BORING DEPTH (ft bgs)</b> |
|------------------------|---------------------|-----------------------------|-------------------------------|--------------------------------------|----------------------------|------------------------------|---------------------------------|-------------------------------------|------------------------------|
| TT161S1                | VPB161              | 2/24/2022                   | 62.0                          | 61.74                                | 225                        | 52                           | 200 - 220                       | 220 - 225                           | 240                          |

MSL - mean sea level

ft bgs - feet below ground surface

**TABLE 3**  
**MONITORING WELL DEVELOPMENT SUMMARY**  
**OU2 PLUME DATA GAP INVESTIGATION**  
**NWIRP BETHPAGE, NY**

| MONITORING WELL | ADJACENT VPB | AIR DEVELOPMENT |                      | PUMP DEVELOPMENT |                       |                      | APPROX. TOTAL DEVELOPMENT VOLUME (GAL) | FINAL TURBIDITY (NTUs) |
|-----------------|--------------|-----------------|----------------------|------------------|-----------------------|----------------------|--|------------------------|
|                 |              | DATE            | APPROX. VOLUME (GAL) | DATE             | FINAL PUMP DEPTH (FT) | APPROX. VOLUME (GAL) |  |                        |
| TT161S1         | VPB161       | 3/2/2022        | 3,358                | 3/3/2022         | 220                   | 3,120                | 6,266                                  | 5.38                   |

GAL - gallon

FT - feet

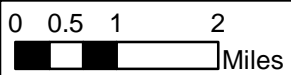
NTUs - Nephelometric Turbidity Units



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## FIGURES

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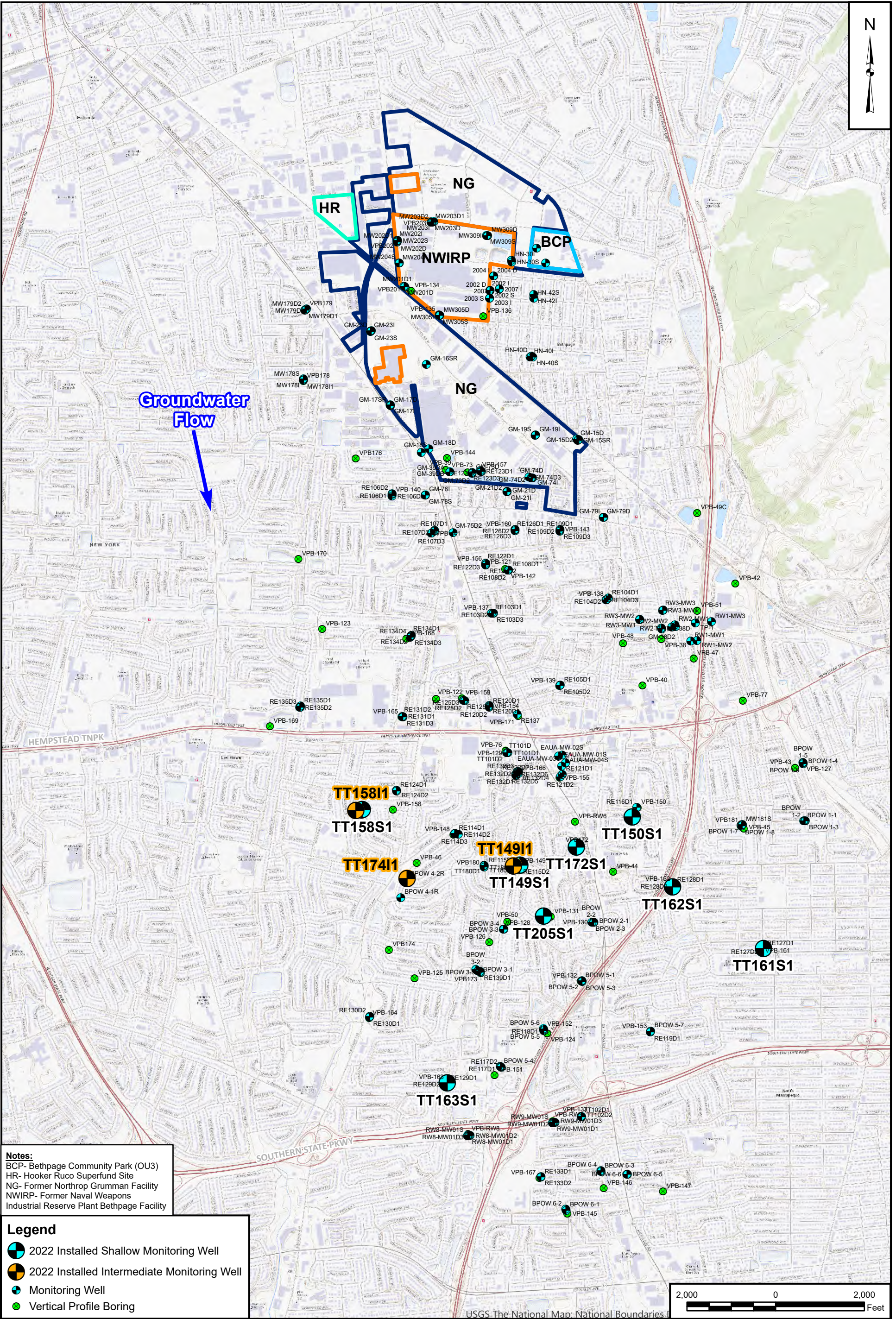
NOR P:\GIS\_files\Bethpage\MAP\_DOCS\IMXD\2013\RI\_add\BP\_longisland.new\_8x11.mxd MMC



**GENERAL LOCATION MAP  
NWIRP BETHPAGE, NEW YORK**

|                       |          |
|-----------------------|----------|
| CTO                   |          |
| N62470-16-D-9008 WE13 |          |
| DRAWN BY              | DATE     |
| MC                    | 08/15/19 |
| CHECKED BY            | DATE     |
| EW                    | 08/15/19 |
| FIGURE NUMBER         |          |
| 1                     |          |

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**Notes:**  
 BCP- Bethpage Community Park (OU3)  
 HR- Hooker Ruco Superfund Site  
 NG- Former Northrop Grumman Facility  
 NWIRP- Former Naval Weapons Industrial Reserve Plant Bethpage Facility

**Legend**

- 2022 Installed Shallow Monitoring Well
- 2022 Installed Intermediate Monitoring Well
- Monitoring Well
- Vertical Profile Boring

**2022 INSTALLED MONITORING WELLS  
 OU2 VOC PLUME DATA GAP INVESTIGATION  
 NWIRP BETHPAGE, NEW YORK**

USGS The National Map: National Boundaries

2,000 0 2,000 Feet

**NAVFAC**  
 Naval Facilities Engineering Systems Command

|            |           |                       |
|------------|-----------|-----------------------|
| DRAWN BY   | DATE      | CTO                   |
| MAS        | 12/8/2022 | N62470-16-D-9008-WE13 |
| CHECKED BY | DATE      | FIGURE NUMBER         |
| EW         | 12/8/2022 | <b>2</b>              |

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**Appendix A**  
**TT161S1**



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## **Appendix A**

### **TT161S1**

- 1. TT161S1 Boring Log**
- 2. TT161S1 Hydropunch Groundwater Sample Log Sheets**
- 3. TT161S1 Gamma Log**
- 4. TT161S1 Monitoring Well Construction Log**
- 5. TT161S1 Well Development/Groundwater Sample Log Sheets**
- 6. TT161S1 Analytical Data Unvalidated**

## **1. TT161S1 Boring Log**



CLIENT NAVFAC MIDLANT PROJECT NAME NWIRP Bethpage OU2  
 PROJECT NUMBER 112G08005-WE13 PROJECT LOCATION BETHPAGE  
 DATE STARTED 2/8/22 COMPLETED 2/21/22 GROUND ELEVATION 62.0 HOLE SIZE 9.25 inches  
 DRILLING CONTRACTOR DELTA WELL & PUMP DRILLING METHOD HSA (0-52' bgs) Mud Rotary (>52' bgs).  
 GROUND WATER LEVEL --- LOGGED BY B. Benfield  
 NORTHING 199135.9 ft EASTING 1131245.5 ft DATUM: NAVD 88  
 NOTES Hole size 12.25" from 0 to 52 feet below ground surface

| DEPTH (ft) | SAMPLE TYPE NUMBER | RECOVERY (in) | BLOW COUNTS (N VALUE) | U.S.C.S. | GRAPHIC LOG   | MATERIAL DESCRIPTION | WELL DIAGRAM  |
|------------|--------------------|---------------|-----------------------|----------|---|----------------------|---|
| 0          |                    |               |                       |          |   |                      | Casing Top Elev: 61.74 (ft)<br>Casing Type: PVC Sch. 40 |
| 0.5        |                    |               |                       | OL       | (OL) Topsoil/Organic SILT, moist  | 61.5                 | Top of Casing   |
| 6.0        |                    |               |                       | SP       | (SP) Yellowish brown poorly graded fine to medium subrounded SAND   | 56.0                 |   |
| 10         |                    |               |                       | SPGP     | (SPGP) Yellowish brown poorly graded medium subrounded SAND, few small to medium subrounded Gravel                          |                      | - 10" Diameter Steel Surface Casing                     |
| 38.0       |                    |               |                       | SPGP     | (SPGP) Brown to yellowish brown poorly graded medium to coarse subrounded SAND, trace to few small subrounded gravel        | 24.0                 |   |
| 60.0       |                    |               |                       | GP       | (GP) Yellowish brown fine to medium subrounded GRAVEL, little medium to coarse subrounded Sand, trace silt and iron nodules | 2.0                  | - Bentonite Cement Grout                                |
| 70.0       |                    |               |                       | SW       | (SW) Yellowish brown well graded fine to coarse subrounded SAND, some fine to medium subrounded Gravel                      | -8.0                 |   |
| 75.0       |                    |               |                       | GP       | (GP) Yellowish brown fine subrounded GRAVEL, little subrounded medium to coarse Sand, trace silt and iron nodules           | -13.0                |   |
| 78.0       |                    |               |                       | SW       | (SW) Light brown well graded fine to coarse subrounded SAND   | -16.0                |   |
| 85.0       |                    |               |                       | GP       | (GP) Brown poorly graded fine to medium subrounded GRAVEL, little coarse Sand   | -23.0                |   |
| 92.0       |                    |               |                       | SP       | (SP) Light brown to gray poorly graded fine to medium subrounded SAND, few fine subrounded Gravel and Muscovite             | -30.0                |   |
| 96.0       |                    |               |                       | CLSP     | (CLSP) Black fine Sandy lean CLAY   | -34.0                |   |
| 100.0      |                    |               |                       | SPCL     | (SPCL) Yellowish brown poorly graded fine to medium SAND, some lean Clay, trace lignite                                     | -38.0                |   |
| 115.0      |                    |               |                       | SP       | (SP) Yellowish brown fine to medium subangular SAND   | -53.0                |   |
| 120.0      |                    |               |                       | SP       | (SP) Yellowish brown poorly graded fine to medium SAND, trace silt and pyrite   | -58.0                |   |
| 130.0      |                    |               |                       |          |   | -68.0                | - Schedule 40 PVC Riser                                 |

BETHPAGE SHALLOW MWS - TT\_NAVFAC.2018.V1.GDT - 12/21/22 11:47 - C:\USERS\BEAU.BENFIELD\DESKTOP\BP\_NIRIS.GPJ



CLIENT NAVFAC MIDLANT

PROJECT NAME NWIRP Bethpage OU2

PROJECT NUMBER 112G08005-WE13

PROJECT LOCATION BETHPAGE

| DEPTH (ft) | SAMPLE TYPE NUMBER | RECOVERY (in) | BLOW COUNTS (N VALUE) | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION  | WELL DIAGRAM |
|------------|--------------------|---------------|-----------------------|----------|-------------|---|--------------|
| 130        |                    |               |                       | CLSM     |             | (CLSM) Dark gray fine to coarse Sandy lean CLAY, some fine to medium subrounded Gravel, trace lignite |              |
| 135.0      |                    |               |                       |          |             | -73.0   |              |
| 140        |                    |               |                       | ML       |             | (ML) Yellowish gray SILT, little fine Sand, trace lignite   |              |
| 150        |                    |               |                       | SP       |             | (SP) Light brown poorly graded medium subrounded SAND   |              |
| 154.0      |                    |               |                       |          |             | -88.0   |              |
| 154.0      |                    |               |                       | SM       |             | (SM) Yellowish brown to light brown Silty medium to coarse subrounded SAND                            |              |
| 160        |                    |               |                       | SC       |             | (SC) Yellow Clayey fine to medium SAND  |              |
| 164.0      |                    |               |                       |          |             | -102.0  |              |
| 168.0      |                    |               |                       | SP       |             | (SP) Light brown poorly graded fine to medium subangular SAND, trace silt                             |              |
| 170        |                    |               |                       |          |             | -106.0  |              |
| 180        |                    |               |                       | SC       |             | (SC) Yellowish brown Clayey medium subangular SAND  |              |
| 188.0      |                    |               |                       |          |             | -126.0  |              |
| 194.0      |                    |               |                       | SP       |             | (SP) Light gray poorly graded fine to medium subangular SAND, trace silt                              |              |
| 200        |                    |               |                       |          |             | -143.0  |              |
| 205.0      | SS                 | 18            | 12-20-15-17 (35)      | SP       |             | (SP) Light brown poorly graded fine SAND, trace silt  |              |
| 210        |                    |               |                       |          |             | -151.0  |              |
| 213.0      | SS                 | 8             | 12-15-30-25 (45)      | SP       |             | (SP) Light brown poorly graded fine to medium subangular SAND, trace lignite                          |              |
| 219.0      |                    |               |                       |          |             | -157.0  |              |
| 224.0      | SS                 | 18            | 10-20-23-30 (43)      | SP       |             | (SP) Gray poorly graded fine SAND, trace silt   |              |
| 230        |                    |               |                       | SPCL     |             | (SPCL) Yellowish brown poorly graded fine SAND, some lean Clay  |              |
| 240.0      |                    |               |                       |          |             | -178.0  |              |

- Bentonite Seal
- Secondary Sand Pack #0 Sand
- Primary Sand Pack #1 Sand
- Schedule 40 PVC 0.010 Slotted Screen With #1 Sand
- 5' Sump

Bottom of borehole at 240.0 feet.

BETHPAGE SHALLOW MWS - TT\_NAVFAC\_2018\_V1.GDT - 12/21/22 11:47 - C:\USERS\BEAU.BENFIELD\DESKTOP\BP\_NIRIS.GPJ

## **2. TT161S1 Hydropunch Groundwater Sample Log Sheets**

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## GROUNDWATER SAMPLE LOG SHEET



Event: MW161S1 Hydropunch  
 Project Site Name: NWIRP Bethpage  
 Project No.: 112G08005-WE13

|   |                                  |
|---|----------------------------------|
| Sample ID: <u>BP-MW-161S1-GW-200-202</u>  | Sampled By: <u>Beau Benfield</u> |
| QA/QC Duplicate ID: <u>N/A</u>  | Sample Date: <u>02/18/22</u>     |
| MS/MSD Collected: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO | Sample Time: <u>12:50</u>        |

|                                       |   |
|---------------------------------------|---|
| <b>WELL INFORMATION:</b>              |   |
| Well ID: <u>--</u>                    | Purge Date: <u>--</u>                   |
| Well Diameter (in): <u>--</u>         | Static Water Level (ft-BTOR): <u>--</u> |
| Top of Screen (ft-BTOR): <u>--</u>    | PID Monitor Reading: <u>--</u>          |
| Bottom of Screen (ft-BTOR): <u>--</u> | Purge Method: <u>--</u>                 |
| Total Well Depth (ft-BTOR): <u>--</u> | Sample Method: <u>--</u>                |

|   |                            |
|---|----------------------------|
| <b>EQUIPMENT INFORMATION:</b>                         |                            |
| Water Quality Instrument: <u>YSI Professional DSS</u> | Pump Controller: <u>--</u> |
| Turbidity Meter: <u>Hach 2100Q</u>                    |                            |

| <b>WATER QUALITY DATA:</b> |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|----------------------------|----------------------------------|------------------|-------------|-----------|--------------|-----------|-----------------|------------|----------|---------------------|-------|
| Time (Hrs)                 | H <sub>2</sub> O Level (ft-BTOR) | Flow (mL / min.) | Color       | pH (S.U.) | S.C. (uS/cm) | DO (mg/L) | Turbidity (NTU) | Temp. (C°) | ORP (mV) | Salinity (% or ppt) | Other |
| 12:50                      | --                               | --               | Very Cloudy | 7.81      | 446.2        | 5.9       | 556             | 11.6       | 69.9     | --                  |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |

| <b>FINAL PURGE / SAMPLE DATA:</b> |           |              |                        |           |              |           |                 |            |          |                     |       |
|-----------------------------------|-----------|--------------|------------------------|-----------|--------------|-----------|-----------------|------------|----------|---------------------|-------|
| Start Purge                       | End Purge | Total (min.) | Total Vol. (gal. / L.) | pH (S.U.) | S.C. (mS/cm) | DO (mg/L) | Turbidity (NTU) | Temp. (C°) | ORP (mV) | Salinity (% or ppt) | Other |
| --                                | --        | --           | --                     | --        | --           | --        | --              | --         | --       | --                  |       |

| <b>ANALYSIS, PRESERVATION AND BOTTLE REQUIREMENTS</b> |             |              |        |       |             |           |
|---|-------------|--------------|--------|-------|-------------|-----------|
| Analysis  | Method      | Preservative | Number | Vol.  | Bottle Type | Collected |
| VOC   | SW846-8260B | HCl          | 3      | 40 ml | VOA         | x         |
|   |             |              |        |       |             |           |
|   |             |              |        |       |             |           |
|   |             |              |        |       |             |           |
|   |             |              |        |       |             |           |
|   |             |              |        |       |             |           |
|   |             |              |        |       |             |           |
|   |             |              |        |       |             |           |
|   |             |              |        |       |             |           |
|   |             |              |        |       |             |           |

**OBSERVATIONS / NOTES:**

|              |   |   |               |
|--------------|---|---|---------------|
| Coordinates: | N | E | Signature(s): |
|--------------|---|---|---------------|



# GROUNDWATER SAMPLE LOG SHEET



Event: MW161S1 Hydropunch  
 Project Site Name: NWIRP Bethpage  
 Project No.: 112G08005-WE13

|  |                           |
|--|---------------------------|
| Sample ID: BP-MW-161S1-GW-220-222  | Sampled By: Beau Benfield |
| QA/QC Duplicate ID: N/A  | Sample Date: 02/21/22     |
| MS/MSD Collected: YES <input type="checkbox"/> NO <input type="checkbox"/> | Sample Time: 11:55        |

|                                |                                  |
|--------------------------------|----------------------------------|
| <b>WELL INFORMATION:</b>       |                                  |
| Well ID: --                    | Purge Date: --                   |
| Well Diameter (in): --         | Static Water Level (ft-BTOR): -- |
| Top of Screen (ft-BTOR): --    | PID Monitor Reading: --          |
| Bottom of Screen (ft-BTOR): -- | Purge Method: --                 |
| Total Well Depth (ft-BTOR): -- | Sample Method: --                |

|  |                     |
|--|---------------------|
| <b>EQUIPMENT INFORMATION:</b>                  |                     |
| Water Quality Instrument: YSI Professional DSS | Pump Controller: -- |
| Turbidity Meter: Hach 2100Q                    |                     |

| <b>WATER QUALITY DATA:</b> |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|----------------------------|----------------------------------|------------------|-------------|-----------|--------------|-----------|-----------------|------------|----------|---------------------|-------|
| Time (Hrs)                 | H <sub>2</sub> O Level (ft-BTOR) | Flow (mL / min.) | Color       | pH (S.U.) | S.C. (uS/cm) | DO (mg/L) | Turbidity (NTU) | Temp. (C°) | ORP (mV) | Salinity (% or ppt) | Other |
| 11:55                      | --                               | --               | Very Cloudy | 8.44      | 457.7        | 3.95      | 825             | 12.7       | -23.6    | --                  |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |
|                            |                                  |                  |             |           |              |           |                 |            |          |                     |       |

| <b>FINAL PURGE / SAMPLE DATA:</b> |           |              |                        |           |              |           |                 |            |          |                     |       |
|-----------------------------------|-----------|--------------|------------------------|-----------|--------------|-----------|-----------------|------------|----------|---------------------|-------|
| Start Purge                       | End Purge | Total (min.) | Total Vol. (gal. / L.) | pH (S.U.) | S.C. (mS/cm) | DO (mg/L) | Turbidity (NTU) | Temp. (C°) | ORP (mV) | Salinity (% or ppt) | Other |
| --                                | --        | --           | --                     | --        | --           | --        | --              | --         | --       | --                  |       |

| <b>ANALYSIS, PRESERVATION AND BOTTLE REQUIRMENTS</b> |             |              |        |       |             |           |
|--|-------------|--------------|--------|-------|-------------|-----------|
| Analysis   | Method      | Preservative | Number | Vol.  | Bottle Type | Collected |
| VOC  | SW846-8260B | HCl          | 3      | 40 ml | VOA         | X         |
|  |             |              |        |       |             |           |
|  |             |              |        |       |             |           |
|  |             |              |        |       |             |           |
|  |             |              |        |       |             |           |
|  |             |              |        |       |             |           |
|  |             |              |        |       |             |           |
|  |             |              |        |       |             |           |
|  |             |              |        |       |             |           |

**OBSERVATIONS / NOTES:**

|              |   |   |               |
|--------------|---|---|---------------|
| Coordinates: | N | E | Signature(s): |
|--------------|---|---|---------------|

### **3. TT161S1 Gamma Log**

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# AQUA TERRA GEOPHYSICS, INC.

Borehole Logging - Groundwater Consulting  
 Bellport, NY 11713  
 P: (631) 286-7699  
 aquaterra@optonline.net

**BOREHOLE ID:** MW161S1  
**DATE:** FEBRUARY 21, 2022

**TYPE OF LOG:** NATURAL GAMMA

**CUSTOMER:** DELTA WELL & PUMP  
**PROJECT:** NWIRP BETHPAGE  
**TOWN:** NORTH MASSAPEQUA  
**COUNTY:** MASSAU

**STATE:** NY

**WELL LOCATION:**

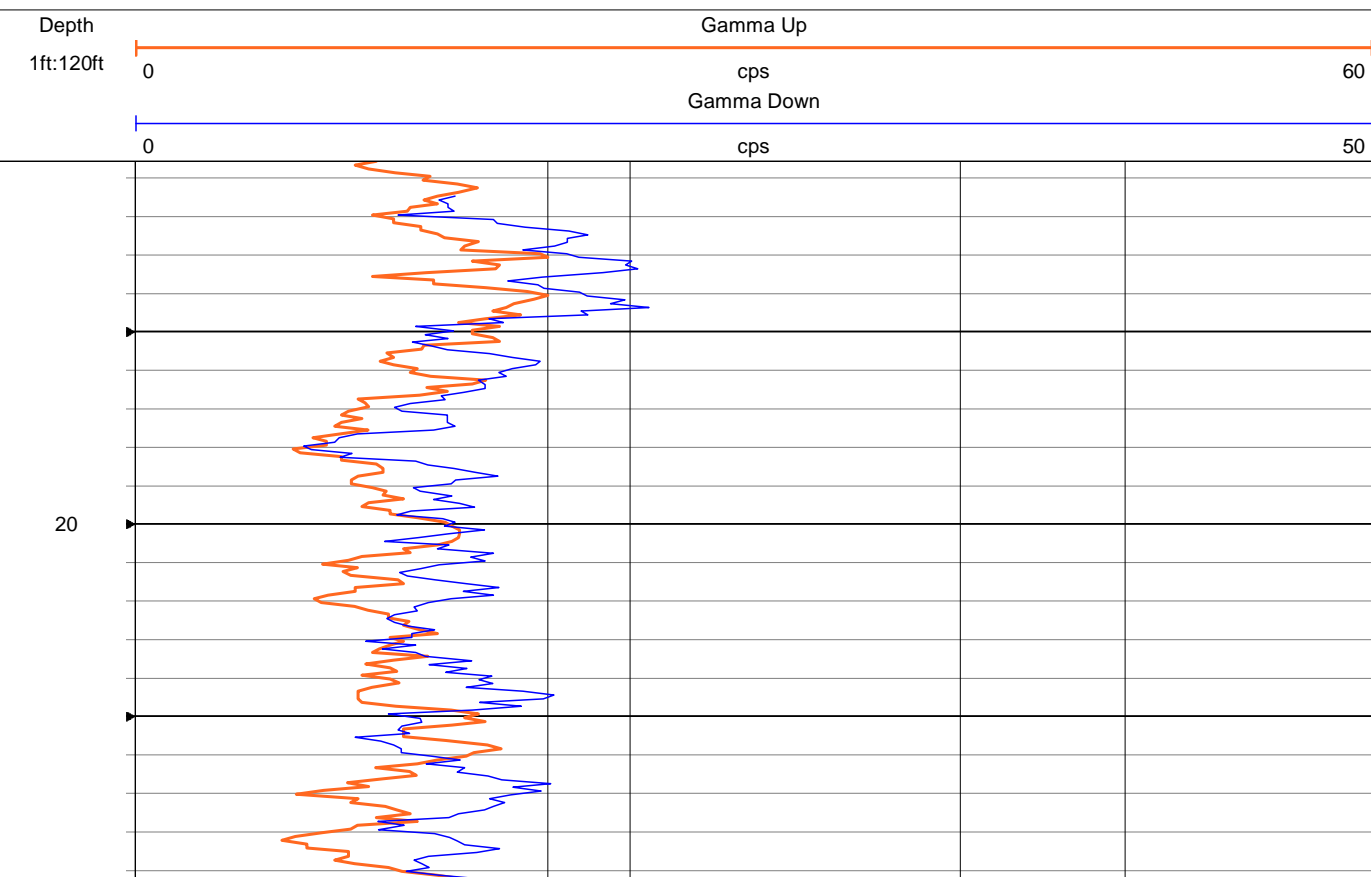
**OTHER SERVICES / COMMENTS:**

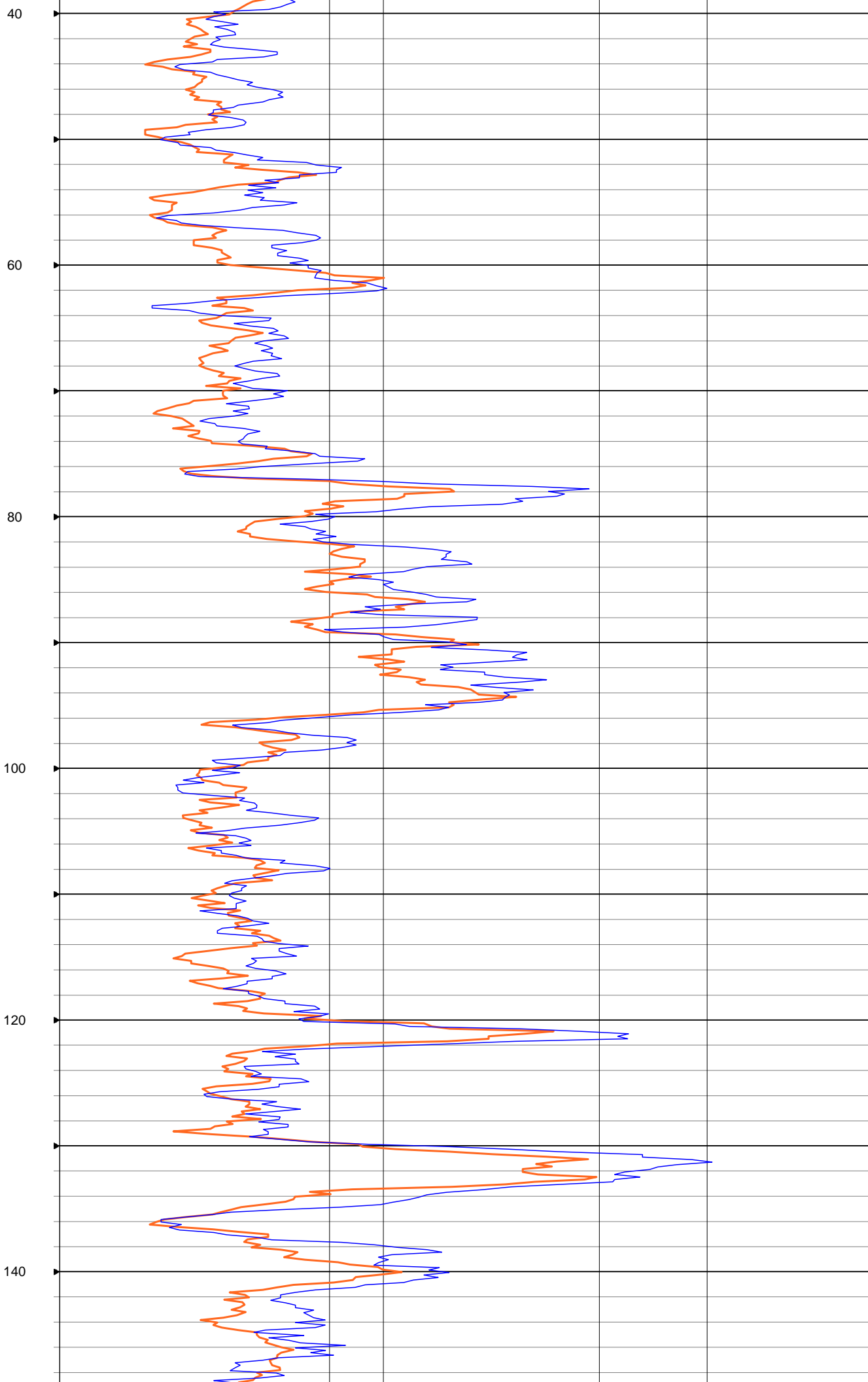
## BOREHOLE DATA

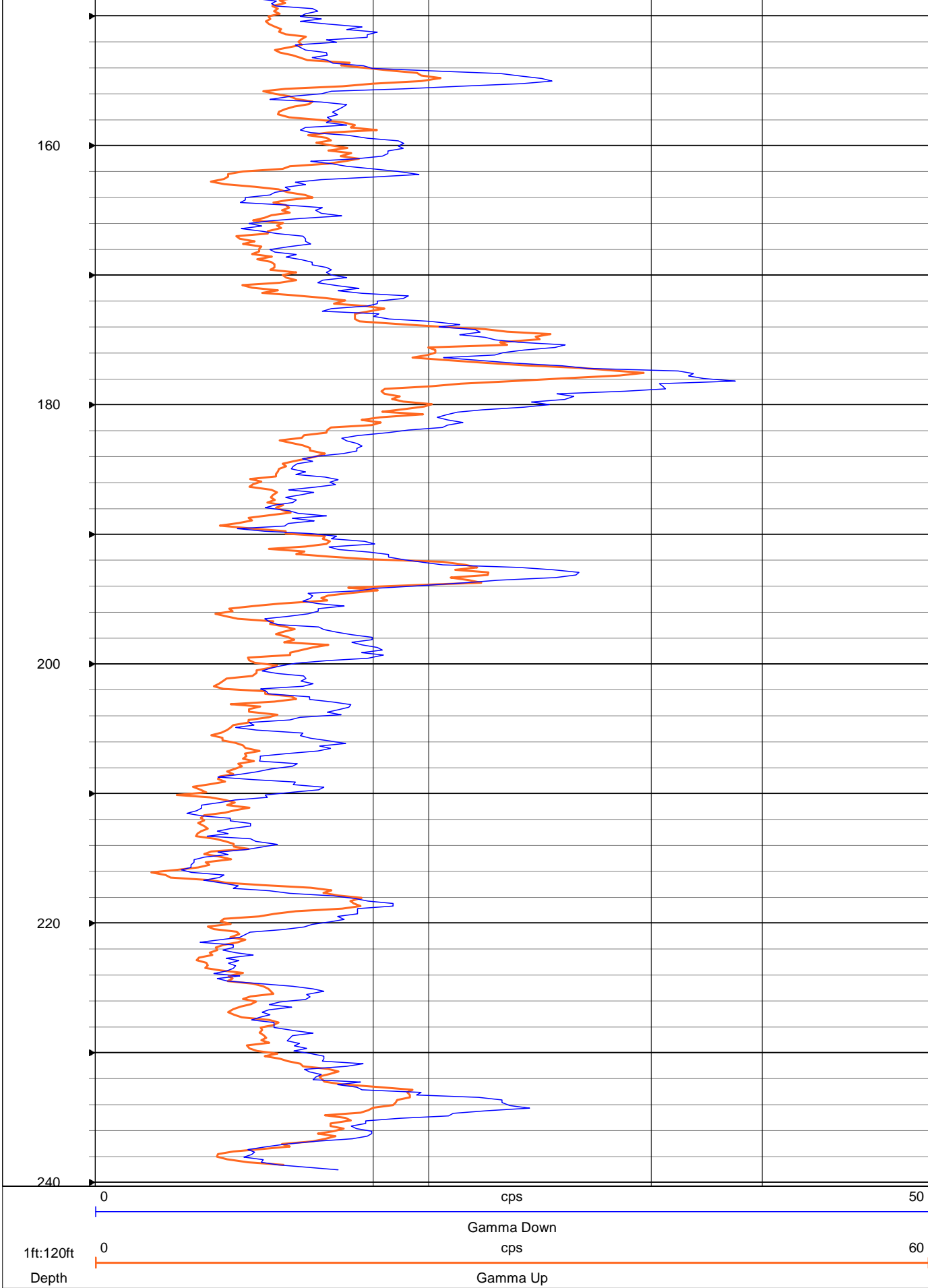
|                      |                |                |                  |
|----------------------|----------------|----------------|------------------|
| DRILLING CONTRACTOR: | TETRA TECH     | CONTACT:       | BEAU BENFELD     |
| CONSULTANT:          | MUD ROTARY     | WITNESS:       | MT SOPRIS MATRIX |
| DRILL METHOD:        | MUD ROTARY     | LOGGER MODEL:  | MT SOPRIS MATRIX |
| PROBE SERIAL NO.:    |                | LOGGING SPEED: | 20 FEET / MINUTE |
| DEPTH DRILLER:       | 240 FEET       | DEPTH LOGGER:  | 240 FEET         |
| LOG MEASURED FROM:   | GROUND SURFACE | LOGGED BY:     | BENJAMIN RICE    |

## LOGGING DATA

| BOREHOLE RECORD: |         | CASING RECORD |         |       |        |         |
|------------------|---------|---------------|---------|-------|--------|---------|
| BIT              | FROM    | TO            | SIZE    | WGT.  | FROM   | TO      |
| 9 5/8 IN.        | 50 FEET | TD            | 10 INCH | STEEL | 0 FEET | 50 FEET |
|                  |         |               | 4 INCH  | DP    | 0 FEET | TD      |
|                  |         |               |         |       |        |         |
|                  |         |               |         |       |        |         |
|                  |         |               |         |       |        |         |
|                  |         |               |         |       |        |         |
|                  |         |               |         |       |        |         |







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#### **4. TT161S1 Monitoring Well Construction Log**

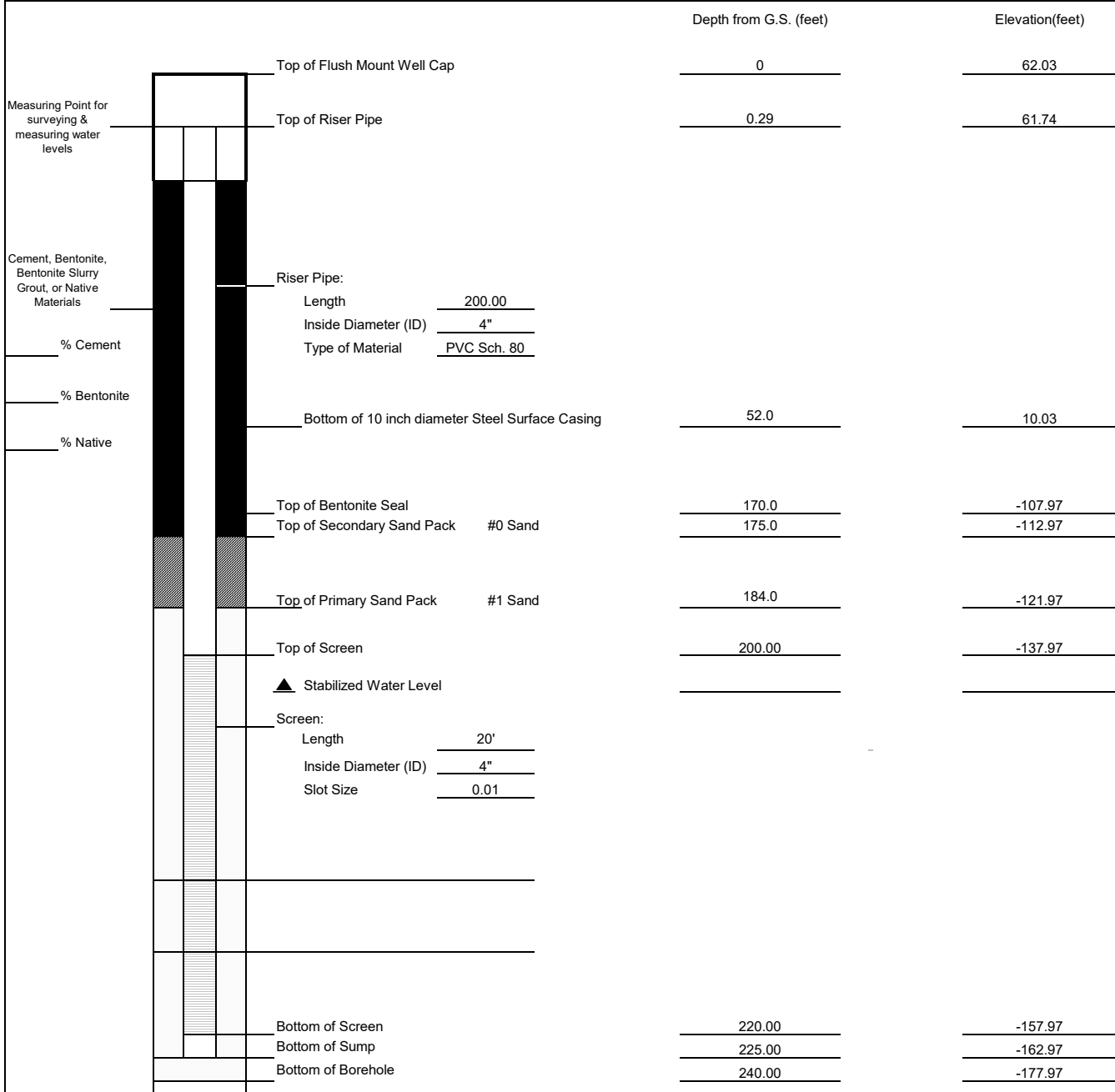


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|  |                                |                               |
|--|--------------------------------|-------------------------------|
| Client: NAVFAC                                     | Project Number: 112G08005-WE13 | <b>WELL ID: TT161S1</b>       |
| Site Location: NWIRP BETHPAGE, NY                  |                                |                               |
| Well Location: N. Michigan Ave and Woodward Dr.    |                                | Date Installed: 2/24/2022     |
| Method: Hollow Stem Auger & Mud Rotary             |                                | Inspector: Beau Benfield      |
| Coordinates: Northing: 199135.9 Easting: 1131245.5 |                                | Contractor: Delta Well & Pump |

**MONITORING WELL CONSTRUCTION DETAIL**



Borehole Diameter: 9.25"

Describe Measuring Point:

62.0 Ground Surface

  
 Signature

2/24/2022  
 Date

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**5. TT161S1 Well Development/Groundwater Sample Log Sheets**

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## GROUNDWATER SAMPLE LOG SHEET



**Event:** MW161S1 Development  
**Project Site Name:** NWIRP Bethpage  
**Project No.:** 112G08005-WE13

|  |                                  |
|--|----------------------------------|
| <b>Sample ID:</b> BP-TT-MW161S1-GW-20220303  | <b>Sampled By:</b> Beau Benfield |
| <b>QA/QC Duplicate ID:</b> N/A   | <b>Sample Date:</b> 03/03/22     |
| <b>MS/MSD Collected:</b> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> | <b>Sample Time:</b> 12:30        |

|  |  |
|--|--|
| <b>WELL INFORMATION:</b>               |  |
| <b>Well ID:</b> MW161S1                | <b>Purge Date:</b> 3/3/22                  |
| <b>Well Diameter (in):</b> 4           | <b>Static Water Level (ft-BTOR):</b> 22.34 |
| <b>Top of Screen (ft-BTOR):</b> 200    | <b>PID Monitor Reading:</b> --             |
| <b>Bottom of Screen (ft-BTOR):</b> 220 | <b>Purge Method:</b> --                    |
| <b>Total Well Depth (ft-BTOR):</b> 225 | <b>Sample Method:</b> --                   |

|   |                                  |
|---|----------------------------------|
| <b>EQUIPMENT INFORMATION:</b>                         |                                  |
| <b>Water Quality Instrument:</b> YSI Professional DSS | <b>Pump Controller:</b> Grundfos |
| <b>Turbidity Meter:</b> Hach 2100Q                    |                                  |

| <b>WATER QUALITY DATA:</b> |                                  |                 |       |           |              |           |                 |            |          |                     |       |
|----------------------------|----------------------------------|-----------------|-------|-----------|--------------|-----------|-----------------|------------|----------|---------------------|-------|
| Time (Hrs)                 | H <sub>2</sub> O Level (ft-BTOR) | Flow gal / min. | Color | pH (S.U.) | S.C. (uS/cm) | DO (mg/L) | Turbidity (NTU) | Temp. (C°) | ORP (mV) | Salinity (% or ppt) | Other |
| 10:35                      | Begin development                |                 |       |           |              |           |                 |            |          |                     |       |
| 11:00                      | 22.51                            | 26              | Clear | 10.53     | 166.3        | 47.9      | 23.3            | 12.5       | 135.6    | --                  |       |
| 11:30                      | 22.51                            | 26              | Clear | 8.34      | 168.5        | 26.3      | 10.2            | 11.3       | 147.5    | --                  |       |
| 12:00                      | 22.51                            | 26              | Clear | 8.05      | 167.3        | 11.4      | 5.5             | 10.9       | 162.8    | --                  |       |
| 12:30                      | 22.51                            | 26              | Clear | 7.48      | 167.2        | 8.61      | 5.38            | 11.2       | 183.7    | --                  |       |
| 12:35                      | Collect sample                   |                 |       |           |              |           |                 |            |          |                     |       |
|                            |                                  |                 |       |           |              |           |                 |            |          |                     |       |
|                            |                                  |                 |       |           |              |           |                 |            |          |                     |       |
|                            |                                  |                 |       |           |              |           |                 |            |          |                     |       |
|                            |                                  |                 |       |           |              |           |                 |            |          |                     |       |
|                            |                                  |                 |       |           |              |           |                 |            |          |                     |       |
|                            |                                  |                 |       |           |              |           |                 |            |          |                     |       |
|                            |                                  |                 |       |           |              |           |                 |            |          |                     |       |
|                            |                                  |                 |       |           |              |           |                 |            |          |                     |       |
|                            |                                  |                 |       |           |              |           |                 |            |          |                     |       |

| <b>FINAL PURGE / SAMPLE DATA:</b> |           |              |                   |           |              |           |                 |            |          |                     |       |
|-----------------------------------|-----------|--------------|-------------------|-----------|--------------|-----------|-----------------|------------|----------|---------------------|-------|
| Start Purge                       | End Purge | Total (min.) | Total Vol. (gal.) | pH (S.U.) | S.C. (mS/cm) | DO (mg/L) | Turbidity (NTU) | Temp. (C°) | ORP (mV) | Salinity (% or ppt) | Other |
| 10:35                             | 12:35     | 120          | 3,120             | 7.48      | 167.2        | 8.61      | 5.38            | 11.2       | 183.7    | --                  |       |

| <b>ANALYSIS, PRESERVATION AND BOTTLE REQUIREMENTS</b> |             |              |        |       |             |           |
|---|-------------|--------------|--------|-------|-------------|-----------|
| Analysis  | Method      | Preservative | Number | Vol.  | Bottle Type | Collected |
| VOC   | SW846-8260B | HCl          | 2      | 40 ml | VOA         | yes       |
| 1-4-Dioxane   | 8270 SIM    | None         | 1      | 1-L   | Glass Amber | yes       |
|   |             |              |        |       |             |           |
|   |             |              |        |       |             |           |
|   |             |              |        |       |             |           |
|   |             |              |        |       |             |           |
|   |             |              |        |       |             |           |
|   |             |              |        |       |             |           |
|   |             |              |        |       |             |           |

| <b>OBSERVATIONS / NOTES:</b> |   |   |                      |
|------------------------------|---|---|----------------------|
|                              |   |   |                      |
| <b>Coordinates:</b>          | N | E | <b>Signature(s):</b> |



V@Áæ^Ác}á}á^Á-á|á\Á

## **6. TT161S1 Analytical Data Unvalidated**

V@Áæ^Ác}á}á^Á-á|á\Á

### Report of Analysis

|                    |                          |                 |              |
|--------------------|--------------------------|-----------------|--------------|
| Client:            | Tetra Tech NUS, Inc.     | Date Collected: | 02/18/22     |
| Project:           | CTO WE13                 | Date Received:  | 02/22/22     |
| Client Sample ID:  | BP-TT-MW161S1-GW-200-202 | SDG No.:        | N1629        |
| Lab Sample ID:     | N1629-02                 | Matrix:         | Water        |
| Analytical Method: | SW8260                   | % Moisture:     | 100          |
| Sample Wt/Vol:     | 5 Units: mL              | Final Vol:      | 5000 uL      |
| Soil Aliquot Vol:  | uL                       | Test:           | VOCMS Group1 |
| GC Column:         | RXI-624 ID : 0.25        | Level :         | LOW          |

|                   |           |           |                |               |
|-------------------|-----------|-----------|----------------|---------------|
| File ID/Qc Batch: | Dilution: | Prep Date | Date Analyzed  | Prep Batch ID |
| VN071025.D        | 1         |           | 02/22/22 13:58 | VN022222      |

| CAS Number     | Parameter                      | Conc. | Qualifier | MDL  | LOD  | LOQ / CRQL | Units |
|----------------|--------------------------------|-------|-----------|------|------|------------|-------|
| <b>TARGETS</b> |                                |       |           |      |      |            |       |
| 74-87-3        | Chloromethane                  | 0.75  | U         | 0.20 | 0.75 | 1.00       | ug/L  |
| 75-01-4        | Vinyl Chloride                 | 0.50  | U         | 0.19 | 0.50 | 1.00       | ug/L  |
| 74-83-9        | Bromomethane                   | 2.50  | U         | 0.87 | 2.50 | 5.00       | ug/L  |
| 75-00-3        | Chloroethane                   | 0.75  | U         | 0.35 | 0.75 | 1.00       | ug/L  |
| 75-69-4        | Trichlorofluoromethane         | 0.50  | U         | 0.25 | 0.50 | 1.00       | ug/L  |
| 76-13-1        | 1,1,2-Trichlorotrifluoroethane | 0.50  | U         | 0.21 | 0.50 | 1.00       | ug/L  |
| 75-35-4        | 1,1-Dichloroethene             | 0.75  | U         | 0.26 | 0.75 | 1.00       | ug/L  |
| 67-64-1        | Acetone                        | 3.80  | U         | 1.60 | 3.80 | 5.00       | ug/L  |
| 75-15-0        | Carbon Disulfide               | 0.75  | U         | 0.25 | 0.75 | 1.00       | ug/L  |
| 1634-04-4      | Methyl tert-butyl Ether        | 0.48  | J         | 0.22 | 0.50 | 1.00       | ug/L  |
| 75-09-2        | Methylene Chloride             | 0.50  | U         | 0.18 | 0.50 | 1.00       | ug/L  |
| 156-60-5       | trans-1,2-Dichloroethene       | 0.50  | U         | 0.19 | 0.50 | 1.00       | ug/L  |
| 75-34-3        | 1,1-Dichloroethane             | 1.80  |           | 0.21 | 0.50 | 1.00       | ug/L  |
| 78-93-3        | 2-Butanone                     | 2.50  | U         | 0.90 | 2.50 | 5.00       | ug/L  |
| 56-23-5        | Carbon Tetrachloride           | 0.75  | U         | 0.27 | 0.75 | 1.00       | ug/L  |
| 156-59-2       | cis-1,2-Dichloroethene         | 0.50  | J         | 0.22 | 0.75 | 1.00       | ug/L  |
| 67-66-3        | Chloroform                     | 0.51  | J         | 0.27 | 0.75 | 1.00       | ug/L  |
| 71-55-6        | 1,1,1-Trichloroethane          | 0.50  | U         | 0.20 | 0.50 | 1.00       | ug/L  |
| 108-87-2       | Methylcyclohexane              | 0.50  | U         | 0.14 | 0.50 | 1.00       | ug/L  |
| 71-43-2        | Benzene                        | 0.50  | U         | 0.18 | 0.50 | 1.00       | ug/L  |
| 107-06-2       | 1,2-Dichloroethane             | 0.50  | U         | 0.25 | 0.50 | 1.00       | ug/L  |
| 79-01-6        | Trichloroethene                | 1.10  |           | 0.17 | 0.50 | 1.00       | ug/L  |
| 78-87-5        | 1,2-Dichloropropane            | 0.50  | U         | 0.17 | 0.50 | 1.00       | ug/L  |
| 75-27-4        | Bromodichloromethane           | 0.50  | U         | 0.20 | 0.50 | 1.00       | ug/L  |
| 108-10-1       | 4-Methyl-2-Pentanone           | 2.50  | U         | 0.87 | 2.50 | 5.00       | ug/L  |
| 108-88-3       | Toluene                        | 0.50  | U         | 0.22 | 0.50 | 1.00       | ug/L  |
| 10061-02-6     | t-1,3-Dichloropropene          | 0.50  | U         | 0.18 | 0.50 | 1.00       | ug/L  |
| 10061-01-5     | cis-1,3-Dichloropropene        | 0.50  | U         | 0.17 | 0.50 | 1.00       | ug/L  |
| 79-00-5        | 1,1,2-Trichloroethane          | 0.50  | U         | 0.24 | 0.50 | 1.00       | ug/L  |
| 591-78-6       | 2-Hexanone                     | 2.50  | U         | 0.92 | 2.50 | 5.00       | ug/L  |
| 124-48-1       | Dibromochloromethane           | 0.50  | U         | 0.18 | 0.50 | 1.00       | ug/L  |
| 127-18-4       | Tetrachloroethene              | 0.45  | J         | 0.17 | 0.50 | 1.00       | ug/L  |

**Report of Analysis**

|                    |                          |                 |              |
|--------------------|--------------------------|-----------------|--------------|
| Client:            | Tetra Tech NUS, Inc.     | Date Collected: | 02/18/22     |
| Project:           | CTO WE13                 | Date Received:  | 02/22/22     |
| Client Sample ID:  | BP-TT-MW161S1-GW-200-202 | SDG No.:        | N1629        |
| Lab Sample ID:     | N1629-02                 | Matrix:         | Water        |
| Analytical Method: | SW8260                   | % Moisture:     | 100          |
| Sample Wt/Vol:     | 5 Units: mL              | Final Vol:      | 5000 uL      |
| Soil Aliquot Vol:  | uL                       | Test:           | VOCMS Group1 |
| GC Column:         | RXI-624 ID : 0.25        | Level :         | LOW          |

|                   |           |           |                |               |
|-------------------|-----------|-----------|----------------|---------------|
| File ID/Qc Batch: | Dilution: | Prep Date | Date Analyzed  | Prep Batch ID |
| VN071025.D        | 1         |           | 02/22/22 13:58 | VN022222      |

| CAS Number                            | Parameter                 | Conc.   | Qualifier | MDL      | LOD  | LOQ / CRQL | Units   |
|---------------------------------------|---------------------------|---------|-----------|----------|------|------------|---------|
| 108-90-7                              | Chlorobenzene             | 0.50    | U         | 0.17     | 0.50 | 1.00       | ug/L    |
| 100-41-4                              | Ethyl Benzene             | 0.50    | U         | 0.18     | 0.50 | 1.00       | ug/L    |
| 179601-23-1                           | m/p-Xylenes               | 1.00    | U         | 0.32     | 1.00 | 2.00       | ug/L    |
| 95-47-6                               | o-Xylene                  | 0.50    | U         | 0.19     | 0.50 | 1.00       | ug/L    |
| 100-42-5                              | Styrene                   | 0.50    | U         | 0.16     | 0.50 | 1.00       | ug/L    |
| 75-25-2                               | Bromoform                 | 0.50    | U         | 0.19     | 0.50 | 1.00       | ug/L    |
| 98-82-8                               | Isopropylbenzene          | 0.50    | U         | 0.23     | 0.50 | 1.00       | ug/L    |
| 79-34-5                               | 1,1,2,2-Tetrachloroethane | 0.75    | U         | 0.29     | 0.75 | 1.00       | ug/L    |
| 541-73-1                              | 1,3-Dichlorobenzene       | 0.50    | U         | 0.19     | 0.50 | 1.00       | ug/L    |
| 106-46-7                              | 1,4-Dichlorobenzene       | 0.50    | U         | 0.20     | 0.50 | 1.00       | ug/L    |
| 95-50-1                               | 1,2-Dichlorobenzene       | 0.50    | U         | 0.19     | 0.50 | 1.00       | ug/L    |
| <b>SURROGATES</b>                     |                           |         |           |          |      |            |         |
| 17060-07-0                            | 1,2-Dichloroethane-d4     | 52.1    |           | 81 - 118 |      | 104%       | SPK: 50 |
| 1868-53-7                             | Dibromofluoromethane      | 49.7    |           | 80 - 119 |      | 99%        | SPK: 50 |
| 2037-26-5                             | Toluene-d8                | 50.5    |           | 89 - 112 |      | 101%       | SPK: 50 |
| 460-00-4                              | 4-Bromofluorobenzene      | 46.2    |           | 85 - 114 |      | 92%        | SPK: 50 |
| <b>INTERNAL STANDARDS</b>             |                           |         |           |          |      |            |         |
| 363-72-4                              | Pentafluorobenzene        | 857000  | 8.086     |          |      |            |         |
| 540-36-3                              | 1,4-Difluorobenzene       | 1350000 | 8.963     |          |      |            |         |
| 3114-55-4                             | Chlorobenzene-d5          | 1200000 | 11.739    |          |      |            |         |
| 3855-82-1                             | 1,4-Dichlorobenzene-d4    | 405000  | 13.674    |          |      |            |         |
| <b>TENTATIVE IDENTIFIED COMPOUNDS</b> |                           |         |           |          |      |            |         |
| 75-43-4                               | Dichlorofluoromethane     | N.D     | U         |          |      | 0          | ug/L    |

U = Not Detected

LOQ = Limit of Quantitation

MDL = Method Detection Limit

LOD = Limit of Detection

E = Value Exceeds Calibration Range

Q = indicates LCS control criteria did not meet requirements

M = MS/MSD acceptance criteria did not meet requirements

J = Estimated Value

B = Analyte Found in Associated Method Blank

N = Presumptive Evidence of a Compound

\* = Values outside of QC limits

D = Dilution

() = Laboratory InHouse Limit

A = Aldol-Condensation Reaction Products

### Report of Analysis

|                    |                          |                 |              |
|--------------------|--------------------------|-----------------|--------------|
| Client:            | Tetra Tech NUS, Inc.     | Date Collected: | 02/21/22     |
| Project:           | CTO WE13                 | Date Received:  | 02/22/22     |
| Client Sample ID:  | BP-TT-MW161S1-GW-220-222 | SDG No.:        | N1629        |
| Lab Sample ID:     | N1629-03                 | Matrix:         | Water        |
| Analytical Method: | SW8260                   | % Moisture:     | 100          |
| Sample Wt/Vol:     | 5 Units: mL              | Final Vol:      | 5000 uL      |
| Soil Aliquot Vol:  | uL                       | Test:           | VOCMS Group1 |
| GC Column:         | RXI-624 ID : 0.25        | Level :         | LOW          |

|                   |           |           |                |               |
|-------------------|-----------|-----------|----------------|---------------|
| File ID/Qc Batch: | Dilution: | Prep Date | Date Analyzed  | Prep Batch ID |
| VN071024.D        | 1         |           | 02/22/22 13:34 | VN022222      |

| CAS Number     | Parameter                      | Conc. | Qualifier | MDL  | LOD  | LOQ / CRQL | Units |
|----------------|--------------------------------|-------|-----------|------|------|------------|-------|
| <b>TARGETS</b> |                                |       |           |      |      |            |       |
| 74-87-3        | Chloromethane                  | 0.75  | U         | 0.20 | 0.75 | 1.00       | ug/L  |
| 75-01-4        | Vinyl Chloride                 | 0.50  | U         | 0.19 | 0.50 | 1.00       | ug/L  |
| 74-83-9        | Bromomethane                   | 2.50  | U         | 0.87 | 2.50 | 5.00       | ug/L  |
| 75-00-3        | Chloroethane                   | 0.75  | U         | 0.35 | 0.75 | 1.00       | ug/L  |
| 75-69-4        | Trichlorofluoromethane         | 0.50  | U         | 0.25 | 0.50 | 1.00       | ug/L  |
| 76-13-1        | 1,1,2-Trichlorotrifluoroethane | 0.50  | U         | 0.21 | 0.50 | 1.00       | ug/L  |
| 75-35-4        | 1,1-Dichloroethene             | 0.75  | U         | 0.26 | 0.75 | 1.00       | ug/L  |
| 67-64-1        | Acetone                        | 2.80  | J         | 1.60 | 3.80 | 5.00       | ug/L  |
| 75-15-0        | Carbon Disulfide               | 0.75  | U         | 0.25 | 0.75 | 1.00       | ug/L  |
| 1634-04-4      | Methyl tert-butyl Ether        | 0.50  | U         | 0.22 | 0.50 | 1.00       | ug/L  |
| 75-09-2        | Methylene Chloride             | 0.50  | U         | 0.18 | 0.50 | 1.00       | ug/L  |
| 156-60-5       | trans-1,2-Dichloroethene       | 0.50  | U         | 0.19 | 0.50 | 1.00       | ug/L  |
| 75-34-3        | 1,1-Dichloroethane             | 2.20  |           | 0.21 | 0.50 | 1.00       | ug/L  |
| 78-93-3        | 2-Butanone                     | 2.50  | U         | 0.90 | 2.50 | 5.00       | ug/L  |
| 56-23-5        | Carbon Tetrachloride           | 0.75  | U         | 0.27 | 0.75 | 1.00       | ug/L  |
| 156-59-2       | cis-1,2-Dichloroethene         | 0.75  | U         | 0.22 | 0.75 | 1.00       | ug/L  |
| 67-66-3        | Chloroform                     | 0.75  | U         | 0.27 | 0.75 | 1.00       | ug/L  |
| 71-55-6        | 1,1,1-Trichloroethane          | 0.50  | U         | 0.20 | 0.50 | 1.00       | ug/L  |
| 108-87-2       | Methylcyclohexane              | 0.50  | U         | 0.14 | 0.50 | 1.00       | ug/L  |
| 71-43-2        | Benzene                        | 0.50  | U         | 0.18 | 0.50 | 1.00       | ug/L  |
| 107-06-2       | 1,2-Dichloroethane             | 0.50  | U         | 0.25 | 0.50 | 1.00       | ug/L  |
| 79-01-6        | Trichloroethene                | 0.50  | U         | 0.17 | 0.50 | 1.00       | ug/L  |
| 78-87-5        | 1,2-Dichloropropane            | 0.50  | U         | 0.17 | 0.50 | 1.00       | ug/L  |
| 75-27-4        | Bromodichloromethane           | 0.50  | U         | 0.20 | 0.50 | 1.00       | ug/L  |
| 108-10-1       | 4-Methyl-2-Pentanone           | 2.50  | U         | 0.87 | 2.50 | 5.00       | ug/L  |
| 108-88-3       | Toluene                        | 0.50  | U         | 0.22 | 0.50 | 1.00       | ug/L  |
| 10061-02-6     | t-1,3-Dichloropropene          | 0.50  | U         | 0.18 | 0.50 | 1.00       | ug/L  |
| 10061-01-5     | cis-1,3-Dichloropropene        | 0.50  | U         | 0.17 | 0.50 | 1.00       | ug/L  |
| 79-00-5        | 1,1,2-Trichloroethane          | 0.50  | U         | 0.24 | 0.50 | 1.00       | ug/L  |
| 591-78-6       | 2-Hexanone                     | 2.50  | U         | 0.92 | 2.50 | 5.00       | ug/L  |
| 124-48-1       | Dibromochloromethane           | 0.50  | U         | 0.18 | 0.50 | 1.00       | ug/L  |
| 127-18-4       | Tetrachloroethene              | 0.50  | U         | 0.17 | 0.50 | 1.00       | ug/L  |

**Report of Analysis**

|                    |                          |                 |              |
|--------------------|--------------------------|-----------------|--------------|
| Client:            | Tetra Tech NUS, Inc.     | Date Collected: | 02/21/22     |
| Project:           | CTO WE13                 | Date Received:  | 02/22/22     |
| Client Sample ID:  | BP-TT-MW161S1-GW-220-222 | SDG No.:        | N1629        |
| Lab Sample ID:     | N1629-03                 | Matrix:         | Water        |
| Analytical Method: | SW8260                   | % Moisture:     | 100          |
| Sample Wt/Vol:     | 5 Units: mL              | Final Vol:      | 5000 uL      |
| Soil Aliquot Vol:  | uL                       | Test:           | VOCMS Group1 |
| GC Column:         | RXI-624 ID : 0.25        | Level :         | LOW          |

|                   |           |           |                |               |
|-------------------|-----------|-----------|----------------|---------------|
| File ID/Qc Batch: | Dilution: | Prep Date | Date Analyzed  | Prep Batch ID |
| VN071024.D        | 1         |           | 02/22/22 13:34 | VN022222      |

| CAS Number                            | Parameter                 | Conc.   | Qualifier | MDL      | LOD  | LOQ / CRQL | Units   |
|---------------------------------------|---------------------------|---------|-----------|----------|------|------------|---------|
| 108-90-7                              | Chlorobenzene             | 0.50    | U         | 0.17     | 0.50 | 1.00       | ug/L    |
| 100-41-4                              | Ethyl Benzene             | 0.50    | U         | 0.18     | 0.50 | 1.00       | ug/L    |
| 179601-23-1                           | m/p-Xylenes               | 1.00    | U         | 0.32     | 1.00 | 2.00       | ug/L    |
| 95-47-6                               | o-Xylene                  | 0.50    | U         | 0.19     | 0.50 | 1.00       | ug/L    |
| 100-42-5                              | Styrene                   | 0.50    | U         | 0.16     | 0.50 | 1.00       | ug/L    |
| 75-25-2                               | Bromoform                 | 0.50    | U         | 0.19     | 0.50 | 1.00       | ug/L    |
| 98-82-8                               | Isopropylbenzene          | 0.50    | U         | 0.23     | 0.50 | 1.00       | ug/L    |
| 79-34-5                               | 1,1,2,2-Tetrachloroethane | 0.75    | U         | 0.29     | 0.75 | 1.00       | ug/L    |
| 541-73-1                              | 1,3-Dichlorobenzene       | 0.50    | U         | 0.19     | 0.50 | 1.00       | ug/L    |
| 106-46-7                              | 1,4-Dichlorobenzene       | 0.50    | U         | 0.20     | 0.50 | 1.00       | ug/L    |
| 95-50-1                               | 1,2-Dichlorobenzene       | 0.50    | U         | 0.19     | 0.50 | 1.00       | ug/L    |
| <b>SURROGATES</b>                     |                           |         |           |          |      |            |         |
| 17060-07-0                            | 1,2-Dichloroethane-d4     | 52.7    |           | 81 - 118 |      | 105%       | SPK: 50 |
| 1868-53-7                             | Dibromofluoromethane      | 49.4    |           | 80 - 119 |      | 99%        | SPK: 50 |
| 2037-26-5                             | Toluene-d8                | 49.5    |           | 89 - 112 |      | 99%        | SPK: 50 |
| 460-00-4                              | 4-Bromofluorobenzene      | 45.9    |           | 85 - 114 |      | 92%        | SPK: 50 |
| <b>INTERNAL STANDARDS</b>             |                           |         |           |          |      |            |         |
| 363-72-4                              | Pentafluorobenzene        | 818000  | 8.086     |          |      |            |         |
| 540-36-3                              | 1,4-Difluorobenzene       | 1310000 | 8.963     |          |      |            |         |
| 3114-55-4                             | Chlorobenzene-d5          | 1130000 | 11.739    |          |      |            |         |
| 3855-82-1                             | 1,4-Dichlorobenzene-d4    | 390000  | 13.668    |          |      |            |         |
| <b>TENTATIVE IDENTIFIED COMPOUNDS</b> |                           |         |           |          |      |            |         |
| 75-43-4                               | Dichlorofluoromethane     | N.D     | U         |          |      | 0          | ug/L    |

U = Not Detected

LOQ = Limit of Quantitation

MDL = Method Detection Limit

LOD = Limit of Detection

E = Value Exceeds Calibration Range

Q = indicates LCS control criteria did not meet requirements

M = MS/MSD acceptance criteria did not meet requirements

J = Estimated Value

B = Analyte Found in Associated Method Blank

N = Presumptive Evidence of a Compound

\* = Values outside of QC limits

D = Dilution

() = Laboratory InHouse Limit

A = Aldol-Condensation Reaction Products

### Report of Analysis

|                    |                           |                 |              |
|--------------------|---------------------------|-----------------|--------------|
| Client:            | Tetra Tech NUS, Inc.      | Date Collected: | 03/03/22     |
| Project:           | CTO WE13                  | Date Received:  | 03/04/22     |
| Client Sample ID:  | BP-TT-MW161S1-GW-20220303 | SDG No.:        | N1797        |
| Lab Sample ID:     | N1797-01                  | Matrix:         | Water        |
| Analytical Method: | SW8260                    | % Moisture:     | 100          |
| Sample Wt/Vol:     | 5 Units: mL               | Final Vol:      | 5000 uL      |
| Soil Aliquot Vol:  | uL                        | Test:           | VOCMS Group1 |
| GC Column:         | DB-624UI ID : 0.18        | Level :         | LOW          |

|                   |           |           |                |               |
|-------------------|-----------|-----------|----------------|---------------|
| File ID/Qc Batch: | Dilution: | Prep Date | Date Analyzed  | Prep Batch ID |
| VX027374.D        | 1         |           | 03/10/22 13:57 | VX031022      |

| CAS Number     | Parameter                      | Conc. | Qualifier | MDL  | LOD  | LOQ / CRQL | Units |
|----------------|--------------------------------|-------|-----------|------|------|------------|-------|
| <b>TARGETS</b> |                                |       |           |      |      |            |       |
| 74-87-3        | Chloromethane                  | 0.75  | U         | 0.20 | 0.75 | 1.00       | ug/L  |
| 75-01-4        | Vinyl Chloride                 | 0.50  | U         | 0.19 | 0.50 | 1.00       | ug/L  |
| 74-83-9        | Bromomethane                   | 2.50  | U         | 0.87 | 2.50 | 5.00       | ug/L  |
| 75-00-3        | Chloroethane                   | 0.75  | U         | 0.35 | 0.75 | 1.00       | ug/L  |
| 75-69-4        | Trichlorofluoromethane         | 0.50  | U         | 0.25 | 0.50 | 1.00       | ug/L  |
| 76-13-1        | 1,1,2-Trichlorotrifluoroethane | 0.50  | U         | 0.21 | 0.50 | 1.00       | ug/L  |
| 75-35-4        | 1,1-Dichloroethene             | 0.64  | J         | 0.26 | 0.75 | 1.00       | ug/L  |
| 67-64-1        | Acetone                        | 3.80  | U         | 1.60 | 3.80 | 5.00       | ug/L  |
| 75-15-0        | Carbon Disulfide               | 0.75  | U         | 0.25 | 0.75 | 1.00       | ug/L  |
| 1634-04-4      | Methyl tert-butyl Ether        | 0.43  | J         | 0.22 | 0.50 | 1.00       | ug/L  |
| 75-09-2        | Methylene Chloride             | 0.50  | U         | 0.18 | 0.50 | 1.00       | ug/L  |
| 156-60-5       | trans-1,2-Dichloroethene       | 0.50  | U         | 0.19 | 0.50 | 1.00       | ug/L  |
| 75-34-3        | 1,1-Dichloroethane             | 2.20  |           | 0.21 | 0.50 | 1.00       | ug/L  |
| 78-93-3        | 2-Butanone                     | 2.50  | U         | 0.90 | 2.50 | 5.00       | ug/L  |
| 56-23-5        | Carbon Tetrachloride           | 0.75  | U         | 0.27 | 0.75 | 1.00       | ug/L  |
| 156-59-2       | cis-1,2-Dichloroethene         | 0.75  | U         | 0.22 | 0.75 | 1.00       | ug/L  |
| 67-66-3        | Chloroform                     | 0.31  | J         | 0.27 | 0.75 | 1.00       | ug/L  |
| 71-55-6        | 1,1,1-Trichloroethane          | 0.50  | U         | 0.20 | 0.50 | 1.00       | ug/L  |
| 108-87-2       | Methylcyclohexane              | 0.50  | U         | 0.14 | 0.50 | 1.00       | ug/L  |
| 71-43-2        | Benzene                        | 0.50  | U         | 0.18 | 0.50 | 1.00       | ug/L  |
| 107-06-2       | 1,2-Dichloroethane             | 0.50  | U         | 0.25 | 0.50 | 1.00       | ug/L  |
| 79-01-6        | Trichloroethene                | 0.98  | J         | 0.17 | 0.50 | 1.00       | ug/L  |
| 78-87-5        | 1,2-Dichloropropane            | 0.50  | U         | 0.17 | 0.50 | 1.00       | ug/L  |
| 75-27-4        | Bromodichloromethane           | 0.50  | U         | 0.20 | 0.50 | 1.00       | ug/L  |
| 108-10-1       | 4-Methyl-2-Pentanone           | 2.50  | U         | 0.87 | 2.50 | 5.00       | ug/L  |
| 108-88-3       | Toluene                        | 0.50  | U         | 0.22 | 0.50 | 1.00       | ug/L  |
| 10061-02-6     | t-1,3-Dichloropropene          | 0.50  | U         | 0.18 | 0.50 | 1.00       | ug/L  |
| 10061-01-5     | cis-1,3-Dichloropropene        | 0.50  | U         | 0.17 | 0.50 | 1.00       | ug/L  |
| 79-00-5        | 1,1,2-Trichloroethane          | 0.50  | U         | 0.24 | 0.50 | 1.00       | ug/L  |
| 591-78-6       | 2-Hexanone                     | 2.50  | U         | 0.92 | 2.50 | 5.00       | ug/L  |
| 124-48-1       | Dibromochloromethane           | 0.50  | U         | 0.18 | 0.50 | 1.00       | ug/L  |
| 127-18-4       | Tetrachloroethene              | 0.46  | J         | 0.17 | 0.50 | 1.00       | ug/L  |



**Report of Analysis**

|                    |                           |                 |              |
|--------------------|---------------------------|-----------------|--------------|
| Client:            | Tetra Tech NUS, Inc.      | Date Collected: | 03/03/22     |
| Project:           | CTO WE13                  | Date Received:  | 03/04/22     |
| Client Sample ID:  | BP-TT-MW161S1-GW-20220303 | SDG No.:        | N1797        |
| Lab Sample ID:     | N1797-01                  | Matrix:         | Water        |
| Analytical Method: | SW8260                    | % Moisture:     | 100          |
| Sample Wt/Vol:     | 5 Units: mL               | Final Vol:      | 5000 uL      |
| Soil Aliquot Vol:  | uL                        | Test:           | VOCMS Group1 |
| GC Column:         | DB-624UI ID : 0.18        | Level :         | LOW          |

|                   |           |           |                |               |
|-------------------|-----------|-----------|----------------|---------------|
| File ID/Qc Batch: | Dilution: | Prep Date | Date Analyzed  | Prep Batch ID |
| VX027374.D        | 1         |           | 03/10/22 13:57 | VX031022      |

| CAS Number                            | Parameter                 | Conc.  | Qualifier | MDL      | LOD  | LOQ / CRQL | Units   |
|---------------------------------------|---------------------------|--------|-----------|----------|------|------------|---------|
| 108-90-7                              | Chlorobenzene             | 0.50   | U         | 0.17     | 0.50 | 1.00       | ug/L    |
| 100-41-4                              | Ethyl Benzene             | 0.50   | U         | 0.18     | 0.50 | 1.00       | ug/L    |
| 179601-23-1                           | m/p-Xylenes               | 1.00   | U         | 0.32     | 1.00 | 2.00       | ug/L    |
| 95-47-6                               | o-Xylene                  | 0.50   | U         | 0.19     | 0.50 | 1.00       | ug/L    |
| 100-42-5                              | Styrene                   | 0.50   | U         | 0.16     | 0.50 | 1.00       | ug/L    |
| 75-25-2                               | Bromoform                 | 0.50   | U         | 0.19     | 0.50 | 1.00       | ug/L    |
| 98-82-8                               | Isopropylbenzene          | 0.50   | U         | 0.23     | 0.50 | 1.00       | ug/L    |
| 79-34-5                               | 1,1,2,2-Tetrachloroethane | 0.75   | U         | 0.29     | 0.75 | 1.00       | ug/L    |
| 541-73-1                              | 1,3-Dichlorobenzene       | 0.50   | U         | 0.19     | 0.50 | 1.00       | ug/L    |
| 106-46-7                              | 1,4-Dichlorobenzene       | 0.50   | U         | 0.20     | 0.50 | 1.00       | ug/L    |
| 95-50-1                               | 1,2-Dichlorobenzene       | 0.50   | U         | 0.19     | 0.50 | 1.00       | ug/L    |
| <b>SURROGATES</b>                     |                           |        |           |          |      |            |         |
| 17060-07-0                            | 1,2-Dichloroethane-d4     | 44.3   |           | 81 - 118 |      | 89%        | SPK: 50 |
| 1868-53-7                             | Dibromofluoromethane      | 49.8   |           | 80 - 119 |      | 100%       | SPK: 50 |
| 2037-26-5                             | Toluene-d8                | 48.3   |           | 89 - 112 |      | 97%        | SPK: 50 |
| 460-00-4                              | 4-Bromofluorobenzene      | 46.5   |           | 85 - 114 |      | 93%        | SPK: 50 |
| <b>INTERNAL STANDARDS</b>             |                           |        |           |          |      |            |         |
| 363-72-4                              | Pentafluorobenzene        | 379000 | 5.556     |          |      |            |         |
| 540-36-3                              | 1,4-Difluorobenzene       | 613000 | 6.763     |          |      |            |         |
| 3114-55-4                             | Chlorobenzene-d5          | 578000 | 10.055    |          |      |            |         |
| 3855-82-1                             | 1,4-Dichlorobenzene-d4    | 268000 | 12.024    |          |      |            |         |
| <b>TENTATIVE IDENTIFIED COMPOUNDS</b> |                           |        |           |          |      |            |         |
| 75-43-4                               | Dichlorofluoromethane     | N.D    |           |          |      |            |         |

U = Not Detected

LOQ = Limit of Quantitation

MDL = Method Detection Limit

LOD = Limit of Detection

E = Value Exceeds Calibration Range

Q = indicates LCS control criteria did not meet requirements

M = MS/MSD acceptance criteria did not meet requirements

J = Estimated Value

B = Analyte Found in Associated Method Blank

N = Presumptive Evidence of a Compound

\* = Values outside of QC limits

D = Dilution

() = Laboratory InHouse Limit

A = Aldol-Condensation Reaction Products

### Report of Analysis

|                    |                           |                 |                |
|--------------------|---------------------------|-----------------|----------------|
| Client:            | Tetra Tech NUS, Inc.      | Date Collected: | 03/03/22       |
| Project:           | CTO WE13                  | Date Received:  | 03/04/22       |
| Client Sample ID:  | BP-TT-MW161S1-GW-20220303 | SDG No.:        | N1797          |
| Lab Sample ID:     | N1797-01                  | Matrix:         | Water          |
| Analytical Method: | SW8270SIM                 | % Moisture:     | 100            |
| Sample Wt/Vol:     | 1000 Units: mL            | Final Vol:      | 1000 uL        |
| Soil Aliquot Vol:  | uL                        | Test:           | SVOC-SIMGroup1 |
| Extraction Type :  | Decanted : N              | Level :         | LOW            |
| Injection Volume : | GPC Factor : 1.0          | GPC Cleanup :   | N PH :         |

|                   |           |                |                |               |
|-------------------|-----------|----------------|----------------|---------------|
| File ID/Qc Batch: | Dilution: | Prep Date      | Date Analyzed  | Prep Batch ID |
| BN018860.D        | 1         | 03/04/22 11:00 | 03/07/22 16:08 | PB143119      |

| CAS Number                | Parameter               | Conc. | Qualifier | MDL      | LOD  | LOQ / CRQL | Units    |
|---------------------------|-------------------------|-------|-----------|----------|------|------------|----------|
| <b>TARGETS</b>            |                         |       |           |          |      |            |          |
| 123-91-1                  | 1,4-Dioxane             | 0.26  |           | 0.10     | 0.20 | 0.20       | ug/L     |
| <b>SURROGATES</b>         |                         |       |           |          |      |            |          |
| 7297-45-2                 | 2-Methylnaphthalene-d10 | 0.27  |           | 30 - 150 |      | 67%        | SPK: 0.4 |
| 93951-69-0                | Fluoranthene-d10        | 0.36  |           | 30 - 150 |      | 89%        | SPK: 0.4 |
| 4165-60-0                 | Nitrobenzene-d5         | 0.27  |           | 55 - 111 |      | 68%        | SPK: 0.4 |
| 321-60-8                  | 2-Fluorobiphenyl        | 0.29  |           | 53 - 106 |      | 72%        | SPK: 0.4 |
| 1718-51-0                 | Terphenyl-d14           | 0.37  |           | 58 - 132 |      | 92%        | SPK: 0.4 |
| <b>INTERNAL STANDARDS</b> |                         |       |           |          |      |            |          |
| 3855-82-1                 | 1,4-Dichlorobenzene-d4  | 3410  | 7.912     |          |      |            |          |
| 1146-65-2                 | Naphthalene-d8          | 9830  | 10.722    |          |      |            |          |
| 15067-26-2                | Acenaphthene-d10        | 6350  | 14.538    |          |      |            |          |
| 1517-22-2                 | Phenanthrene-d10        | 15200 | 17.277    |          |      |            |          |
| 1719-03-5                 | Chrysene-d12            | 16400 | 21.458    |          |      |            |          |
| 1520-96-3                 | Perylene-d12            | 14500 | 23.855    |          |      |            |          |

U = Not Detected

LOQ = Limit of Quantitation

MDL = Method Detection Limit

LOD = Limit of Detection

E = Value Exceeds Calibration Range

Q = indicates LCS control criteria did not meet requirements

M = MS/MSD acceptance criteria did not meet requirements

J = Estimated Value

B = Analyte Found in Associated Method Blank

N = Presumptive Evidence of a Compound

\* = Values outside of QC limits

D = Dilution

() = Laboratory InHouse Limit

A = Aldol-Condensation Reaction Products

V@Áæ^Ác}á}á^Á-á|á\Á

**Appendix B**  
**Survey Data Report**

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# Borbas Surveying & Mapping, LLC

402 Main Street, Boonton, New Jersey 07005 Phone (973) 316-8743 www.borbas.com

## MONITORING WELL CHART

Former Naval Weapons Industrial Reserve Plant (NWIRP)

999 S. Oyster Bay Road (Industrial Park)

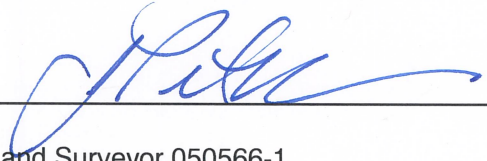
Bethpage, New York, 11714

September 30, 2022

| Monitor Well ID | Grade Elev | Outer Casing | Inner Casing | Northing | Easting   | Latitude North | Longitude West | Survey Date |
|-----------------|------------|--------------|--------------|----------|-----------|----------------|----------------|-------------|
| BPOW4-2R        | 66.6       | 66.56        | 66.11        | 200691.4 | 1123199.9 | 40°42'59.17"   | 73°29'55.53"   | 9/8/2022    |
| MW149I1         | 69.6       | 69.59        | 69.29        | 201001.8 | 1125735.2 | 40°43'02.10"   | 73°29'22.58"   | 9/8/2022    |
| MW149S1         | 69.5       | 69.54        | 69.33        | 201011.1 | 1125752.1 | 40°43'02.19"   | 73°29'22.36"   | 9/8/2022    |
| MW150S1         | 73.9       | 73.86        | 73.45        | 202102.8 | 1128288.1 | 40°43'12.83"   | 73°28'49.34"   | 9/8/2022    |
| MW158I1         | 74.7       | 74.73        | 74.31        | 202260.4 | 1122178.8 | 40°43'14.73"   | 73°30'08.67"   | 9/8/2022    |
| MW158S1         | 74.5       | 74.52        | 74.09        | 202262.5 | 1122200.3 | 40°43'14.75"   | 73°30'08.39"   | 9/8/2022    |
| MW161SI         | 62.0       | 62.03        | 61.74        | 199135.9 | 1131245.5 | 40°42'43.34"   | 73°28'11.17"   | 9/8/2022    |
| MW162S1         | 69.2       | 69.24        | 69.04        | 200519.8 | 1129194.9 | 40°42'57.13"   | 73°28'37.69"   | 9/8/2022    |
| MW163S1         | 54.1       | 54.06        | 53.97        | 196100.4 | 1124114.4 | 40°42'13.76"   | 73°29'43.99"   | 9/8/2022    |
| MW172S1         | 68.4       | 68.36        | 68.11        | 201422.1 | 1127026.9 | 40°43'06.17"   | 73°29'05.77"   | 9/8/2022    |
| MW174I1         | 66.7       | 66.73        | 66.44        | 200714.6 | 1123208.0 | 40°42'59.40"   | 73°29'55.42"   | 9/8/2022    |
| MW205S1         | 68.5       | 68.51        | 68.36        | 199862.5 | 1126287.2 | 40°42'50.81"   | 73°29'15.50"   | 9/8/2022    |
| RE115D1         | 69.6       | 69.55        | 69.06        | 200996.0 | 1125727.4 | 40°43'02.04"   | 73°29'22.68"   | 9/8/2022    |
| RE115D2         | 69.6       | 69.59        | 69.05        | 201006.4 | 1125743.8 | 40°43'02.14"   | 73°29'22.47"   | 9/8/2022    |
| RE127D1         | 61.8       | 61.79        | 61.37        | 199120.2 | 1131245.0 | 40°42'43.18"   | 73°28'11.18"   | 9/8/2022    |
| RE127D2         | 61.7       | 61.72        | 61.22        | 199105.3 | 1131245.6 | 40°42'43.03"   | 73°28'11.17"   | 9/8/2022    |
| RE128D2         | 69.1       | 69.06        | 68.57        | 200537.6 | 1129203.3 | 40°42'57.31"   | 73°28'37.58"   | 9/8/2022    |
| RE129D1         | 54.0       | 54.05        | 53.92        | 196086.6 | 1124099.7 | 40°42'13.62"   | 73°29'44.19"   | 9/8/2022    |
| RE129D2         | 54.0       | 54.02        | 53.88        | 196073.3 | 1124074.2 | 40°42'13.49"   | 73°29'44.52"   | 9/8/2022    |
| RW8             | 45.4       | 45.43        | 44.58        | 194913.7 | 1124679.5 | 40°42'02.00"   | 73°29'36.75"   | 9/8/2022    |
| RW8-MW01D3      | 44.7       | 48.44        | 48.41        | 194916.7 | 1124608.5 | 40°42'02.03"   | 73°29'37.67"   | 9/8/2022    |
| RW9             | 53.0       | 53.03        | 51.98        | 195193.1 | 1126400.1 | 40°42'04.66"   | 73°29'14.39"   | 9/8/2022    |
| RW9-MW01D1      | 53.1       | 56.20        | 56.20        | 195208.5 | 1126506.0 | 40°42'04.81"   | 73°29'13.01"   | 9/8/2022    |
| RW9-MW01D2      | 53.1       | 56.12        | 55.88        | 195212.7 | 1126527.7 | 40°42'04.85"   | 73°29'12.73"   | 9/8/2022    |
| RW9-MW01D3      | 53.3       | 56.24        | 56.32        | 195214.3 | 1126546.1 | 40°42'04.86"   | 73°29'12.49"   | 9/8/2022    |
| RW9-MW01S       | 53.0       | 56.26        | 56.12        | 195204.6 | 1126487.1 | 40°42'04.77"   | 73°29'13.26"   | 9/8/2022    |
| RW9-VPB         | 53.5       |              |              | 195238.1 | 1126494.1 | 40°42'05.10"   | 73°29'13.16"   | 9/8/2022    |

Notes:

1. The horizontal datum is the New York, Long Island State Plane Coordinate System (NAD83) verified by differential GPS observations utilizing the NGS CORS Network on September 6, 2022. Reference Station: NYEL AND NYDP
2. The vertical datum is the North American Vertical Datum of 1988 (NAVD88) GEOID12A, verified by differential GPS observations from the NGS CORS System on December 17, 2019. Benchmark Reference Stations: NYBR (orthometric height= 42.156'), NYCI (orthometric height= 56.453'), NYVH (orthometric height= 309.251') and SHK6 (orthometric height= 30.141').
3. All coordinates and elevations shown hereon are in U.S. Survey Feet.



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J Peter Borbas, P.L.S.

New York Professional Land Surveyor 050566-1

September 30, 2022

P:\LP\P:\LP\2019\11\191103\Documents\191103\_2022-09-30\_Monitoring Well Chart

E: 1131150  
N: 199180

E: 1131320  
N: 199180



SCALE: 1"=20'



### LEGEND

- ⊙ DRAINAGE MANHOLE
- DRAINAGE INLET
- ⊙ SANITARY SEWER MANHOLE
- ⊕ MONITORING WELL
- △ CONTROL POINT

BSM 218  
SPIKE & TAG  
N: 199065.08  
E: 1131208.97  
ELEV: 61.47'

BSM 217  
SPIKE & TAG  
N: 199146.18  
E: 1131242.77  
ELEV: 61.87'

*North Woodward Drive*

*North Michigan Avenue*

E: 1131320  
N: 199030

E: 1131150  
N: 199010

### NOTES:

1. THE HORIZONTAL DATUM IS THE NEW YORK, LONG ISLAND STATE PLANE COORDINATE SYSTEM (NAD83) VERIFIED BY DIFFERENTIAL GPS OBSERVATIONS UTILIZING THE NGS CORS SYSTEM ON SEPTEMBER 06, 2022. REFERENCE STATIONS: NYEL AND NYDPI.
2. THE VERTICAL DATUM IS THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) GEOID12A, VERIFIED BY DIFFERENTIAL GPS OBSERVATIONS FROM THE NGS CORS SYSTEM ON DECEMBER 17, 2019. BENCHMARK REFERENCE STATIONS: NYBR (ORTHOMETRIC HEIGHT= 42.156'), NYCI (ORTHOMETRIC HEIGHT= 56.453'), NYVH (ORTHOMETRIC HEIGHT= 309.251') AND SHK6 (ORTHOMETRIC HEIGHT= 30.141').
3. THIS BASE MAP DEPICTS LIMITED PHYSICAL IMPROVEMENTS AS THEY EXISTED ON SEPTEMBER 06, 2022, IN THE AREA OF THE EXISTING GROUNDWATER MONITORING WELLS. NO ATTEMPT HAS BEEN MADE TO DETERMINE THE LOCATION OF PROPERTY LINES, EASEMENTS OR RIGHT-OF-WAY LINES.
4. ALL COORDINATES AND ELEVATIONS SHOWN HEREON ARE IN U.S. SURVEY FEET.
5. THE UTILITIES SHOWN HAVE BEEN LOCATED FROM EVIDENCE OBSERVED ON THE SURFACE ONLY. THE SURVEYOR MAKES NO GUARANTEES THAT THE UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN-SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.

| DESCRIPTION | GROUND ELEVATION | OUTER CASING ELEVATION | INNER CASING ELEVATION | DATE SURVEYED |
|-------------|------------------|------------------------|------------------------|---------------|
| TT-MW161SI  | 62.0             | 62.03                  | 61.74                  | 09/08/2022    |
| RE127D1     | 61.8             | 61.79                  | 61.37                  | 09/08/2022    |
| RE127D2     | 61.7             | 61.72                  | 61.22                  | 09/08/2022    |

**MONITORING WELL LOCATION MAP - TT-161**  
**FMR. NAVAL WEAPONS INDUSTRIAL RESERVE PLANT**  
**307 NORTH MICHIGAN AVENUE**  
**MASSAPEQUA, NASSAU COUNTY, NEW YORK**



**BORBAS SURVEYING & MAPPING, LLC**  
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 Transportation and Right of Way Surveys • Deformation and Structure Monitoring Surveys

|                       |                |  |
|-----------------------|----------------|--|
|                       |                | SCALE: 1"=20'                            |
|                       |                | SHEET NO.: 6 OF 11                       |
|                       |                | FIELD BOOK: 2022-3/91                    |
|                       |                | JOB NO.: 191103                          |
| SEP 30, 2022          | ORIGINAL ISSUE | PROJECT NAME: 191103                     |
| ADDITIONS AND UPDATES |                | DRAWING NO.: 191103_2022-09-30_WELLS.DWG |

**J. PETER BORBAS**

NEW YORK PROFESSIONAL LAND SURVEYOR 050566-1



Date: SEPTEMBER 30, 2022



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